

RECONCILING THE CONFLICT: ANTITRUST LENIENCY PROGRAMS AND PRIVATE ENFORCEMENT

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I. INTRODUCTION

Price-fixing cartels are often viewed as the most egregious of all antitrust violations. These conspiracies involve a concerted effort to restrict competition to the detriment of consumer welfare and market efficiency. It is difficult, if not impossible, to identify an economic justification for allowing such agreements. Simply put, “if a country were to have only one type of antitrust violation, surely it would be against horizontal cartels” (Lande and Davis, 2011). Accordingly, these agreements are *per se* violations of Section 1 of the United States’ Sherman Act, and of Article 101 of the Treaty on the Functioning of the European Union.¹

Cartel policy – and antitrust law, more generally – may be enforced by public antitrust authorities, private antitrust suits, or a combination of both. Antitrust law in the United States is jointly enforced by public antitrust authorities (e.g., the Department of Justice’s Antitrust Division and state attorneys general) and private plaintiffs; the latter accounts for 90-95% of total antitrust enforcement.² In contrast, European antitrust law, or “competition policy,” has been primarily enforced by public antitrust authorities alone – namely, the European Commission and the national competition authorities of the 28 member states. Private suits have, until now, played a minimal role. The European Court of Justice, in its 2001 *Courage Ltd. v. Crehan* decision, identified a right by European citizens to seek compensation for harm suffered due to competition violations.³ This ruling paved the way for the development of a private enforcement mechanism in European competition policy, but it left the details of implementation largely to the EU member states and their national courts. Consequently, substantial policy differences emerged among the member states, and most subsequent private antitrust suits took place in a small number of member states. There is concern that this is the result of “forum shopping,” the practice of filing suit in jurisdictions that are believed to be more plaintiff-friendly.

Acknowledging a need for harmonization within the EU, the European Commission adopted Directive 2014/104/EU (“The Directive”) into law in November 2014. The Directive aims to develop a common private enforcement mechanism across member states by committing them to a standard set of legal practices. The objective is to develop a well-functioning private enforcement mechanism that complements public enforcement activity.

Private antitrust suits offer a number of potential benefits to the overall efficacy of the European competition policy regime. They raise the probability that an antitrust violation is uncovered and raise the sanction applied to ones that are.⁴ There are myriad reasons that these private suits may even be superior to public enforcement – or at least, always complement it. First, public antitrust authorities may be limited by an administrative budget constraint (Motta and Polo, 2003; Aubert, Rey, and Kovacic, 2006; and Chen and Rey, 2013). Private enforcement can expand overall enforcement activity when public agencies are resource constrained. Related to this is the possibility that plaintiffs possess information of violations that the government may not have access to (Shavell, 1984; Kovacic, 2001; Segal and Whinston, 2006;

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¹ For a more thorough review of antitrust enforcement differences between the United States and the European Union, see Ginsburg (2005).

² See Canenbley and Steinvorth (2011)

³ Case C-453/99, *Courage Ltd. v. Bernard Crehan* (E.C.J. Sept. 20, 2001).

⁴ See Becker (1968).

McAfee, Mialon, and Mialon, 2008; and Motchenkova and Leliefeld, 2010). Without private enforcement in these instances, such violations may go unpunished—and more importantly, these cartels may persist. Lastly, private antitrust suits compensate the victims of antitrust violations. Compensatory justice is at the core of the *Courage* ruling and ultimately of The Directive.⁵

Introducing private enforcement into European competition policy may be expected to enhance deterrence and desistance of cartel activity for the reasons described above. To fully understand the (net) benefits of private enforcement, the interaction between private suits and the cartel leniency program must be considered. Cartel leniency programs provide some combination of fine reductions and reduced criminal sanctions to companies and individuals that confess participation in cartel agreements.⁶ When private damages liability exists, seeking leniency may be less desirable (Wils, 2003; Wils, 2009; Canenbley and Steinvorth, 2011; Cauffman and Philipsen, 2014; Migani, 2014; Kirst and Van den Bergh, 2016; and Knight and de Weert, 2015). This interaction is complicated by the *Courage* decision, which dictates that EU member states cannot provide immunity from private damages liability in exchange for confessing or providing evidence of a competition policy violation. Accordingly, the incentive to seek leniency may be weakened in the presence of private damages liability. In this paper, we demonstrate that from the perspective of reducing cartel formation and persistence, the positive direct effect of private enforcement outweighs its potential negative effect of the leniency program.

The analysis presented here is most similar to Buccirosi, Marvao, and Spagnolo (2015), which examines the decision to seek leniency or not seek leniency following the introduction of private enforcement. The authors find that, by limiting follow-on claims liability for leniency applicants, private enforcement increases the likelihood that a cartel member desists and seeks leniency. The current paper differs in two important ways. First, Buccirosi, Marvao, and Spagnolo (2015) only consider detection by a public competition authority; private enforcement exclusively takes the form of follow-on claims. In the current paper, cartels may be identified by the private enforcement mechanism. A second point of distinction is that the current paper separates the choice to seek leniency and the choice to desist. Here, private enforcement may induce a cartel member to desist, even though it does not seek leniency due to a fear of alerting private claimants to its previous behavior. The results of this paper are similar to those obtained by Buccirosi, Marvao, and Spagnolo (2015): private damages liability can enhance cartel desistance. The primary divergence is that, in the current paper, the result does not require the government to limit follow-on liability for leniency applicants. This distinction is legally relevant, as private claimants have a right, in the EU and other jurisdictions, to seek damages from successful leniency applicants.

We proceed in Section 2 by providing a brief review of the leniency literature. This review provides a concise description of the most relevant policy issues related to leniency programs and provides evidence for the desirability of these programs from a social welfare perspective. Section 3 presents a simple dynamic model of collusion and employs that model to demonstrate that private cartel enforcement may enhance overall cartel desistance and may even enhance the attractiveness of leniency programs. Section 4 provides some concluding remarks that identify the policy relevance of the results in Section 3.

II. LENIENCY PROGRAMS

Antitrust leniency programs are viewed as the most important cartel enforcement tool, and as such have attracted considerable scholarly attention.⁷ Scholars have convincingly demonstrated that these programs enhance overall deterrence and reduce instances of cartelization.

The theoretical leniency literature identifies a tradeoff between *ex ante* deterrence and *ex post* desistance. Reduced fines or criminal liability may destabilize cartels (desistance effect), but they also reduce the expected cost of cartel participation (deterrence effect). Motta and Polo (2003) identify this tradeoff and introduce the question of whether leniency programs foster collusion by either reducing the expected cost of an infringement or if they destabilize existing cartels by increasing the benefit of blowing the whistle. Harrington (2008) further examines the former effect, referring to it as the Cartel Amnesty Effect, the channel through which leniency fosters cartel formation by reducing the expected cost of

⁵ Compensatory justice motivates the adoption of the so-called passing-on defense within The Directive.

⁶ Since there is no criminal liability for antitrust violations in the EU, and individuals are not liable, leniency takes the form of fine reductions for firms.

⁷ See Sokol (2012).

collusion. Harrington, however, argues that this effect will only dominate when leniency is weak – as opposed to “absolute leniency”, e.g. when the leniency recipient is granted full amnesty. When full amnesty is available to leniency applicants, leniency reduces overall collusive behavior. Spagnolo (2003) and Bigoni et. al. (2012) find, similarly, that leniency programs reduce overall cartel activity.

A small empirical literature examines the characteristics of detected cartels after substantial changes in US and EU leniency programs and seeks to identify support for the hypothesis that these programs reduce overall cartel behavior. Harrington and Chang (2009) argue that the introduction of a successful leniency program should be followed by: 1) an increased number of detected cartels, 2) an increase in the average duration of detected cartels in the period directly following the introduction of leniency, and 3) a decrease in the average duration of detected cartels in the longer run. Miller (2009) identifies these characteristics and reports that the US leniency program is responsible for a 59% lower cartel formation rate and a 62% higher detection rate. Evidence from the EU, on the other hand, is mixed. Brenner (2009) does not identify an increase in cartel duration after the introduction of the EU leniency program; Zhou (2013), however, identifies an increased duration of detected cartels in the short run and a decreased duration of detected cartels in the longer run. Zhou (2013) explains the inconsistency between his results and those of Brenner (2009) by stating that the latter came short of properly operationalizing the short and long runs. While it is infeasible to observe cartel formation and collusive behavior explicitly, recent theoretical and empirical analyses provide substantial evidence that leniency programs reduce the prevalence of cartel agreements.

Given the strong evidence that cartel leniency programs successfully reduce cartel behavior, an inquiry into whether private antitrust suits undermine these programs is warranted. The following section of this paper employs a simple model of collusion to identify whether private damages liability reduces the efficacy of leniency programs and cartel stability

III. PRIVATE DAMAGES AND THE EFFICACY OF LENIENCY PROGRAMS

Scholars and policy-makers alike express concerns that private antitrust enforcement may undermine the efficacy of well-functioning leniency programs. When considering whether to apply for leniency, colluding firms may fear that doing so would expose them to an increased risk of private damages liability. This is a particularly serious concern in the EU, where most private antitrust suits are follow-on claims in which guilt has already been established.⁸ We employ a simple dynamic model of collusion to examine whether private damages suits actually weaken the efficacy of leniency programs. We also investigate whether the introduction of private enforcement reduces cartel stability. We find that private damages liability may enhance the efficacy of a cartel leniency program and reduce overall cartel stability.

This section proceeds as follows: 1) a simple dynamic model of collusion between two firms is developed, 2) public enforcement with leniency is introduced into that model, 3) a threshold discount rate above which firms choose to maintain a collusive agreement is identified, 4) private enforcement is introduced into the model, alongside public enforcement with leniency, and 5) a new threshold discount rate above which firms choose to maintain a collusive agreement is identified. We observe that, under some parameterizations of the model, the threshold discount rate increases after the introduction of private enforcement. This finding would suggest that introducing private enforcement into a regime currently characterized by public enforcement with leniency would reduce overall cartel stability.

A. Baseline Model: No Antitrust Enforcement

We employ an infinitely repeated Prisoner’s Dilemma game, in which players attempt to overcome the so-called dilemma by adopting trigger strategies, to evaluate the effect of different antitrust enforcement regimes on cartel stability.⁹ Markets characterized by imperfect competition often place firms in a

⁸ In the EU, following the adoption of The Directive, the defendant in a follow-on claim is presumed to be guilty if they have been found guilty of the same violation by the European Commission or in one of the member states.

⁹ “Trigger strategies” are a class of strategies employed in repeated, non-cooperative games, in which a player initially cooperates, but punishes defections by its rivals with by discontinuing cooperation

Prisoner's Dilemma. Firms enjoy the greatest possible amount of joint profit when they cooperate (e.g., by agreeing to charge higher prices, restrict output, or reduce product quality), but each individual firm has an incentive to deviate from the agreement it makes with its rivals. Firms can only avoid this tendency – and enjoy more profit – if they form a stable cartel.¹⁰

Table 1 illustrates provides a normal form representation of a two-player, single-interaction Prisoner's Dilemma game.¹¹ We define the payoffs in this game as follows: 1) π^C denotes the profits each firm earns when both firms uphold the cartel agreement, 2) π^D denotes the profit earned by a firm that defects on the cartel agreement when the other firm upholds the agreement, and 3) π^N denotes the profit earned by both firms when neither upholds the collusive agreement. By assumption, the market in question is characterized by a Prisoner's Dilemma, and $\pi^D > \pi^C > \pi^N$. This condition implies that (Defect, Defect) is the Pure Strategy Nash Equilibrium of the single-interaction game, and π^N can be viewed as the profits that arise in a competitive market equilibrium.

Firm 1 \ Firm 2	Collude	Defect
Collude	π^C, π^C	$_, \pi^D$
Defect	$\pi^D, _$	π^N, π^N

Table 1: One-Off Prisoner's Dilemma Game

When this Prisoner's Dilemma game is indefinitely repeated, firms may be able to sustain a cartel agreement. That is, it may be incentive compatible to collude and thus achieve π^C . This possibility arises, because firms can punish defections in subsequent time periods. We consider the Grim Trigger punishment strategy. The Grim Trigger Strategy is a strategy in which a firm 1) colludes in the first time period, 2) colludes in each subsequent time period if their rivals have colluded in the previous time period, and 3) otherwise, defects in the current time period and in all subsequent time periods. The Grim Trigger Strategy is an appropriate assumption when considering illegal cartel behavior in the presence of a leniency program. Future collusion is made less likely by the presence of the leniency program.¹²

When the Prisoner's Dilemma game presented in Table 1 is repeated indefinitely, and firms adopt the Grim Trigger Strategy, each firm has an incentive to uphold a cartel agreement if:

$$\pi^C \frac{1}{(1-\delta)} \geq \pi^D + \pi^N \frac{\delta}{(1-\delta)},$$

where δ denotes a firm's individual discount rate. That is, if the discounted payoffs of receiving π^C in the current time period and all subsequent time periods exceeds the discounted payoffs of receiving π^D (the higher defect profit) in the current time period and π^N in all subsequent time periods (the lowest profit level), indefinite collusion is incentive compatible.

We identify a threshold discount rate, $\tilde{\delta}_1$, above which a firm would continue to uphold the collusive agreement by treating the preceding inequality as an equality and solving for δ . In the absence of antitrust enforcement, the baseline threshold is given as:

$$\tilde{\delta}_1 = \frac{\pi^D - \pi^C}{\pi^D - \pi^N}. \tag{1}$$

When this threshold increases, collusion becomes less likely. In the remainder of this section, we examine how different antitrust policies affect $\tilde{\delta}_1$. First, we consider a case in which cartel policy is enforced by a public antitrust authority, and full leniency is awarded to whistleblowers. Second, we consider a case in which cartel policy is enforced by both a public antitrust authority and private plaintiffs, and leniency awards only apply to public sanctions. That is, in the second case, leniency does not apply to private damages awards, only government-imposed fines.

for a period of time. In this paper, we adopt the Grim Trigger Strategy, which supposes that the discontinuation of cooperation is indefinite.

¹⁰ See Green and Porter (1984).

¹¹ The results obtained in this paper generalize out to any number of players. Firms' incentives are unaffected when we increase the number of firms.

¹² See Bigoni et. al. (2012).

B. Public Enforcement with Leniency

We introduce public enforcement with leniency to the simple dynamic cartel model presented above. As before, we assume that, in each time period, a firm can either continue to collude or defect on the cartel agreement. The firm, however, now has the added consideration that if it chooses to collude, it faces the possibility of being discovered by the antitrust authority and being sanctioned. This makes collusion less desirable for two reasons: 1) if a firm chooses to collude, it faces the possibility of being sanctioned, and 2) there is a possibility that collusion breaks down due to detection by the antitrust authority. This second concern is only apparent when examining collusion in a dynamic framework.

Introducing public enforcement requires the addition of two new variables to the model. We define p as the probability that a firm is detected and sanctioned by the antitrust authority, and we define F as the applied sanction. After normalizing $\pi^N = 0$, the discounted expected value of colluding in a particular time period is given as:

$$EV^C = p[\pi^N - F] + (1 - p)\{\pi^C + \delta[p(\pi^N - F) + (1 - p)\pi^C] + \delta \dots ,$$

which simplifies to:

$$EV^C = \frac{(1-p)\pi^C - pF}{1 - \delta(1-p)}.$$

We compare this expected value of sustained collusion to the known value of breaking with the cartel agreement, π^D . In the absence of private enforcement, if a firm chooses break from the cartel agreement, the firm seeks leniency to avoid being liable for the government-imposed fine. Comparing EV^C to payoffs associated with defecting on the cartel agreement and receiving leniency, we identify a new threshold discount rate:

$$\tilde{\delta}_2 = \frac{\pi^D - \pi^C + p(\pi^C + F)}{(1-p)\pi^D}. \quad (2)$$

Proposition 1: The threshold discount rate in Equation 2, $\tilde{\delta}_2$, is weakly greater than the baseline threshold in Equation 1 for $p \geq 0$, and strictly greater for $p > 0$.

Introducing public enforcement and offering full amnesty to whistleblowers increases the threshold discount rate above which sustained collusion is individually rational. That is, cartels are made less stable by the introduction of leniency.

C. Introducing Private Enforcement

We now consider a setting in which cartel policy is enforced both by a public antitrust authority and private plaintiffs. The antitrust authority offers leniency to whistleblowers, but it can only offer amnesty from public sanctions. Whistleblowers remain fully liable in private follow-on suits. Even more, we will assume that if a firm is detected by the antitrust authority or seeks leniency, it will face a follow-on claim. This setting mirrors the enforcement regime outlined in The Directive.

When firms choose to uphold a collusive agreement, they face the possibility of detection, both by an antitrust authority and by a private firm or citizen. If either or both of these forms of detection occur, the cartel breaks down without any firm explicitly choosing to defect. If a firm is detected by the antitrust authority, it will incur fine F and be liable for follow-on damages D . If a firm is detected by a private plaintiff, but not by the antitrust authority, it will only be liable for damages D . The probability that a collusive agreement is detected by the private enforcement mechanism is denoted by q . We present the possible outcomes and probabilities that each arises, when a firm chooses to uphold a collusive agreement, in Table 2.

Probability	p	$(1-p)q$	$(1-p)(1-q)$
Payoff	$\pi^N - F - D$ (collusion ends)	$\pi^N - D$ (collusion ends)	π^C (collusion continues)

Table 2: Possible Outcomes When Colluding

In order to analyze the incentive to uphold a cartel agreement in this enforcement regime, we consider whether a firm seeks leniency when it does not choose to uphold the agreement. Since seeking leniency increases the probability that a firm faces a private antitrust suit, it may be reasonable to defect on the cartel agreement, but not blow the whistle. We suppose, here, that if a firm seeks leniency, they are liable for damages D with probability $q = 1$. If a firm does not seek leniency, it faces a fine F with probability p and damages D with probability $(p + q - pq)$. A firm that chooses to defect on a cartel agreement seeks leniency only if:

$$D \leq \frac{p}{(1-p)(1-q)} F. \quad (3)$$

Otherwise, a firm that defects on a cartel agreement will do so without seeking immunity under the cartel leniency program. By blowing the whistle, the firm exposes itself to private damages liability. If the size of follow-on claims is sufficiently large, the net gains of seeking leniency become negative.

When private damages liability is sufficiently low, firms that choose to defect on a collusive agreement will seek leniency. The resulting threshold discount rate above which a firm chooses to uphold the cartel agreement is:

$$\tilde{\delta}_3 = \frac{\pi^D - (1-p)(1-q)(\pi^C + D) + pF}{(1-p)(1-q)(\pi^D - D)}.$$

We identify a number of relevant characteristics of this threshold discount rate. First, it is easy to demonstrate that when $D=0$ and $q=0$, introducing private damages neither increases nor decreases the threshold discount rate, relative to the threshold provided by Equation 1. Second, the threshold above is increasing in q . That is, as the probability of being successfully sued for collusion – which results in the breakdown of collusion – rises, the expected value of collusion declines. Together, these first two characteristics imply that, in the neighborhood of $D=0$, introducing private enforcement strictly reduces cartel stability when $q>0$. The third characteristic that we identify is that whenever the threshold discount rate is less than one, it is decreasing in damages liability D at an increasing rate. Alternatively put, any increase in D enhances cartel stability, assuming that a defection is followed by an application for leniency. This third characteristic implies that, while private enforcement reduces cartel stability when D is sufficiently small, it is possible that D could rise to a level above which private enforcement enhances cartel stability. This is because when a firm seeks leniency, we assume that it faces a follow-on claim of D .

Proposition 2: When $D < \frac{p}{(1-p)(1-q)} F$, and $q>0$, introducing private enforcement enhances cartel stability when D is sufficiently small, but that marginal increases in D enhance cartel stability (i.e., $\frac{\partial \tilde{\delta}_3}{\partial D} < 0$).

When private damages liability is sufficiently high that firms that break from the cartel agreement opt not to seek leniency *as to potentially avoid follow-on claims*, the threshold discount rate above which firms choose to uphold the cartel agreement is given as:

$$\tilde{\delta}_3 = \frac{\pi^D - (1-p)(1-q)\pi^C}{(1-p)(1-q)[\pi^D - p(F+D) - (1-p)qD]}.$$

If this discount rate is less than one, it is increasing in, D , at an increasing rate. Marginal increases in the size of the damages liability reduce cartel stability. This threshold is also increasing in q , which implies that increasing the likelihood of being detected by private enforcement also reduces cartel stability. Importantly, when $D = \frac{p}{(1-p)(1-q)} F$, the two thresholds are equal, implying that there is no discontinuity at the threshold discount rate.

Proposition 3: When $D > \frac{p}{(1-p)(1-q)} F$, which implies that defecting firms do not seek leniency, $\frac{\partial \tilde{\delta}_3}{\partial D} > 0$, and $\frac{\partial \tilde{\delta}_3}{\partial q} > 0$. Marginal increases in D and q reduce cartel stability.

Figure 1 presents the threshold discount rate as a function of private damages liability, D . We include the threshold discount rates from Regime 1 (i.e., No Cartel Enforcement), Regime 2 (i.e., Public Enforcement with a Leniency Program), and Regime 3 (i.e., Public Enforcement with a Leniency Program and Private Enforcement).¹³ The highest threshold discount rate for a particular value of D corresponds to

¹³ Figure 1 assumes that $p>0$, which implies that $\tilde{\delta}_2 > \tilde{\delta}_1$.

the enforcement regime that most reduces cartel stability for that value of D . For obvious reasons, the threshold discount rates in Regime 1 and Regime 2, $\tilde{\delta}_1$ and $\tilde{\delta}_2$, respectively, do not depend on the size of private damages liability D .

Following from Propositions 2 and 3, we observe that $\tilde{\delta}_3$ is decreasing in D until D reaches the critical value $\hat{D} = \frac{p}{(1-p)(1-q)}F$, and increasing in D to the right of this critical value. We can also demonstrate how this discount rate changes as the probability of being liable for such damages, q , rises. Let $\tilde{\delta}'_3$ denote the threshold discount rate when $q = 0$, and let $\tilde{\delta}''_3$ denote the threshold discount rate when $\hat{q} = \frac{-pF[p\pi^D - (1-p)\pi^C + pF]}{\pi^D[\pi^D + p(1-p)F]}$. This is the value of q above which private enforcement reduces cartel stability for all values of D .¹⁴

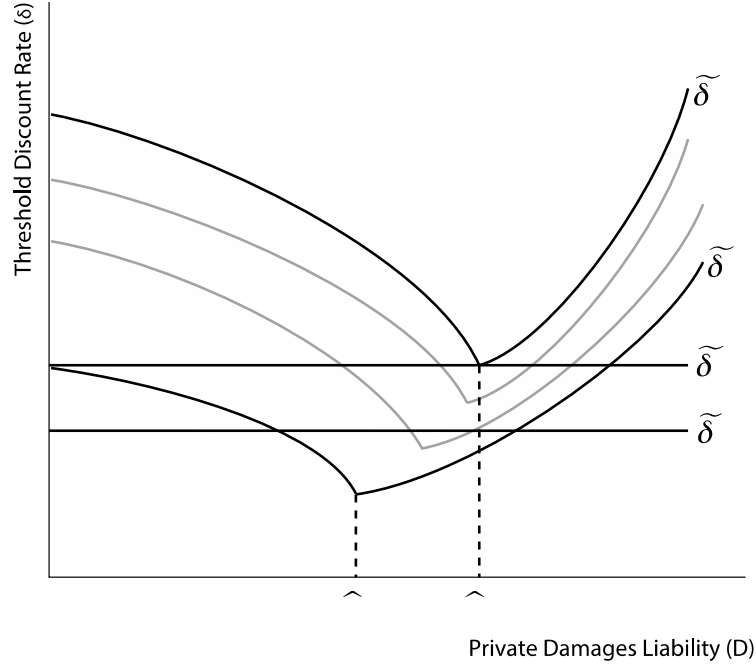


Figure 1: The Effect of D on Desistance

There are combinations of private enforcement parameters q and D for which private enforcement increases the attractiveness of the leniency program and reduces cartel stability. These combinations are depicted by the portion of the relevant $\tilde{\delta}_3$ curve that are above $\tilde{\delta}_2$ and lie to the left of \hat{D} . Moreover, there are other combinations of these parameters for which private enforcement may not enhance the attractiveness of the leniency program, but for which private enforcement still enhances desistance. This second group of parameterizations arises, because for values of $D > \hat{D}$, a firm that chooses not to uphold the cartel agreement would attempt to avoid follow-on claims by not applying for leniency.

Corollary 1: For all values of $q \in (0, \hat{q})$, there exist two ranges of D over which private enforcement reduces cartel stability (i.e., $\tilde{\delta}_3 > \tilde{\delta}_2$). The first arises when D is sufficiently small, and the other when D is sufficiently large.

If $0 < q < \hat{q}$, there is a range of sufficiently small D , over which introducing private enforcement makes firms more likely to break from the cartel agreement and apply for leniency from the antitrust authority, and a range of sufficiently high D over which introducing private enforcement makes firms more likely to break from the cartel agreement but not apply for leniency. Over an intermediate range of D , introducing private enforcement enhances cartel stability. Within this intermediate range, private damages liability is sufficiently large to dissuade firms from applying for leniency, but not large enough to

¹⁴ This value of q , above which introducing private enforcement reduces cartel stability for all values of D , is less than one.

incentivize desistance. Within this range, the cartel destabilizing effect of the leniency program is diminished, and private liability is not strong enough to destabilize the cartel on its own.

D. Endogenizing the Probability of Facing a Private Suit

The results above are primarily obtained by conducting a comparative static analysis, examining the effects of D and q on the threshold discount rate separately. First, we observe that, holding the amount of damages liability constant, an increase in the probability of facing a private suit raises the threshold discount rate, and thus, raises the likelihood that introducing private enforcement enhances desistance. Second, we see that, holding the probability of facing a private suit constant, increasing the value of private damages liability would, at first, reduce the threshold discount rate, as firms choose not to seek leniency in an attempt to avoid follow-on liability. Eventually, further increases in the amount of private liability raise the threshold discount rate, as firms become sufficiently afraid of private damages liability. This second result, however, raises an important question: could the probability of facing a private suit be dependent upon the amount of private liability?

Private suits are brought by profit-maximizing firms and utility-maximizing individuals. A suit is brought only when the expected benefit to the plaintiff exceeds their expected cost. The probability of facing a private suit might well depend positively on the amount of damages liability. That is, q may be a monotonically increasing function of D .

Here, we explore whether our results – specifically, Corollary 1 – are robust to the assumption that q is a monotonically increasing function of D . We suppose, in this subsection that $q \equiv \varphi(D)$; where $\varphi(0) = 0$, $\varphi'(D) > 0$, and $\lim(\text{as } D \text{ approaches } \infty) \leq 1$.

For obvious reasons, the threshold discount rate that exists before the introduction of private liability does not depend on q ; any changes to the treatment of q only affect the threshold discount rate under Regime 3, δ_3 . The model would predict even greater desistance in the presence of private enforcement, compared to when q was simply a parameter. Corollary 1, prior to endogenizing q , holds for all strictly positive values of q . If the probability of facing a private suit is dependent upon the value of the damages liability, because private damages awards entice plaintiffs to file suit, the two ranges of D over which private enforcement reduces cartel stability will be left intact. In fact, the range of D over which private enforcement reduces cartel stability will grow.

Corollary 1 is generally robust to endogenizing q . This does not mean, however, that treating q as endogenous does not affect this simple model of collusion, and alter the results regarding cartel stability. First, the slope of δ_3 to the left of \bar{D} becomes ambiguous. We can easily illustrate this using a simple total derivative of $\delta_3(D, q(D))$:

$$\frac{D\delta_3}{dD} = \frac{\partial\delta_3}{\partial D} + \frac{\partial\delta_3}{\partial q} \frac{\partial q}{\partial D}. \quad (4)$$

When $D < \bar{D}$, the first term is negative, and when of $D > \bar{D}$, the first term is positive. Consistent with Propositions 2 and 3, when q is treated as an exogenous policy parameter, the second term in Equation 4 equals zero. Following the introduction of $q \equiv \varphi(D)$, however, the second term is unambiguously positive. Thus, endogenizing q leaves the sign of this equation ambiguous when $D < \bar{D}$. A second, and related, difference is that there may no longer be any range of D over which private enforcement increases cartel stability. If the second term of Equation 4 is larger in magnitude than the first, for example, increasing damages liability will always reduce cartel stability, and private enforcement will always reduce cartel stability for all strictly positive values of q .

The analysis presented above, and the results depicted in Figure 1, rest on the assumption that the probability of facing a private suit is exogenous, and unrelated to the damages liability. This assumption is likely not realistic, because profit-motivated plaintiffs will be more likely to bring a suit when damages liability is higher. As we have discussed in this section, introducing the strategic behavior of plaintiffs and treating the probability of facing a private suit as an increasing function of the damages liability alters the results of the model, but does not contradict the finding that there will always exist a sufficiently small level of damages liability and a sufficiently large one such that private enforcement enhances cartel desistance. In fact, if the aim of this paper is to shed light on the desistance effects of introducing private enforcement, the results presented in Corollary 1 can be viewed as a minimal baseline. Treating q as an endogenous choice variable leads the model to unambiguously identify an even greater desistance effect of private enforcement.

IV. CONCLUDING REMARKS

Private cartel suits do not necessarily reduce the efficacy of leniency programs, nor do they promote cartel stability. The results obtained in this paper provide evidence against the concerns in the academic literature and policy discourse that private damages liability undermines cartel enforcement.

Directive 2014/104/EU facilitates the introduction of private enforcement into EU cartel policy. Before its passage, there was considerable debate within the academic and policy communities regarding the appropriate design of private cartel enforcement in Europe. A common question in this discussion was whether private damages liability in follow-on claims would reduce the efficacy of the cartel leniency program, and ultimately enhance cartel stability. We respond to these concerns by exploring the rationale for promoting private cartel enforcement and by identifying the effect private enforcement on the attractiveness of the cartel leniency program, as well as overall cartel desistance.

We presented and discussed three reasons that private antitrust suits may enhance enforcement, and thus be desirable. Issues related to resource constrained antitrust authorities, information and cost asymmetries between private plaintiffs and public antitrust authorities, and compensatory justice were explored. We then employed a simple dynamic model of collusion to identify whether private damages liability reduces the efficacy of leniency programs and/or promotes cartel stability. We showed that private enforcement enhances desistance when damages liability is sufficiently small, because firms are not dissuaded from applying by the (small) amount of liability in follow-on claims. In this scenario, for example, a firm may break with the cartel agreement due of the increased likelihood of being detected that is introduced with private enforcement and choose to seek leniency. Cartel desistance is also enhanced when damages liability is sufficiently large, because firms wish to avoid damages liability in future time periods. In this case, however, firms do not seek leniency; they simply break with the collusive agreement. These results demonstrate that private enforcement can enhance overall cartel desistance, and in a subset of these cases, even make leniency more attractive.

This paper was motivated by the passage of Directive 2014/104/EU and the related policy discourse, but its results have implications beyond Europe. Around the world, cartel behavior is illegal –in many places, a *per se* violation of the antitrust laws and regulations – and is enforced against with some combination of public and private mechanisms. In many countries, a cartel leniency program is in place, and public enforcement relies on it as a powerful tool for detection and desistance. This paper sheds light on the relationship between different enforcement policies when a leniency program is present.

V. REFERENCES

- Aubert, C., Rey, P., and Kovacic, W. E. "The impact of leniency and whistle-blowing programs on cartels." *International Journal of Industrial Organization*, 24(6), 2006, 1241-1266.
- Becker, G. "Crime and punishment: an economic approach." *Journal of Political Economy*, 76(2), 1968, 169-217.
- Bigoni, M., Fridolfsson, S. O., Le Coq, C., and Spagnolo, G. "Fines, leniency, and rewards in antitrust." *The RAND Journal of Economics*, 43(2), 2012, 368-390.
- Blair, R. D., and Knight, T. "Compliance with corporate policy: an economic approach." *Managerial and Decision Economics*, 34(7-8), 2013, 529-537.
- Brenner, S. "An empirical study of the European corporate leniency program." *International Journal of Industrial Organization*, 27(6), 2009, 639-645.
- Buccirossi, P., Marvao, C. M. P., and Spagnolo, G. "Leniency and Damages," 2015, *Available at SSRN 2566774*.
- Canenbley, C., and Steinvorh, T. "Effective enforcement of competition law: is there a solution to the conflict between leniency programmes and private damages actions?" *Journal of European Competition Law & Practice*, 2(4), 2011, 315-326.
- Cauffman, C., and Philipsen, N. J. "Who Does What in Competition Law: Harmonizing the Rules on Damages for Infringements of the EU Competition Rules?" *Maastricht European Private Law Institute Working Paper (2014/19)*, 2014.
- Chen, Z., and Rey, P. "On the design of leniency programs." *Journal of Law and Economics*, 56(4), 2013, 917-957.
- Feess, E., and Walzl, M. "Self-reporting in Optimal Law Enforcement when there are Criminal Teams." *Economica*, 71(283), 2004, 333-348.
- Ginsburg, D. H. "Comparing antitrust enforcement in the United States and Europe." *Journal of Competition Law and Economics*, 1(3), 2005, 427-439.
- Green, E. J., and Porter, R. H. "Noncooperative collusion under imperfect price information." *Econometrica*, 52(1), 1984, 87-100.
- Harrington, J. E. "Optimal Corporate Leniency Programs." *The Journal of Industrial Economics*, 56(2), 2008, 215-246.
- Harrington, J. E., and Chang, M. H. "Modeling the birth and death of cartels with an application to evaluating competition policy." *Journal of the European Economic Association*, 7(6), 2009, 1400-1435.
- Kirst, P., and Van den Bergh, R. "The European directive on damages actions: a missed opportunity to reconcile compensation of victims and leniency incentives." *Journal of Competition Law and Economics*, 12(1), 2016, 1-30.
- Knight, T., and de Weert, W. "On Implementing Private Damages in European Competition Cases." *University of Florida Working Paper*, 2015.
- Kovacic, W. E. "Private monitoring and antitrust enforcement: paying informants to reveal cartels." *George Washington Law Review*, 69(5-6), 2001, 766-797.

- Lande, R. H., and Davis, J. P. "Comparative Deterrence from Private Enforcement and Criminal Enforcement of the US Antitrust Laws." *Brigham Young University Law Review*, 2011(2), 2011, 315-390.
- McAfee, R. P., Mialon, H. M., and Mialon, S. H. "Private v. public antitrust enforcement: A strategic analysis." *Journal of Public Economics*, 92(10), 2008, 1863-1875.
- Medinger, J. D. "Antitrust Leniency Programs: A Call for Increased Harmonization as Proliferating Programs Undermine Deterrence." *Emory Law Journal*, 52(3), 2003, 1439-1482.
- Migani, C. "Directive 2014/104/EU: In Search of a Balance between the Protection of Leniency Corporate Statements and an Effective Private Competition Law Enforcement." *Global Antitrust Review*, 7, 2014, 81-111.
- Miller, N. H. "Strategic leniency and cartel enforcement." *The American Economic Review*, 99(3), 2009, 750-768.
- Motchenkova, E., and Leliefeld, D. "Adverse effects of corporate leniency programs in view of industry asymmetry." *Journal of Applied Economic Sciences*, 12, 2010, 114-128.
- Motta, M., and Polo, M. "Leniency programs and cartel prosecution." *International Journal of Industrial Organization*, 21(3), 2003, 347-379.
- Salop, S. C., and White, L. J. "Treble Damages Reform: Implications of the Georgetown Project." *Antitrust Law Journal*, 55(1), 1986, 73-94.
- Segal, Ilya R., and Michael D. Whinston. "Public vs. private enforcement of antitrust law: A survey." 2006, Available at SSRN 952067.
- Shavell, S. "Liability Harm versus Regulation of Safety." *Journal of Legal Studies*, 13(2), 1984, 357-374.
- Sokol, D. D. "Cartels, corporate compliance, and what practitioners really think about enforcement." *Antitrust Law Journal*, 78(1), 2012, 201-240.
- Spagnolo, Giancarlo. "Optimal deterrence mechanisms against cartels and organized crime" mimeo, Mannheim, 2003.
- Vande Walle, S., *Private Antitrust Litigation in the European Union and Japan: A Comparative Perspective*. Antwerpen: Maklu, 2013.
- Wils, W. P. "Should private antitrust enforcement be encouraged in Europe?" *World Competition: Law and Economics Review*, 26(3), 2003, 473-488.
- Wils, W. P. "Leniency in antitrust enforcement: Theory and practice." *World Competition: Law and Economics Review*, 30(1), 2007, 25-63.
- Wils, W. P. "The relationship between public antitrust enforcement and private actions for damages." *World Competition*, 32(1), 2009, 3-26.
- Zhou, J. "Evaluating leniency with missing information on undetected cartels: Exploring time-varying policy impacts on cartel duration." 2013, Available at SSRN 1985816.