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Leniency and Damages*

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Modern antitrust engenders a possible conflict between public and private enforcement due to the central role of Leniency Programs. Damage actions may reduce the attractiveness of Leniency Programs for cartel participants if their cooperation with the competition authority increases the chance that the cartel's victims will bring a successful suit. A long legal debate culminated in a EU directive, adopted in November 2014, which seeks a balance between public and private enforcement. It protects the effectiveness of a Leniency Program by preventing the use of leniency statements in subsequent actions for damages and by limiting the liability of the immunity recipient to its direct and indirect purchasers. Our analysis shows such compromise is not required: limiting the cartel victims' ability to recover their loss is not necessary to preserve the effectiveness of a Leniency Program and may be counterproductive. We show that damage actions will actually improve its effectiveness, through a legal regime in which the civil liability of the immunity recipient is minimized (as in Hungary) and full access to all evidence collected by the competition authority, including leniency statements, is granted to claimants (as in the US).

JEL Classification: C72, C73, D43, D81, H11, K21, K42, L13, L44, L51

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1 Introduction

On December 1st, 2014, Deutsche Bahn sued Lufthansa, the immunity recipient in a recent cartel case on airline freight, for 1.76 billion euros worth of damages.¹ How many new leniency applicants should we expect after such an example is set?

There is evidence to suggest that, among a range of competition policy tools, effective anti-cartel enforcement is by far the most important for a country's productivity growth (Buccirossi et al. (2013)). Public and private enforcement typically serve complementary purposes. In fact, in the US, public and private law enforcement have coexisted since the Sherman Act and private litigation plays a major role in antitrust law. However, it is also in the case of anti-cartel enforcement, that current antitrust enforcement may engender conflicts between the two. Such conflict may arise due to the central role played by Leniency Programs (LPs), which provide a fine reduction (up to immunity) to cartel members in exchange for reporting the cartel and further cooperation with an investigation, and to the effect that private actions may have on these programs.

Private action for damages may jeopardize Leniency Programs since a leniency application increases the risk of a successful damage claim by the cartel's victims. This is because, first, the evidence provided by the leniency applicant may be used by the claimants in the damage action, to prove the existence of the infringement and its effects. Second, leniency applicants, and especially immunity recipients, normally do not challenge in court the infringement decision adopted by the competition authority, at least as far as the existence of the cartel is concerned. Since the cartelists are joint and severally liable towards all the cartel's victims, the leniency applicant becomes the preferred target of the damage action for the entire harm caused by the cartel. Hence, the incentive stemming from the avoidance of a fine may be counterbalanced by the disincentive of being condemned to pay damages.

In the US, victims of an antitrust infringement are entitled to treble damages and, as in the EU, cartel members are jointly and severally liable for these damages. Moreover, the applicable discovery rules allow claimants in a damage action to obtain full disclosure of all relevant documents, included those provided by the leniency applicants. In order to reduce the risk of undermining the effectiveness of the US LPs, the US Congress enacted the Antitrust Criminal Penalty Enhancement and Reform Act (ACPERA) in 2009. ACPERA eliminates treble damages and joint liability for the amnesty recipient, who has also a duty to cooperate with the claimants in the civil action. Hence, the cooperating party is exposed only to single damages (detrebling) while the other conspirators will cover the additional damages.

The existing LPs in the EU do not protect leniency applicants from the civil law

¹In 2010, the European Commission fined 11 airlines in a total of 800 million euros, for a price fixing cartel. After damage claims were made, Deutsche Bahn proceeded to sue the other airlines, including Lufthansa, for damage claims, although the largest portion of the damages is being claimed from the latter. A total fine of 1.59 billion euro was also set by the DOJ on 16 firms involved in the same cartel.

consequences of their participation in the cartel. Furthermore, the general rules of tort law of all EU Member States provide that when several parties are responsible for the same damage, as in the case of a cartel, they are jointly and severally liable for it. This means that each victim is entitled to claim their entire loss from each liable party. This includes the leniency applicants, who may afterwards claim from the other co-cartelists a sum corresponding to their respective shares in the liability².

In the EU, follow-on damages actions have so far not impinged on the success of the Leniency Programs, which may be attributed to the very limited recourse to them. The situation may however change rapidly if there is an increase in private litigation, which is the policy goal pursued by the Directive on antitrust damages actions recently adopted by the EU Council of Ministers (European Commission (2014))³.

Other jurisdictions have adopted different solutions. A rather interesting one has been adopted in Hungary, where the immunity applicant can be called to compensate the cartel's victims if and only if the other cartel members are unable to pay the damages awarded.

Two issues are particularly important in order to find the right balance between public enforcement and the protection of the LP on one side, and private enforcement and the protection of the victims' right to compensation on the other side. The first issue is whether leniency applicants (and in particular the immunity recipient) should have the same level and type of liability as all other cartelists. The second issue is whether access to the leniency statements and related documents should be granted to the claimants in the damage action.

The aim of this paper is to examine whether the solutions adopted by the EU, the US and Hungary are the most appropriate ones taking into consideration both the objective of preserving (or improving) the effectiveness of the LP and the objective of guaranteeing the right to compensation of the cartel's victims. We investigate whether pursuing the primary goal of the public enforcement system, to achieve an optimal level of deterrence of anticompetitive conducts, necessarily requires sacrificing the amount of damages that claimants can expect to recover, or whether, to what extent and how these two objectives can be both pursued in a consistent and complementary way. In Spagnolo (2004), it is shown that, in order to maximize deterrence in the presence of a leniency program, it is optimal to minimize the amount of damages paid by the first (and only the first) reporting firm. However, how much information from the leniency report has to be disclosed in the civil action and the right of victims to be compensated were not taken into account. Here, we extend Spagnolo (2004) to include these two additional elements. We determine the optimal combination of damage liability of the reporting firm and the amount of information which should be accessible to the claimants (which includes leniency statements), both in terms of deterrence and of the ability of victims to be compensated.

²A summary of damage legislation in some EU member states and in the US is included in *Appendix II*.

³The Directive is further discussed in the next section

We find that, normally, there is no conflict between the two objectives, contrary to what is as presumed by the legal debate. To maximize the attractiveness of the leniency program and deterrence, it is optimal to a) minimize the amount of damages the leniency applicant is liable for, and b) to maximize the share of information collected by the competition authority and made accessible by the claimants, including leniency statements. Hence, we suggest a legal regime in which the immunity recipient's liability is reduced as much as possible (possibly eliminated) and full access to the file of the competition authority is granted to the claimants in the ensuing damage actions. When we examine expected damages awarded, we find that as long as competitors are able to jointly cover the damages caused by the leniency applicant, the proposed solution is also optimal, as it maximizes the possibility of victims to obtain compensation for harm. Claimants are worse-off with the Directive, in comparison with both the previous legal system and with the legal system that would result from our proposed solutions. The latter dominates both the other systems and maximizes deterrence. The US solution is suboptimal too. It can be improved by granting the amnesty recipient with full immunity on civil liability. The Hungarian solution instead works well since, as a matter of fact, if there is no risk of bankruptcy, it is equivalent to the solution we propose.

We also examine strategic risk (the fear of being betrayed by a partner applying for leniency) as a deterrence channel, and extend the model to include the cost of being the preferred target of the damage actions. We find that both these factors further increase the efficiency gain of the proposal over the Directive.

Finally, we consider the case in which cartel members' assets suffice to pay awarded damages only if the first leniency applicant is not kept immune from its civil liability. In this situation a possible conflict between deterrence and victims' compensation may emerge. We show that, in this scenario, the Hungarian solution can be considered a "second best" which maximizes deterrence under the constraint of holding the value of expected liquidated damages constant. However, we argue that if we take into account both the welfare of the actual victims of uncovered cartels and the welfare of the customers of potential cartels that do not occur because of the increased deterrence, then our proposal is likely to perform better than the Hungarian solution.

The remainder of the article is organized as follows. *Section 2* relates this paper to the legal debate and the relevant literature. *Section 3* presents the theoretical model. *Section 4* discusses some extensions of basic model: 1) deterrence linked to strategic risk; 2) the impact of being the preferred targets in damage actions; and 3) the risk of bankruptcy. *Section 5* concludes. All proofs and derivations are in the Appendix.

2 Literature Review

The possible conflict between public and private enforcement has originated a long and ongoing debate, which culminated with the recently approved Directive.⁴ In this section, we review this legal debate and the literature on the trade-off between public and private enforcement.

2.1 The recent legal debate and the EU Directive

Before the adoption of the Directive, the issues of liability of the immunity applicant and access to leniency statements, were dealt with by applying some general legal principles.

The first relevant principle, as stated by the European Court of Justice (ECJ) in the *Manfredi* (2006)⁵ and *Courage* (2001)⁶ judgements, is that the victims of an antitrust infringement have a right to be fully compensated for the harm they suffered. If a more favorable treatment of a leniency applicant with respect to its civil liability hindered the effective exercise of this right to a full compensation, it would run against this principle. As for the access to the leniency statements, in a judgement on a reference from the district court of Bonn in Germany (*Pfleiderer* case)⁷ the ECJ ruled that EU law does not prohibit a third party, who has been adversely affected by a breach of competition law, from having access to a leniency application by the infringer. The court held that it is for the national judge to determine the conditions under which access to leniency material can be granted to someone seeking to obtain damages. According to the ECJ, the national judge would need to take into account and weigh all the interests protected by EU law, namely the need to ensure the effectiveness of leniency Programs and to support antitrust damage actions.⁸ This position has been confirmed in the more recent *Donau Chemie* judgement,⁹ where the ECJ affirmed that national courts must balance these possibly conflicting interests on a case-by-case basis, taking into consideration all the relevant facts of the case.

The recent Directive has finally intervened on these two issues. As for the rule on the liability, the Directive provides “*that an immunity recipient is jointly and severally liable as follows: (a) to its direct or indirect purchasers or providers; and (b) to other injured parties only where full compensation cannot be obtained from the other undertakings that were involved in the same infringement of competition law*” (Art. 11(4)).

As for the access to the documents submitted by a leniency applicant (not only the

⁴For a complete survey on private and public enforcement of antitrust law see Segal and Whinston (2006).

⁵Judgement of the Court of Justice of 13 Jul. 2006, Joined Cases C-295/04 to C-298/04, *Manfredi*, ECR I-6619.

⁶Judgement of the Court of Justice of 20 Sept. 2001, Case C-453/99, *Courage*, ECR I-6297.

⁷Judgement of 14 June 2011 in the case C-360/09.

⁸On 30 January 2012, the German court which had brought the case before the ECJ concluded that access to leniency documents should be denied.

⁹Case C-536/11 – Bundeswettbewerbsbehörde v Donau Chemie AG and others.

immunity recipient), the Directive provides that “national courts cannot at any time order a party or a third party to disclose any of the following categories of evidence: (a) leniency statement; and (b) settlement submissions.” (Art. 6(6)). Moreover, article 7(1) provides that “Member States shall ensure that evidence in the categories listed in Article 6(6) which is obtained by a natural or legal person solely through access to the file of a competition authority is either deemed to be inadmissible in actions for damages or is otherwise protected under the applicable national rules”.

The legal debate has been active regarding the coexistence of private and public enforcement (Shavell (1997), Lande and Davis (2011) and Bernard (2012)) and the interaction between leniency Programs and damage claims.

More closely related to the question posed in this paper, are the articles by Komninos (2011), Cauffman (2011) and MacCulloch and Wardhaugh (2012) which describe the relationship between leniency Programs and damage claims. While Cauffman (2011) and MacCulloch and Wardhaugh (2012) suggest that the effectiveness of leniency should prevail and therefore, the reports should not be disclosed, Komninos (2011) proposes a case by case approach. In addition, Komninos (2011) and Cauffman (2011) suggest that the reporting firm should have further limited liability. These proposals are somewhat in line with what has been approved in the new directive. Two other papers examine the directive itself. Kortmann and Wesseling (2013) and Geradin and Grelier (2013) view the directive as being flawed in the sense that the liability of immunity recipients should be further reduced.

2.2 Other relevant literature

Shavell (1997) was one of the first to explore the differences between the social and private incentives to litigate, from a legal perspective. The author argues that having a number of litigations which is neither socially excessive nor socially inadequate requires corrective social policies and the guarantee that the claimants have more knowledge than that which the public regulators have or could possibly obtain. The author points out that low litigation costs allow more plaintiffs to access justice but encourages them to sue firms even in cases where social costs exceed social benefits and, according to Bourjade et al. (2009), where lawsuits are poorly-founded. Bourjade et al. (2009) study, theoretically, the effect of encouraging private actions for breaches of EU competition law, by developing a model of litigation and settlement with information asymmetry. The authors conclude that it is better to increase damages than to reduce the cost of suing.

McAfee et al. (2008) develop a theoretical model which compares private and public enforcement and find that, if the courts resolve with a low error level, then only legitimate suits are submitted and the optimal solution is the conjunction of public and private enforcement. This is because private parties have a better signal of the violation than the public agency. The authors assume that neither private nor public entities can commit and that public entities aim to maximize social welfare. In this scenario, they

propose a system where private claimants pay a subsidy for public investigation in exchange for a monetary award following a conviction.

Spagnolo (2004) shows that in order to maximize deterrence in the presence of a leniency program it is optimal to minimize (eliminate) the damages paid by the first reporting firm (only). This proposal is also supported by Green and McCall (2009), who additionally suggest extending the immunity of the leniency applicant to civil liability. The empirical work of Gonzalez and Micco (2014) indicates that damage trial convictions are more likely if the competition authority is actively involved.

This paper is also related to the recent but extensive literature on the economics of Leniency Programs, starting with the contributions by Motta and Polo (2003), Spagnolo (2004), Aubert et al. (2006) and Harrington (2008), and followed by many others.

3 A Simple Model

Consider an economy composed by a continuum of industries. In each industry, two symmetric firms produce an homogeneous good and repeatedly play a Bertrand game in the infinite, discrete time. Firms may choose to enter a collusive agreement to maintain a high price and escape the poor competitive outcome. If they do, and respect the agreement, each of them earns (at most) collusive profits of Π per period.

In each industry, firms share the same discount factor δ . However, each industry has a different discount factor, because of e.g. different frequency of market interactions, and the different industry discount factors are uniformly distributed in the interval $(\frac{1}{2}, 1)^{10}$, so that collusion is sustainable in every industry.

We assume that to reach a collusive agreement firms need to communicate, that hard and compromising evidence is produced only after both firms agree to collude, and that this evidence, available to cartel members, can also be found by a competition authority (CA) that investigates the industry. If a cartel forms, the likelihood that the CA investigates, finds evidence on the collusive agreement and successfully prosecutes the cartel members without any of them cooperating with the investigation (revealing information) is ρ , with $0 < \rho < 1$. A Leniency Program (LP) is in place, encouraging cartel members to self-report such hard evidence before any such investigation.

If a cartel is convicted because of an independent investigation by the CA, each member must pay a fine F that, for simplicity, we assume is exogenously given, as in most previous analysis. If a cartel is convicted because one of the firms reported the hard information within the LP, the reporting firm pays no fines while the other pays the full fine F . If both parties self-report, each of them pays half of the fine.

In each period, the timing of the game is therefore as follows:

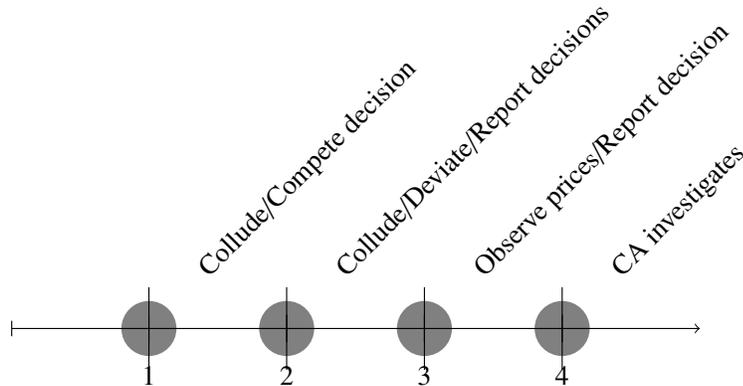
- Stage 1: Each firm chooses whether to enter into a collusive agreement. If at least one firm chooses not to collude, then competition “à la Bertrand” takes place and

¹⁰With $\delta < \frac{1}{2}$ collusion is not sustainable, independently of antitrust enforcement.

the game ends for that period. The competitive Nash equilibrium generates zero profits for both firms. Otherwise:

- Stage 2: Each of the firms chooses whether to respect the agreement and “collude”, quoting the agreed upon price, or deviate from it, undercutting the agreed upon price. Firms can also choose whether to apply to the LP and report the cartel to the CA. If at least one of the firms applies, the game ends for the period. Otherwise:
- Stage 3: Quoted prices become public information. Firms choose whether to apply for the LP and report the cartel to the CA. If at least one of the firms applies to the LP, the game ends for the period. Otherwise:
- Stage 4: The CA chooses which industries to investigate, ρ realizes, and the game ends for the period.

The figure below shows a graphical representation of the stage game.



3.1 Damages

In addition to fines, cartel members are liable for compensation of buyers. The maximum amount of estimated damages for each firm is D , so that the maximum amount of damages for which the cartel is liable for is $2D$. What fraction of these maximum total damages each convicted firm will have to pay, depends on the liability rules defined by the legislation in the various situations. The amount of damages that convicted firms expect to pay will also depend on the amount of information available to victims after the conviction, denoted by α , with $0 < \alpha < 1$.

We will start by analyzing the effects of different liability and disclosure rules on deterrence and on victims' expected compensation under the assumption that there is no risk of bankruptcy, in the sense that each firm is solvent for its own direct damages and non reporting cartel members have sufficient assets to jointly cover the damages

caused by the cartel, including those caused by the leniency applicant. While we believe this assumption to capture the current situation well, particularly for large cartels, we will also discuss what happens if it is not satisfied. For simplicity it is also assumed that firms do not appeal decisions.

We can then denote the amount of damages a given firm is liable for by D^{NR} if no firm applies to the LP; by D^R if the firm applies to the LP but the other cartel member does not; D^{OR} if only the other cartel member applies and reports the cartel; and D^{BR} if both do.

Expected total damages that firms will have to pay are a function of the amount of information available to victims, after a cartel is convicted, to sue for damages in each case. We denote the amount of this information by α^{NR} if no firm reports under the LP (or if the leniency statement cannot be disclosed), and α^R if at least one firm reports, with $\alpha^R \geq \alpha^{NR}$.

As mentioned in the introduction, the EU Directive restricts disclosure of leniency statements, thereby reducing α^R . In the absence of bankruptcy risks, the changes in the liability rules introduced by the Directive do not affect a reporting firm's expected liability, which remains at $D^R = D$. Our proposal is instead to do the opposite, set $D^R = 0$ and maximize α^R .

3.2 Analysis

To sustain collusion, agents use a grim-trigger strategy, which is reversion to competitive Nash equilibrium, forever, in case of deviation. The environment is stationary, so if no deviation is observed, firms continue to collude after they are convicted by a random investigation by the CA.¹¹ A firm that deviates undercutting price also finds it optimal to apply to the LP at the same stage (Stage 2). Firms can therefore sustain a stationary collusive agreement in subgame perfect Nash equilibrium if the expected gains from respecting the collusive agreement and not reporting are larger than the expected discounted gains from optimally deviating and reporting under the LP.

If firms choose not to report, they will earn in each period, a net profit of Π minus the expected penalty ($F + \alpha^{NR}D$). However, if a firm jointly deviates and reports, while the other firm complies, it will earn profits of 2Π and it will receive immunity from fines ($F = 0$), although it will still be liable for damages in the amount of $\alpha^R D^R$. The expected discount values of reporting (R) and not reporting (NR) are then:

$$V_{NR}(C, C) = \frac{\Pi - \rho(F + \alpha^{NR}D)}{1 - \delta}$$

$$V_R(R, C) = 2\Pi - 0 - \alpha^R D^R$$

¹¹This is as in Chen and Rey (2012). Results would not change if we assumed that collusion would stop, temporarily or forever, after a successful conviction of the cartel linked to a random investigation, without any deviation from the cartel partners.

The incentive compatibility constraint (ICC) below, determines the minimum discount factor $\underline{\delta}$ necessary for collusion to be sustainable in equilibrium:

$$V_{NR} - V_R > 0 \leftrightarrow \delta > \underline{\delta} \equiv 1 - \frac{\Pi - \rho(F + \alpha^{NR}D^{NR})}{2\Pi - \alpha^R D^R} \quad (1)$$

Since collusion is sustainable in equilibrium only in those industries where $\delta > \underline{\delta}$, an increase in $\underline{\delta}$ increases cartel deterrence, as it directly reduces the number of industries that satisfy the condition for collusion to be an equilibrium.

It can be easily seen that when $\alpha^R D^R$ decreases, $\underline{\delta}$ increases. Therefore, in the presence of a Leniency Program which provides the first applicant with immunity from fines, and with private enforcement in the form of damage claims, to maximize deterrence in terms of number of industries in which there exists no collusive equilibrium, $\alpha^R D^R$ should be set at its minimum level. Since α^R belongs in the interval $(\alpha^{NR}, 1)$, the minimal level of $\alpha^R D^R = 0$ can only be achieved by limiting leniency applicants' liability, setting $D^R = 0$ as we suggest.

By reducing the amount of information victims can access and use in private damage suits (in particular, leniency statements), setting $\alpha^R = \alpha^{NR}$, as done by the Directive, can never lead to maximal deterrence. Similarly, the legal regime determined by the ACPERA in the US leads to a level of deterrence that is below the maximum that can be achieved through a more generous LP. The Hungarian solution, instead, is optimal if there is no risk of bankruptcy as assumed in this basic version of the model, because D^R is effectively zero.

Proposition 1: The effectiveness of the Leniency Program, in terms of deterrence, is strictly smaller under the new EU directive or under the US ACPERA than in our proposal and in the Hungarian legal regime.

The various policies are also not equivalent regarding the possibility of victims to obtain compensation for harm. In particular, we compare the situation determined by the EU Directive and the one that would stem from our proposal. In equilibrium, no cartel is formed that is afterwards reported. However, suppose that unexpected trembles in the discount factor of firms may occur. A large enough tremble downwards would lead to a violation of the ICC, inducing that firm to deviate and apply for leniency. Under our policy, the amount of total damages expected by victims as compensation is $\alpha^R 2D$. Under the EU Directive, since $\alpha^R = \alpha^{NR}$, it would be $\alpha^{NR} 2D < \alpha^R 2D$.

An alternative way of looking at the effect of these policies on the right of compensation of victims (aware and unaware), is to evaluate the amount of damages which is left uncompensated. Suppose there is an unexpected change in the legal regime, which creates a shift in the discount factor, from $\underline{\delta}$ to $\underline{\delta}' > \underline{\delta}$. Assume this change implements our proposal, thus replacing the Directive.

In industries where $\underline{\delta}' > \delta > \underline{\delta}$, the increase in $\underline{\delta}$ leads cartels to collapse, report and pay a fraction (α^R) of the damages. The total of uncompensated damages in these

industries is given by $(\underline{\delta}' - \underline{\delta})(1 - \alpha^R)2D$, which is zero in our proposal. In the remaining industries, with $\delta > \underline{\delta}'$, cartels survive and the loss in damages is given by $(1 - \underline{\delta}')2D$. With the Directive, the amount of uncompensated damages was $2D(1 - \underline{\delta})$. It follows that our proposal reduces the amount of uncompensated damages by $2D[\underline{\delta}' - \underline{\delta}]$.

Proposition 2: The effectiveness of the Leniency Program, in terms of the ability of victims to obtain compensation and in terms of the loss in non-compensated cartel damages, is strictly smaller in the new EU directive than in our proposal.

4 Extensions

4.1 Strategic Risk

It is natural that each firm considers the possibility of defection by the other cartel member. A collusive agreement, to be viable, also requires that firms have sufficient confidence that co-conspirators will respect the agreement and will not get “cold feet”, i.e. that they are not too afraid of the possibility that its partner will not comply.

Spagnolo (2004) showed that this fear constitutes an additional deterrence channel for collaborative crimes, by introducing the concept of strategic risk to capture it formally, and that - ceteris paribus- a well designed and run LP (i.e. “strict” - limited to the first spontaneously reporting party - and with powerful incentives, e.g. high fines for non-reporting parties) can strongly increase cartel deterrence by increasing this fear.¹² Bigoni et al. (2012) provide striking experimental evidence on the power of this novel deterrence channel for collaborative crimes, showing that cartel formation falls dramatically when a (strict) LP is introduced, even when the probability that the cartel is independently detected by the CA when nobody reports under the LP, is zero.¹³

In this section, we take into account this novel deterrence channel and check whether and how the results of the previous section change in its light.

The simplest way to take into account the effect of strategic risk on an agent’s choice regarding whether or not to form a cartel, is to see it as an equilibrium selection criterion. When collusion satisfies the ICC, the game has multiple equilibria, collusive and competitive ones. Strategic risk points at equilibria that are less “risky”, i.e. where the consequences of the opponent not playing the equilibrium strategy (deviating) are less negative. It trades off equilibrium gains and losses if the opponent defects, and tells us which equilibrium is likely to be selected in different environments. The collusive equilibrium is more profitable than the competitive one, but it exposes the firm

¹²The game theoretic foundations of this concept have been then developed in Blonski et al. (2011) and Blonski and Spagnolo (2014). Experimental evidence of the importance of strategic risk was found in Dreber et al. (2008), Dal Bó and Fréchette (2011), Blonski et al. (2011) and Bigoni et al. (2014).

¹³A more recent experiment by Chowdhury and Wandschneider (2013) confirms the robustness of this result. For an overview of available empirical and experimental evidence on the effects of leniency programs, see Marvão and Spagnolo (forthcoming March 2015).

to the risk of being “cheated upon”, a particularly costly event in the presence of a LP, as a deviating opponent will then also report the cartel to the CA. We can then derive a minimum level of the discount factor $\underline{\delta}^*$ necessary for the higher strategic risk of collusive equilibrium to be dominated by higher expected profits so that subjects choose to collude. The minimum discount factor necessary for firms to choose the collusive equilibrium rather than the reporting one will of course always be strictly larger than the one necessary for a collusive equilibrium to exist in the first place, as defined by the ICC (i.e. $\underline{\delta}^* > \underline{\delta}$).

To derive $\underline{\delta}^*$, we use the best response equivalent matrix to calculate the “Nash products” of the two pure strategy equilibria, as shown in the Appendix. Collusion is risk dominated by reporting when:

$$\delta < \underline{\delta}^* \equiv 1 - \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{3\Pi + \frac{F}{2} + \alpha^R(D^{OR} - D^{BR} - D^R)}$$

Given that it is always the case that $\underline{\delta}^* > \underline{\delta}$, maximizing deterrence taking into account strategic risk considerations amounts to maximizing $\underline{\delta}^*$. The comparative statics of $\underline{\delta}^*$, also derived in the appendix, prove the following.

Lemma 1: Taking into account strategic risk (the fear of betrayal), cartel deterrence is:

- a) decreasing in D^R ;
- b) increasing in D^{OR} ; and
- c) increasing in α^R if $D^R < \frac{D}{2}$ and decreasing in if α^R if $D^R > \frac{D}{2}$.

Taking strategic risk also into account changes our previous conclusions in two ways. First, it highlights the fact that minimizing D^R is not only important for increasing the incentives to defect (Lemma 1a) but also because it automatically increases the liability of firms that do not report D^{OR} (Lemma 1b). This worsens the consequences and increases the fear that if you choose to collude, your partner may report you under the LP. Second, it shows that for full disclosure to maximize the effectiveness of cartel deterrence, the liability of the party reporting under the LP must be reduced more than it was suggested by the ICC in the previous section. The optimal policy in terms of the effectiveness of the leniency program however, does not change, nor do the consequences on the ability of victims to claim damages. It can also be shown that the Directive leads to a further loss of efficiency¹⁴. We can therefore state the following.

Proposition 3: Taking into account strategic risk (the fear of being reported), the effectiveness of the leniency program, in terms of cartel deterrence and the ability of the victims to obtain compensation when a cartel is reported, remains both strictly smaller under the EU Directive than under a policy that further reduces liability for the first firm that reports under the leniency program and maximizes information disclosure to

¹⁴Proof in the Appendix 7.3.

victims, giving full access to leniency statements for private actions. Moreover, the efficiency loss implied by the EU Directive is larger than that implied by the ICC and *Proposition 1*.

4.2 Preferred Target

In the previous sections, the model does not take into account the incentives of lawyers to target a specific cartel member in the action for damages. Let T denote the cost of being the preferred target of the action for damages. If none or both firms report, then this cost is equally divided between the cartel members ($\frac{T}{2}$).

When only one firm reports, in the new directive (*scenario II*), both firms have the same probability of being the target of the damage action and each supports half of the cost ($\frac{T}{2}$). Before the directive (*scenario I*), the reporter was the preferred target, supporting all the cost (T). In our proposed scenario (*scenario III*), the reporter has a lower liability for damages and the non-reporting cartel member supports the full cost (T).

Taking T into account, we calculate new expressions for the discount factors and we compute comparative statics on the discount factors in the three scenarios (proofs and derivations can be found in the Appendix). It can be shown that the difference between the discount factors of scenarios *III* and *II*, is increasing in T . This means that the efficiency gain of the proposal over the directive, is larger when T is taken into account:

$$\frac{\partial[\underline{\delta}^{*(III)}(T) - \underline{\delta}^{*(II)}(T)]}{\partial T} = \frac{(V'_{NR} - \rho T)(V_{BR} - V_{OR} + V_R)^2 + \frac{T^2}{4}V'_{NR}}{[(V_{BR} - V_{OR} + V_R)^2 - \frac{T^2}{4}]^2} > 0 \quad (2)$$

Proposition 4: Taking into account the cost of the claimant's choice of the preferred target of damage claims, further increases the loss of deterrence implied by the new directive (*II*), relative to the optimal policy (*III*).

4.3 Bankruptcy

Another relevant extension of our model is to consider a setting where firms may go bankrupt. In this extension we consider the simple case in which each firm individually has assets (W) that are insufficient to pay the fine and the awarded damages both if the cartel is uncovered by the CA by its own initiative, and if the cartel is uncovered because the other cartel member reported it to the CA. In this setting, a firm that does not cooperate with the CA goes bankrupt if the cartel is detected and is condemned to pay damages. However, we assume that if both firms are liable towards the victims, their total assets ($2W$) are sufficient to pay both the sanctions and damages. We further assume that if a firm goes bankrupt it is immediately replaced by another identical firm, so that the competitive conditions in the market do not change. We focus only on the

incentive compatibility constraint.¹⁵

The analysis is straightforward. If firms do not report in each period, with probability $(1 - \rho)$ each of them obtains Π and with probability ρ it is caught by the CA and fails, so that its payoff is 0. Hence, the expected discounted value of not reporting is:

$$V_{NR}(C, C) = \frac{1 - \rho}{1 - (1 - \rho)\delta} \Pi$$

The expected discounted value of reporting does not change with respect to the previous analysis and therefore is:

$$V_R(R, C) = 2\Pi - \alpha^R D^R$$

The minimum discount factor for collusion to be sustainable becomes:

$$\underline{\delta} \equiv \frac{1}{1 - \rho} - \frac{\Pi}{2\Pi - \alpha^R D^R}$$

and it is clearly decreasing in $\alpha^R D^R$, so that *Proposition 1* is unaffected.

However, *Proposition 2* does not necessarily hold anymore. Indeed, if we pose $D^R = 0$ (i.e. claimants cannot ask for compensation to the reporting firm) the value of damages that claimants are liquidated is $W - F$. This corresponds to value of the non-reporting firm's assets that remain after the payment of the sanction, whereas they would obtain a total compensation equal to $2\alpha^{NR}D$ if also the reporting firm is asked to repay damages and the other rules of the Directive apply. By assumption, $W < F + \alpha^R D^{OR}$ and, since when $D^R = 0$ then $D^{OR} = 2D$, we have that $W - F < 2\alpha^R D$.

If α^{NR} is sufficiently different from α^R (i.e. if the impossibility of using in the action the leniency documents has a strong impact on the ability of the claimants to obtain a favorable judgement) claimants still receive a higher compensation with our proposal than with the Directive. In this case, the gain from the increase in deterrence is larger than that from the loss in victim's compensation and *Proposition 2* holds.

Alternatively, if α^{NR} is sufficiently close to α^R , claimants would receive a higher compensation with the Directive than with our proposal. Therefore, if the solution we propose is adopted, the victims of those cartels that are not deterred and that are uncovered due to the LP might be worse off than under the legal regime envisaged by the Directive.

However, even in this case, we can still say that the Directive determines a sub-optimal regime, as the Hungarian solution dominates it. This is easy to show. The critical discount factor is monotonically decreasing in $\alpha^R D^R$. Hence, optimal deterrence is achieved at a corner solution that depends on the constraint we pose on $\alpha^R D^R$, beyond the non-negativity constraint. Suppose that this constraint follows the policy objective of allowing the victims of cartels uncovered through a LP, to obtain the

¹⁵However, our conclusions remain valid if we take into account strategic risk considerations.

same level of compensation that they can obtain under the Directive regime under any possible circumstance. Now, we can have two possible situations: in the first, the non-reporting firm has sufficient assets to pay damages. If so, the optimal (corner) solution is $\alpha^R D^R = 0$. The second possible situation is that in which the non-reporting firm has insufficient assets to pay the level of damages that would result under the Directive, that is $W - F < 2\alpha^{NR} D$; if so the optimal corner solution is to set $\alpha^R = \alpha^{NR}$ and $D^R = 2D - (W - F)$. Hence, to maximize deterrence, under the constraint defined above, we can set $\alpha^R = \alpha^{NR}$ and $D^R = \max(0, 2D - (W - F))$. This solution is a fairly good representation of the Hungarian rules, at least as far as the liability of the immunity recipient is concerned.

Proposition 4: If firms may be unable to compensate the cartel’s victims without the contribution of the immunity recipient, the EU Directive is strictly dominated by the Hungarian solution (i.e., in which the leniency recipient only becomes liable if all other cartel members go bankrupt).

The above discussion shows that when there is a risk of firms’ bankruptcy, there might exist a trade-off between the deterrence objective and that of allowing cartels’ victims to obtain full redress. In this case, the Hungarian rules on the civil liability of the immunity recipient may seem a good compromise. However, we can say something more, even if we restrict our attention to customers’ welfare and leave aside any allocative efficiency considerations that would strongly suggest to focus only on the deterrence properties of the enforcement system. Indeed, the trade-off between deterrence and victims’ compensation can be represented, in the customers’ welfare space, as a trade-off between the welfare of the customers of potential cartels that do not form because they are effectively deterred, and the welfare of the customers of actual cartels that are uncovered due to a LP and subsequently obtain damages. As far as we know, nobody has ever argued that the welfare of actual victims is more important than the welfare of potential victims and we cannot see which arguments could ever be used in favor of this proposition. So, if actual and potential victims’ welfare are equally important, we should not be satisfied with a “second best” solution. In particular, we can check if, or under which conditions, adopting our solution rather than the Hungarian one, would make cartels’ victims, actual and potential, better off.

To make this assessment, let us assume that all cartels (actual and potential) cause the same level of harm to consumers (D) and, for the sake of this analysis, assume that the level of awarded damages (α^R) is the same in both legal regimes when a cartel is uncovered through a leniency application. The two solutions are equivalent if the assets of each (would-be) cartelists are sufficient to pay the fine and the awarded damages. Hence, we can restrict attention to the case in which victims can obtain the awarded damages only if the leniency applicant is held liable. In this case, our proposed solution deters more cartels but reduces the level of compensation obtained by the victims of

actual cartels. Hence, we can define its consequences in the consumer welfare space as a benefit and a cost.

The benefit is the consumer harm of the potential cartels that do not occur due to increased deterrence; the cost is the portion of consumer harm that is not compensated because the immunity recipient is not required to pay damages. Therefore, the benefit is:

$$(F(\underline{\delta}') - F(\underline{\delta}_H))D$$

where $\underline{\delta}'$ is the critical discount factor when our proposal is implemented, $\underline{\delta}_H$ is the critical discount factor when the Hungarian solution is in place, and F is the cumulative distribution function of firms' actual discount factor, δ . The cost, instead is:

$$(1 - F(\underline{\delta}'))\beta\lambda\alpha^R D$$

where β is the fraction of undeterred cartels that are then reported by a leniency applicant, λ is the fraction of awarded damages that will not be covered by the other cartelists and α^R is the portion of actual damages that is awarded by a court.

Our model does not allow us to say that the benefit of our proposal always exceeds its cost. This issue might be addressed empirically. However, we think that there are good reasons to believe that the benefit of our proposal is larger than its cost. First and foremost, customers of a potential but deterred cartel save the entire harm that the cartel would cause them (D), whereas those of an actual cartel are usually able to recover only a fraction of the harm they suffered. This is especially true if we consider that damage repayment is uncertain, takes time and the civil action entails costs that are rarely fully reimbursed by the losing party. Therefore α^R might be relatively low. Second, we are not aware of cases, at least in Europe, in which a damage action has determined the failure of one or more condemned defendants. From this, we can infer that the fraction of awarded damages that will not be paid if the immunity recipient is not liable (λ) is likely to be extremely low. Third, if the immunity recipient is granted immunity also on civil ground, we suspect that the LP may become a tremendously powerful deterrence mechanism, so that the fraction of undeterred cartels ($1 - F(\underline{\delta}')$) is likely to be relatively low. Fourth, we have no elements to say how many undeterred cartels fall apart because one of the members reports the cartel to a CA. What we can say is that in a stationary model, as ours, this number is zero (so that β is zero) because either the cartel is deterred or, if not deterred, is not reported.

All these considerations make us quite confident that our solution would outperform the Hungarian one if we give equal weight to the welfare of the actual victims of uncovered cartels and the welfare of the customers of potential cartels that do not occur because of increased deterrence.

4.4 Other extensions

An extension which is likely to increase the appropriateness of our suggested solution is to increase the number of cartel members. Keeping all else equal, an increase

in the number of competing firms should increase the risk that some other firms would take advantage of the LP and report the cartel's existence. Hence, the LP may be rendered extremely effective if the first applicant is further "rewarded" with a civil liability immunity, as the risk that a competitor would be lured by this reward increases exponentially in the number of active and colluding firms.

5 Conclusions

Does the pursuit of the primary goal of the public enforcement system, i.e. achieving an optimal level of deterrence of anticompetitive conducts, necessarily requires to sacrifice the amount of damages that claimants can expect to recover? In this paper, we examine whether the solutions adopted by the EU, the US and Hungary are the most appropriate ones taking both objectives into consideration .

The position of the ECJ summarized in the introduction has the merit of clarifying that actions for damages initiated by the victims of an antitrust infringement may increase the level of deterrence. In this respect, public and private enforcement do not conflict with each other. However, as far as hard-core cartels are concerned, the public interest has been pursued in many jurisdictions through the adoption of LPs. The legal debate has been centered on the question of whether damage actions can jeopardize the effectiveness of these programs. In our view, the legal debate has taken for granted that an inherent conflict exists between the proper functioning of a LP and private damage claims, so that any proper legislation necessarily has to compromise between the interest of the public enforcement system and the interest of private cartel victims to be fully compensated. The recently adopted EU Directive on damage actions follows this path. Our analysis shows that a compromise is not actually needed: we do not have to limit the ability of cartel victims to recover their loss to preserve the effectiveness of a LP. In fact, damage actions can even improve the effectiveness of such programs.

The simple theoretical model discussed in the previous sections shows that as far as the incentive compatibility constraint is concerned, the optimal solution is to limit as far as possible the risk for the immunity recipient to be condemned to pay damages, through reducing its level of liability. This maintains the deterrence properties of a LP implied by the incentive compatibility constraint. The Directive partially limits this liability but it also limits the information that is available to the claimants. These two instruments (lower liability of the immunity recipients and restricting the available information) have different effects on deterrence and on the victims' ability to be fully compensated. Indeed, given that all cartelists are jointly and severally liable towards all the cartel's victims, reducing the level of liability of the immunity recipient does not affect the amount of damages they can obtain. On the contrary, limiting the evidence they can use in the damage action will certainly reduce the expected value of the final compensation. Hence, if we want to give concrete application to the legal principle according to which any victim has the right to be fully compensated, the best solution

would be to grant complete access to all documents submitted by the immunity applicant and restrict (possibly eliminate) the civil liability of the immunity recipient.

The US legislation is also not optimal because it only detrebles damages for the successful amnesty applicant who, therefore, remains liable for single damages. The solution adopted in Hungary (which unfortunately is bound to be abandoned in favor of the EU Directive) instead is optimal when there is no risk of bankruptcy. Moreover, limiting the immunity applicant's civil liability will significantly reduce its incentive to disclose only the information that is strictly necessary for a successful leniency application and strategically avoid any information that would facilitate the hard work that the cartel's victims have to undertake when they claim for damages.

Deterrence does not depend only on the cartelists' incentives to deviate (and report); it also depends on the riskiness of continuing to collude. Recent laboratory evidence confirms that strategic risk is the main driver of deterrence. Our analysis shows that once risk dominance considerations enter the picture, our suggested solution dominates the Directive to an even larger extent, in terms of deterrence effects. Hence, reducing the individual liability of the first reporting firm as much as possible and allowing claimants to obtain all the evidence collected during the administrative investigation is the optimal solution to pursue the interests of both public and private enforcement.

We have then considered the case in which firms may go bankrupt and therefore claimants cannot recover the entire awarded damages if the immunity recipient is not liable. Our analysis shows that a conflict between deterrence and the victims' right to compensation may exist in this case. However, the EU Directive remains a bad compromise: the Hungarian solution clearly dominates it, as it performs better, as far as deterrence is concerned, and never reduces the amount of damages that victims can recover. Finally, we have argued that the trade-off between deterrence and the right to compensation can be interpreted as a trade-off between the welfare of customers of potential but deterred cartels and the welfare of customers of actual cartels then reported by one of the conspirators. On that basis we have proposed some arguments that support our claim that our proposed solution would entail a cost, in terms of expected reduced compensation of actual victims, that is largely outweighed by its benefit, that is the full "compensation" of customers of potential cartels that are never damaged as the cartels are effectively deterred.

6 Appendix I

6.1 Calculation of the Nash Products

Let us first “summarize” our dynamic game into a two by two matrix with the expected payoffs in the four crucial states in *Table 1*. The collusive equilibrium is “strategic risk dominant” if each firm’s equilibrium strategy is the best reply to the other firm’s strategy of randomizing with equal probability between “Collude” and “Report”.

We define the following value functions for the cases in which only the other firm reports and when both report¹⁶:

$$V_{OR}(C, R) = 0 - F - \alpha^R D^{OR}$$

$$V_{BR}(R, R) = \Pi - \frac{1}{2}F - \alpha^R D^{BR}$$

The game matrix is described in *Table 1*.

Table 1: Game matrix (1)

	C_j	R_j
C_i	V_{NR}, V_{NR}	V_{OR}, V_R
R_i	V_R, V_{OR}	V_{BR}, V_{BR}

By transforming the bimatrix-form of this game when agents establish a collusive agreement, the best response equivalent matrix is as shown in *Table 2* (see Harsanyi and Selten (1988) for more details on this transformation).

Table 2: Game matrix (2)

	C_j	R_j
C_i	$V_{NR} - V_R, V_{NR} - V_R$	0,0
R_i	0,0	$V_{BR} - V_{OR}, V_{BR} - V_{OR}$

The riskiness of the collusive agreement (γ) can be calculated using the “Nash products” of the two pure strategy equilibria. It can then be shown that collusion (C) is

¹⁶When both firms deviate and report simultaneously, they will both set $P = P^{monopoly} - \varepsilon$ and split the market, receiving $\Pi^{deviate} = \Pi - \varepsilon$. It is assumed that $\varepsilon \approx 0$.

“strategic risk dominated” by “reporting” (R) when:

$$\begin{aligned}
\gamma &\equiv (V_{BR} - V_{OR})^2 - (V_{NR} - V_R)^2 > 0 \\
&\leftrightarrow (\Pi - \frac{F}{2} - \alpha^R D^{BR} + F + \alpha^R D^{OR})^2 - [\frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{1 - \delta} - 2\Pi + \alpha^R D^R]^2 > 0 \\
&\leftrightarrow \Pi - \frac{F}{2} - \alpha^R D^{BR} + F + \alpha^R D^{OR} + 2\Pi - \alpha^R D^R > \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{1 - \delta} \\
&\leftrightarrow \delta < \underline{\delta^*} \equiv 1 - \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{3\Pi + \frac{F}{2} + \alpha^R (D^{OR} - D^{BR} - D^R)}
\end{aligned}$$

$\underline{\delta^*}$ can also be expressed as:

$$\underline{\delta^*} = 1 - \frac{V'_{NR}}{V_{BR} - V_{OR} + V_R}$$

where V'_{NR} is the numerator of V_{NR} .

6.2 Comparative Statics on δ^*

$$\frac{\partial \underline{\delta^*}}{\partial D^R} = \frac{\alpha^R [\frac{\partial D^{OR}}{\partial D^R} - \frac{\partial D^{BR}}{\partial D^R} - 1][\Pi - \rho(F + \alpha^{NR} D^{NR})]}{[3\Pi + \frac{F}{2} + \alpha^R (D^{OR} - D^{BR} - D^R)]^2} = \frac{-2\alpha^R [\Pi - \rho(F + \alpha^{NR} D^{NR})]}{[3\Pi + \frac{F}{2} + \alpha^R (D^{OR} - D^{BR} - D^R)]^2} < 0$$

$$\begin{aligned}
\frac{\partial \underline{\delta^*}}{\partial \alpha^R} &= \frac{[D^{OR} - D^{BR} - D^R + \alpha^R (\frac{\partial D^{OR}}{\partial \alpha^R} - \frac{\partial D^{BR}}{\partial \alpha^R} - \frac{\partial D^R}{\partial \alpha^R})][\Pi - \rho(F + \alpha^{NR} D^{NR})]}{[3\Pi + \frac{F}{2} + \alpha^R (D^{OR} - D^{BR} - D^R)]^2} \\
&= \frac{[D^{OR} - D^{BR} - D^R][\Pi - \rho(F + \alpha^{NR} D^{NR})]}{[3\Pi + \frac{F}{2} + \alpha^R (D^{OR} - D^{BR} - D^R)]^2} > 0 \text{ iff } D^{OR} > D^{BR} + D^R \leftrightarrow D^R < \frac{D}{2}
\end{aligned}$$

6.3 Difference in discount factors

The relative change in the discount factors derived from the ICC and the analysis of strategic risk, in the Directive and our proposal, is given by:

$$\begin{aligned}
\frac{\underline{\delta^*}^{(III)} - \underline{\delta^*}^{(II)}}{\underline{\delta^*}^{(III)}} &> \frac{\underline{\delta}^{(III)} - \underline{\delta}^{(II)}}{\underline{\delta}^{(III)}} \leftrightarrow \\
&\leftrightarrow \frac{1 - \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{3\Pi + \frac{F}{2} + \alpha^{R(III)}(D - 2D^{R(III)})} - 1 + \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{3\Pi + \frac{F}{2} + \alpha^{R(II)}(D - 2D^{R(II)})}}{1 - \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{3\Pi + \frac{F}{2} + \alpha^{R(III)}(D - 2D^{R(III)})}} > \frac{1 - \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{2\Pi - \alpha^{R(III)} D^{R(III)}} - 1 + \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{2\Pi - \alpha^{R(II)} D^{R(II)}}}{1 - \frac{\Pi - \rho(F + \alpha^{NR} D^{NR})}{2\Pi - \alpha^{R(III)} D^{R(III)}}}
\end{aligned}$$

With $\alpha^{R(III)} = 1 > \alpha^{R(II)} = \alpha^{NR}$ and $D = D^{R(II)} > D^{R(III)} = 0$ the above expression becomes:

$$\begin{aligned}
& \leftrightarrow \frac{-\frac{\Pi-\rho(F+\alpha^{NR}D^{NR})}{3\Pi+\frac{F}{2}+(D-2D^{R(II)})} + \frac{\Pi-\rho(F+\alpha^{NR}D^{NR})}{3\Pi+\frac{F}{2}+\alpha^{NR}(D-2D^{R(II)})}}{1 - \frac{\Pi-\rho(F+\alpha^{NR}D^{NR})}{3\Pi+\frac{F}{2}+(D-2D^{R(III)})}} > \frac{-\frac{\Pi-\rho(F+\alpha^{NR}D^{NR})}{2\Pi-D^{R(III)}} + \frac{\Pi-\rho(F+\alpha^{NR}D^{NR})}{2\Pi-\alpha^{NR}D^{R(II)}}}{1 - \frac{\Pi-\rho(F+\alpha^{NR}D^{NR})}{2\Pi-D^{R(III)}}} \\
& \leftrightarrow \frac{\frac{D+\alpha^{NR}D}{(3\Pi+\frac{F}{2}-\alpha^{NR}D)(3\Pi+\frac{F}{2}+D)}}{\frac{2\Pi+\frac{F}{2}+D+\rho(F+\alpha^{NR}D^{NR})}{3\Pi+\frac{F}{2}+D}} > \frac{\frac{\alpha^{NR}D}{4\Pi^2-2\Pi\alpha^{NR}D}}{\frac{\Pi+\rho(F+\alpha^{NR}D^{NR})}{2\Pi}} \\
& \leftrightarrow \frac{1 + \alpha^{NR}}{\alpha^{NR}} \frac{\Pi + \rho(F + \alpha^{NR}D^{NR})}{\Pi + \frac{F}{2} + (2\Pi - \alpha^{NR}D)} > \frac{\Pi + \rho(F + \alpha^{NR}D^{NR}) + (\Pi + \frac{F}{2} + D)}{2\Pi - \alpha^{NR}D}
\end{aligned}$$

The above condition is true when α^{NR} is sufficiently small.

6.4 Discount factors with T

The new value functions become:

$$\begin{aligned}
V_{NR}(T) &= V_{NR} - \frac{\rho}{1-\delta} \frac{T}{2} \\
V_{BR}(T) &= V_{BR} - \frac{T}{2} \\
V_R(T)(I) &= V_R - T; \quad V_R(T)(II) = V_R - \frac{T}{2}; \quad V_R(T)(III) = V_R - 0 \\
V_{OR}(T)(I) &= V_{OR} - 0; \quad V_{OR}(T)(II) = V_{OR} - \frac{T}{2}; \quad V_{OR}(T)(III) = V_{OR} - T
\end{aligned}$$

As shown in subsection (7.1) in the Appendix, $\underline{\delta}^*$ can be expressed as:

$$\underline{\delta}^* = 1 - \frac{V'_{NR}}{V_{BR} - V_{OR} + V_R} \tag{3}$$

Therefore, the new discount factors are:

$$\begin{aligned}\underline{\delta}^{*(I)}(T) &\equiv 1 - \frac{V'_{NR} - \rho \frac{T}{2}}{(V_{BR} - \frac{T}{2}) - (V_{OR} - 0) + (V_R - T)} = 1 - \frac{V'_{NR} - \rho \frac{T}{2}}{V_{BR} - V_{OR} + V_R - \frac{3T}{2}} \\ \underline{\delta}^{*(II)}(T) &\equiv 1 - \frac{V'_{NR} - \rho \frac{T}{2}}{(V_{BR} - \frac{T}{2}) - (V_{OR} - \frac{T}{2}) + (V_R - \frac{T}{2})} = 1 - \frac{V'_{NR} - \rho \frac{T}{2}}{V_{BR} - V_{OR} + V_R - \frac{T}{2}} \\ \underline{\delta}^{*(III)}(T) &\equiv 1 - \frac{V'_{NR} - \rho \frac{T}{2}}{(V_{BR} - \frac{T}{2}) - (V_{OR} - T) + (V_R - 0)} = 1 - \frac{V'_{NR} - \rho \frac{T}{2}}{V_{BR} - V_{OR} + V_R + \frac{T}{2}}\end{aligned}$$

The difference between the discount factors of scenarios *III* and *II* is:

$$\begin{aligned}\underline{\delta}^{*(III)}(T) - \underline{\delta}^{*(II)}(T) &= \\ &= 1 - \frac{V'_{NR} - \rho \frac{T}{2}}{V_{BR} - V_{OR} + V_R + \frac{T}{2}} - 1 + \frac{V'_{NR} - \rho \frac{T}{2}}{V_{BR} - V_{OR} + V_R - \frac{T}{2}} \\ &= \frac{V'_{NR} - \rho \frac{T}{2}}{V_{BR} - V_{OR} + V_R - \frac{T}{2}} - \frac{V'_{NR} - \rho \frac{T}{2}}{V_{BR} - V_{OR} + V_R + \frac{T}{2}} \\ &= \frac{(V'_{NR} - \rho \frac{T}{2})[V_{BR} - V_{OR} + V_R + \frac{T}{2} - V_{BR} + V_{OR} - V_R + \frac{T}{2}]}{(V_{BR} - V_{OR} + V_R + \frac{T}{2})(V_{BR} - V_{OR} + V_R - \frac{T}{2})} \\ &= \frac{V'_{NR} T - \rho \frac{T^2}{2}}{(V_{BR} - V_{OR} + V_R)^2 - \frac{T^2}{4}}\end{aligned}$$

The derivative of this difference with respect to T is:

$$\begin{aligned}\frac{\partial[\underline{\delta}^{*(III)}(T) - \underline{\delta}^{*(II)}(T)]}{\partial T} &= \\ &= \frac{(V'_{NR} - \rho T)[(V_{BR} - V_{OR} + V_R)^2 - \frac{T^2}{4}] + \frac{T}{2}(V'_{NR} T - \rho \frac{T^2}{2})}{[(V_{BR} - V_{OR} + V_R)^2 - \frac{T^2}{4}]^2} \\ &= \frac{(V'_{NR} - \rho T)(V_{BR} - V_{OR} + V_R)^2 + \frac{T^2}{4} V'_{NR}}{[(V_{BR} - V_{OR} + V_R)^2 - \frac{T^2}{4}]^2} \\ &> 0\end{aligned}$$

Appendix II: EU and US Damage Policies

The European Court of Justice (*ECJ*) rules that everyone can claim compensation for damages incurred due to law infringement and in the report of European Commission (2005b), the intention to facilitate private enforcement actions is clearly expressed. At the time of the Green Paper, an accompanying document (European Commission (2005a)) suggested the possibility of introducing punitive or multiple damages for infringements of the competition rules. The majority of responses were favorable to a system of double damages, where the immunity recipient would benefit from a discount in the form of a de-doubling of the amount of damages. This would not prevent full compensation and the discount system would increase the gap between the position of the immunity recipient and that of non-reporters. However, concerns over the (potential) lack of deterrence of this system put an end to its discussion (*CEPS impact assessment study*).

In June 2013, the European Commission issued a draft directive on antitrust damage actions, which was adopted by the Council on the 10th of November 2014. This is the Directive examined in the paper. Before the Directive, the leniency applicant was the favorite target of litigation, since courts were allowed access to the LP assessment. This situation weakened the incentive to apply for leniency because firms who received immunity from fines were heavily targeted with damage claims. In this article, we propose an alternative state of the legislation, in terms of the amount of information available to claimants and liability of the leniency applicants.

Some EU member States have particular features in their damage claims system. UK Courts allow claimants to sue a cartel member's subsidiary firm so as to anchor the claim in the UK against all cartel members and claim damages for harm caused across the EU. In contrast with most EU countries, the UK eases the trial process and subsequent disclosure of a wide range of its documents (*UK Civil Procedural Rules, part 31*). The Office of Fair Trading has also suggested the introduction of legislation allowing the immunity applicant to receive up to 100% of the damages he is liable for, from the non-leniency recipients (Office of Fair Trading (2007), *art.7.18-7.19*). Although there was some support to this initiative, others showed some concern that it would increase the level of uncertainty for immunity recipients and lead to further litigation.

In Germany, judges can estimate the amount of damages on the basis of a claimant's concrete submission (*German Code of Civil Procedure, section 287*). The legislation also allows entities, such as the Belgian entity *Cartel Damage Claim*, to represent a group of claimants.

The Netherlands features a low cost of litigation and collective litigation. It is the only Member State which allows binding collective claim settlements (*Wet Collectieve Afwikkeling Massaschade, 2011* and *Dutch Civil Code art.3:305a, 1994*).

Hungary's damage claim system aims to reconcile leniency incentives and the right of claimants to obtain damage compensation. The legislation allows the immunity re-

recipient to refuse reimbursement of the cartel damages until the claim can be collected from other cartel members held liable for the same infringement, and as far as the claim can be collected from those firms (*Hungarian Competition Act, art.88D 2011*). This means that the leniency applicant is the last target of damage lawsuits. If there is a request to review the decision of the Hungarian Competition Authority, establishing an infringement, the immunity recipient will only be sued after the administrative lawsuit judgment becomes legally binding. However, the other cartel members can claim a contribution of the immunity recipient, to the extent of his fault. In this system, the increased gap between the immunity recipient and the other members is likely to destabilize cartels but it also delays the payment of compensation to the claimants.

In the US, the Antitrust Criminal Penalty Enhancement and Reform Act of 2004 (ACPERA) (Department of Justice (2004)), which has been extended in 2010 until June 2020 (Department of Justice (2010)), limits the civil liability of leniency applicants to single instead of treble damages (i.e. penalties up to three times the estimated damage). The cartel members who did not receive immunity are jointly and severally liable for all damages including treble damages and compensation given to the victims cannot be claimed from any other cartel member(s). The ACPERA Act also increased the maximum amount of corporate penalties from \$10M to \$100M, and of individual fines from \$350,000 to \$1M; as well as jail time from 3 to 10 years. Despite the extension of ACPERA, there has been inconclusive evidence that the Act has improved the DOJ's ability to uncover cartels through the LP (Department of Justice (1993)), enough to outweigh the deterrent effect of treble damages (Miller (2009)).

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