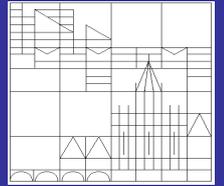




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Private Antitrust Enforcement Revisited: The Role of Private Incentives to Report Evidence to the Antitrust Authority

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Private antitrust enforcement revisited: The role of private incentives to report evidence to the antitrust authority

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It is commonly believed that the possibility to sue privately for antitrust damages decreases the number of type II errors in enforcement at the cost of creating more type I errors. We extend the analysis by taking into account the fact that private parties often submit evidence during public prosecution. Such parties consider private suit as a partial substitute for public prosecution, as both imply desistance of the violation. The trial option might induce these parties to be less willing to contribute evidence to public cases. Private trials crowd out public prosecution and can have ambiguous effects on the number of enforcement errors.

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1 Introduction

1.1 Motivation and main result

In 2003, the European Commission enacted legislation allowing antitrust breaches to be prosecuted through national and European courts. Private parties now have the possibility to sue for damages and for injunctions against violations of competition law and thus are able to initiate antitrust proceedings. Previously, only antitrust authorities were able to impose a fine or declare a given behavior to be in breach of antitrust laws.¹ This policy change has aligned European enforcement practice with that of the United States,² where trials filed by private parties are the most common form of prosecution.³ As this legal reform has the potential to fundamentally change enforcement practice, it has naturally triggered a wave of research on its economic effects.

One argument identified by a number of researchers is that with supplementary private enforcement, the number of unprosecuted anticompetitive actions (type II errors) decreases; however, this occurs at the cost of an increase in false prosecutions (type I errors). The ideas behind this theory are simple and identical for the two error types. If the antitrust authority (henceforth AA) fails to prosecute an antitrust breach, the option for private enforcement introduces a second chance for prosecution, namely through judicial decree in the private suit. Similarly, even if the courts correctly choose to not prosecute a procompetitive action, the possibility of private trial entails a second risk for false prosecution. McAfee et al. (2008) and Calcagno (2012) examine this argument in formal models. Both start from the assumption that there is some private party eligible for payment of damages, and that this party is perfectly informed about the antitrust violation, while the AA receives only an imperfect signal regarding the competitive nature of the offending firm's action. The objective of private trial enforcement is to utilize this information about the legality of an action possessed by the injured party. They further assume that a private trial is the only channel through which this private information can be exploited in antitrust enforcement. However, this simplification does not represent the actual way in which antitrust institutions operate, as communication between injured parties and the AA in connection with standard investigation seems to be a common feature in enforcement practice.

We investigate the consequences of private trials on enforcement efficacy, taking into account the fact that private parties have the possibility to report breaches of competition law to the AA. The fact that AAs rely on and act upon the revelation of information by third parties is well documented. For instance, Harrington (2006) discusses the steps

¹However, the judicial system played an important role in antitrust enforcement, as a prosecuted firm had the right to appeal administrative convictions in the Court of First Instance.

²An important remaining difference between American and European enforcement institutions is that the antitrust authority in the US cannot itself apply fines, but must bring the case to trial, just as a private party does. See Ganglmair and Guenster (2011) for a technical analysis of the effects resulting from this institutional difference.

³Segal and Whinston (2006) report that in the US about 90% of all antitrust trials are initiated by private parties.

of antitrust enforcement procedures, concluding that the AA plays almost no role in the detection of antitrust violations, but rather investigates and prosecutes based upon initial evidence provided by outside parties. Hay and Kelley (1974) find that in only two out of 49 price-fixing cases did the Department of Justice (the American competition authority) initiate an investigation without any external informant reporting the infringement. The possibility of external complaint is also formalized in EC Regulation 01/2003 Article 7, which specifies that any party with a legitimate interest can demand that the AA initiates a formal investigation.⁴ This paper addresses the highly topical matter of the enforcement effects of private trials in the light of private incentives to present evidence to the AA. Our study establishes that allowing private trials does not necessarily decrease the chance that guilty firms will go undetected (i.e., lower the probability of type II errors); this finding contradicts previous literature. In an additional contrast to the established argument, we show that private trials may in fact decrease (increase) the deterrence of anticompetitive (procompetitive) actions. For an intuitive illustration, consider the case of anticompetitive actions. If the injured firm has the possibility to sue, it might no longer be willing to cooperate with the AA, since by bringing suit it can both enforce the injunction as well as secure payment for damages. Thus, going to trial and reporting evidence to the AA are substitutable. However, under the assumption that the court will be more likely to make an error than the AA, reporting would be superior from a social point of view, because the strength of the private party (initial evidence) is combined with the investigative powers of the authority (as Harrington 2006 argues). The firm considers the possibility that the AA will initiate proceedings even without the firm's evidence, in which case the firm could save on evidence production costs. Consequently, reporting has a higher social value than suing but is relatively undervalued by the firm, due to the potential expenses in trial, which are wasted if the authority has already established its verdict. With both enforcement channels, the injured party can wait and see whether the AA will act alone, but suing has the advantage that the expenses cannot ex-ante be wasted. Shavell (1997) describes how underenforcement results from a misalignment of the private and public incentives to litigate. In our model, private trials have a positive direct effect, increasing the level of law enforcement; however, at the same time they crowd out a superior method of law enforcement. If the indirect effect dominates the direct effect, the result that private trials will increase the likelihood of prosecution will be reversed. The situation with regard to the decrease in deterrence resulting from the possibility of private trials is completely analogous. By the same argument, the possibility of private trials can deter injured parties from reporting frivolous evidence of procompetitive actions to the AA. Here, however, if the court is less capable than the AA of distinguishing procompetitive from anticompetitive behavior, then the introduction of private trials cannot decrease the number of type I errors, even if a private party will only report when trials are not possible. The resulting

⁴If the AA refuses to investigate the complaint, the complaining party can seek judicial review and might become eligible for damage payments against the Commission if the case is found to have been wrongfully dismissed. See Albers-Llorens (2002).

effect on deterrence can be reversed, such that more procompetitive behavior is deterred when private trials are not an option.

The objective of our model is to isolate the enforcement effect of higher probability of prosecution resulting from the information advantage of private parties. In order to accomplish this most effectively, we abstract from the reality that the level of payments following a public conviction differs between regimes. Private suits can follow up on a public conviction, whereby deterrence is increased through the additional damage payment. Wils (2003) argues, however, that this deterrent effect can alternatively be achieved directly by increasing the criminal fine. To exclude this enforcement effect (which does not contribute beyond the arguments of Becker (1968)), we allow an injured firm to sue for damages in both legal setting; however, in the restrictive setting (referred to hereafter as the no-trial setting), suit is only permitted if the breach has already been administratively established by the AA (so-called follow-up suits). Although this is not a comparison of the previous and current European legal system, it offers much more interesting juxtaposition, as it identifies the pure enforcement effect resulting from the exploitation of information held by private parties.

Methodologically, our model augments the standard analysis by introducing a dynamic structure. Previous models assumed one-shot deviations and one-time prosecution possibilities. We consider a repeated game, in which an action can be taken and prosecution is possible in each period. The game only ends when either public or private prosecution determines the legality or illegality of an action. This also allows us to clearly distinguish between deterrence and desistance of antitrust violations in the private enforcement context, as it is common in the broader literature on antitrust enforcement (e.g., the analysis of leniency programs).

1.2 Literature review

The enforcement of laws has been a documented interest of economic scholars since Becker (1968). A survey on private antitrust enforcement is provided by Segal and Whinston (2006). We build directly upon the research of McAfee et al. (2008) and Calcagno (2012), who demonstrate that the information advantage of a third party, that can be exploited in private trial has the effect of decreasing type II errors, but increasing type I errors. An alternate mechanism of private enforcement has been suggested by Martini and Rovesti (2004). They identify an underenforcement problem of pure public enforcement, which may be overcome by delegating enforcement to a private party. This party does not consider fines as welfare-neutral and thus investigates more intensively than a welfare-maximizing AA. Their model is conceptually different than ours, as they are interested in the question of private enforcement as a replacement for public enforcement, rather than as a complementary system. The effect of the private trial option on public enforcement in connection to information spillovers is considered by Bourjade et al. (2009) and Briggs et al. (1996); however, they do not consider the fact that private parties also play a role in

public prosecution. Silbye (2012) argues that private trials can have a negative impact on public prosecution, specifically for leniency programs, because the incentive to self-report decreases when private trial is possible. From a practitioner’s perspective, Wils (2003, 2009) does not see any need for private suits as a means to increase enforcement efficiency;⁵ instead, he highlights the importance of strengthening the collaboration between private parties and the AA in European enforcement practice.

The rest of the paper is structured as follows: The model is introduced in Section 2; subsequently, we derive the conditions, under which the injured firm will report its evidence to the AA only if it cannot sue privately. In Section 3, it is shown that the decrease in reporting resulting from the trial possibility might dominate additional enforcement effects from trials against anticompetitive action, culminating in fewer prosecuted violations. Analogously, in Section 4, we demonstrate that for procompetitive actions, the result can only be reversed for deterrence but not for desistance, even when reporting is crowded out and the AA commits fewer errors. Both Sections 3 and 4 include numerical examples to illustrate that the novel effects are likely to occur for realistic parameter constellations and likely to dominate the previously established effects. Section 5 discusses policy implications and concludes.

2 The model

2.1 The setup

At the beginning of the game, nature offers firm 1 one of two choices sets, the starting points of two independent subgames. In the first subgame, firm 1 has the choice to behave anticompetitively or do nothing; in the second subgame, it chooses whether to behave procompetitively or do nothing. The entire subgame (including the trial possibility) following the determination of the anticompetitive choice set is depicted in Figure 1. The game tree of the subgame with the procompetitive action is analogous, with appropriately adjusted payoffs and probabilities at the moves of nature. Each of the subgames has several stages as described below. We consider a dynamic setup, in which the subgame is played repeatedly, until certain end notes are reached, at which point the game can be altered or terminated.

Stage 0. Firm 1 decides whether to undertake the offered action. If the action is not performed the game ends.

Stage I. Once firm 1 has decided to undertake the action, the AA will investigate the action with exogenous probability $0 < \sigma < 1$. The probability of investigation is larger than zero and smaller than one, as the AA can screen some industries but cannot screen all industries because of a budget constraint. An anticompetitive action is con-

⁵However compensation of injured parties through private trials is reasonable justification for Wils (2003).

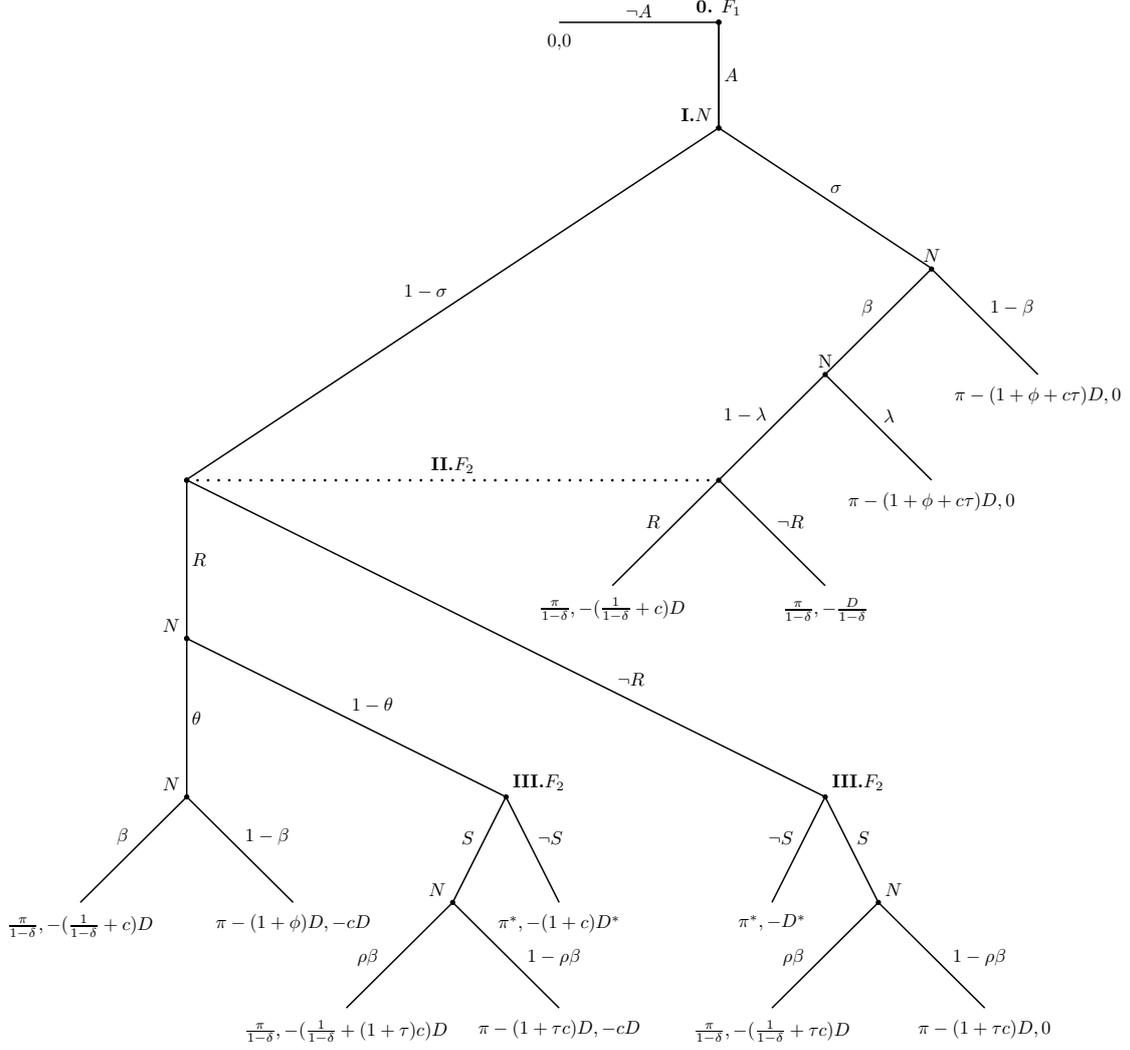


Figure 1: The subgame of anticompetitive actions

victed with probability $(1 - \beta)$ and a procompetitive action with probability β .⁶ The fact that antitrust authorities and courts make erroneous decisions has already been observed by Posner (1976). In an empirical study, Duso et al. (2007) find that about 20%-25% of all merger decisions made by the European Commission are erroneous. Thus, β denotes the error probability for the two types of actions and is assumed to be identical for both types of errors.⁷ If the action was successfully prosecuted by the AA, the game ends and is not repeated, corresponding to perfect desistance following a conviction. Furthermore, we assume that an acquittal precludes any future possibility of either public prosecution

⁶We follow the common assumption that the probability of investigation and conviction are exogenously given. This approach has also been used by Calcagno (2012). McAfee et al. (2008) assume instead that the authority is an active welfare-maximizing player. This approach is incompatible with payoffs determined by gains from the action and the fine, since then the AA would never intervene as fines are ex-post welfare-neutral. Rather, they assume that all payoffs are reset to zero after an AA ruling. This would be not compatible with some of our arguments, as they rely on the fact that prosecution by the AA and private trial imply different payoffs.

⁷See Schinkel and Tuinstra (2006) for a discussion of symmetric error probabilities.

or private trial. Firm 1 can continue to take the action in later periods without any risk of conviction.

Stage II. If firm 1 was not convicted in Stage I, firm 2 has the possibility to report information to the AA that can start an investigation. However, firm 2 cannot perfectly determine whether the AA did in Stage I not investigate the action or decided not to prosecute it. It learns of an acquittal following an investigation only with probability λ and can otherwise not distinguish acquittals from non-investigations. Prosecution, however, is perfectly observed. In practice, enforcement authorities sometimes publish investigations that did not lead to a prosecution. However, this gives only an imperfect signal of the AA's activity and of how it will respond to further evidence in a given industry.⁸ If the AA has not previously investigated the action, the report will induce the AA to investigate with probability $0 < \theta < 1$. Again, investigations are subject to error probability β . If the AA investigated and acquitted firm 1 in Stage I, it will ignore the newly provided evidence. Thus, the private firm can induce the AA to investigate a case, but not to err or correct a previous error. These assumptions about the behavior of the AA are consistent with the above mentioned arguments made by Harrington (2006): Private parties help the AA to detect illegal activities, but the conviction probability once investigation has begun is not influenced by third parties, since the AA has more investigative power (e.g., dawn raids) than private parties do.⁹ Again, prosecution ends the game, while acquittal precludes both public and private prosecution in the future.

Stage III. Depending on the status of the legal system, if the AA did not carry out an investigation, firm 2 might now have the possibility to privately litigate against firm 1 for damages (in the trial setting). If the AA investigated but found firm 1 not guilty, private trial is impossible, as I assume that the court will never reverse an administrative decision. This requires in turn that firm 2 is at the beginning of the trial, opposed to the Stage II, where it chooses whether to report, informed about the reason for non-conviction through the AA. We thus assume that at the beginning of the trial it is public knowledge, whether the AA carried out an investigation or not. This reflects the fact that most legal systems have an admissibility test before a trial starts protecting the plaintiff from pursuing cases it cannot win (e.g., for formal reasons). The private firm wins the stand-alone case with probability $1 - \rho\beta$ for anticompetitive actions and with probability $\rho\beta$ for procompetitive actions. We interpret $\rho\beta$ as the error probability of the court (analogous to the error probabilities of the AA) and assume that the courts are more prone to err than the AA,

⁸Another reason for imperfect recognition could be that the AA publishes the results of failed investigations strategically; see Sauvagnat (2010).

⁹Note that we assume that firm 2 knows ex-ante whether the action of firm 1 breached antitrust laws or not. This information structure is the usual justification for private enforcement and hence the starting point of this model. The firm's activity is to generate evidence and to provide it to the AA, not to find out whether the action is a violation. Firm 2 can thus provide truthful evidence in the case of an anticompetitive action, or it can manipulate the AA to investigate a procompetitive action resulting in a fine on an innocent firm, just as it can bring about both legitimate and frivolous lawsuits.

that is, $\rho > 1$. The factor ρ can be interpreted as a measure of the ability of the AA to correctly interpret economic evidence relative to the ability of a judge. As with public prosecution, private conviction ends the game and acquittal precludes any future conviction. If no investigation was carried out and there was no private trial, the subgame is repeated in identical form.

Payoffs. If the action was not undertaken by firm 1 all payoffs are zero. Both the anticompetitive and the procompetitive action generate a per-period profit π for firm 1 and a damage D for firm 2. The damage is fully recuperated by firm 2 if either public prosecution or private trial is successful.¹⁰ In the first case, we implicitly assume that a follow-up case after a public conviction will be won by firm 2 with certainty. A public conviction additionally leads to a fine of size ϕD for firm 1, where ϕ denotes the size of the fine relative to the damage payment. Reporting information to the AA comes at cost cD for firm 2.¹¹ Total litigation costs are assumed to be a multiple of the reporting cost τcD , with $\tau > 1$. We further assume that litigation costs are borne according to the British rule; that is, the losing party must pay the expenses of both parties as well as legal fees, but evidence production cost cannot be shifted to the losing party.¹²

Either a public or a private conviction will prevent firm 1 from continuing the action in all following periods. The game ends and all payoffs will be zero in all future periods. This is a common assumption in the literature and reflects the idea that the AA very closely monitors industries with recent convictions and is perfectly able to recognize violations without any cost. Indeed, Bosch and Eckard (1991) have shown that the number of repeated infringements is very low. There is also some evidence that private trials have a strong desistance effect. In a stock market event study Bizjak and Coles (1995) have shown that the loss of market value for a firm convicted in a private antitrust trial is much greater than the loss that would be justified by the monetary payment. The authors conclude that a large part of the loss occurs due to the impossibility of continuing the profitable action, which is well captured in our model by the assumption that a successful conviction also creates quasi-payments from firm 1 to firm 2 in all periods. However, private and public prosecution have different legal consequences in terms of damage payments. A public prosecution leads to both a fine and the private damage payment, whereas after a private conviction the AA does not follow up with a fine.

Finally, if neither public nor private prosecution occurs, the drawn subgame is repeated; in Figure 1, this corresponds to the payoffs indicated with a star. Payoffs are affected by a common discount factor, given by $\delta < 1$.

To summarize, the decisions for firm 2 are in each subgame (i) whether or not to provide

¹⁰European enforcement design rules out treble damages.

¹¹To simplify notation, we define all payoffs of firm 2 relative to the damage payment D .

¹²This is the legal standard in most European jurisdictions. In our model the British rule increases the parameter ranges of the identified effects; however it is by no means a necessary requirement for the effects to arise.

evidence to the AA at Stage I and (ii) whether or not to sue at Stage II. If the firm reports information to the AA, the chance of public prosecution increases and the increase in expenses and error rate of a private trial can be avoided. However, reporting can be wasteful from firm 2's perspective, since the AA might already have investigated and concluded that firm 1 is innocent and will not carry out any further investigations. Firm 1 must only decide whether it should undertake the offered actions or not, after taking the enforcement probabilities associated with reporting and suing into consideration.

Note that providing information to the AA and filing suit have different consequences for the expected payoffs of firm 2. Reporting information on the one hand leads to a lower error probability but does not ensure that the action will be investigated in the same period. On the other hand, trial increases the error probability but ensures that the decision will be made in the given period. This seems reasonable as the AA is very effective at gathering and evaluating economic evidence on potential breaches of competition law, but is unskilled at detecting violations. In contrast, the court is obliged to investigate when a private party files suit, but has much less economic knowledge and thus has a harder time differentiating between procompetitive and anticompetitive actions.

2.2 Trials and the incentives to report

In this section we show that the incentive to report information on both types of actions can decrease when stand-alone private trials are possible. Introducing the option of private trials creates different effects on the incentives to report. The intuitive reason for not providing information is that under the trials regime, the returns on investment for reporting are lower, as both the desistance in future periods and the damage payment can also be achieved through the private trial. Enforcement through the courts is more expensive for firm 2 than reporting, but can still crowd out reporting, as there is a positive probability that the AA will neglect reported evidence altogether (wasting the reporting cost) because the agency already took an earlier decision that was unobserved by firm 2. However, trials can also crowd in reporting if courts have a high (low) probability of committing an error in the anticompetitive (procompetitive) case, as this error cannot be corrected later. Consequently, firm 2 will try to prevent a court decision, as it would preclude future chances of prosecution by the AA.

We derive conditions under which firm 2 will report information to the AA on both pro- and anticompetitive actions in the no-trials setting only, as only this allows a potential increase in the number of type II errors and a potential decrease in the number of type I errors through the introduction of private trials.

2.2.1 Anticompetitive actions

Assume that firm 2 knows that firm 1 violated the antitrust law. It must then decide whether to gather and provide evidence to the AA by comparing the gain resulting from a higher chance of investigation and thus desistance against the cost of reporting. If

stand-alone trials are not possible, firm 2 will report whenever the cost of reporting is lower than the expected additional gain if the action is halted. In addition to the damage payment (which can be obtained in both the trial and the non-trial setting), successful prosecution creates quasi-payoffs of size D in all future periods for firm 2, as the action will not be continued by court order. If the actions are not investigated in the current period, there will be the identical probability for the actions to be investigated and prosecuted in the following period.¹³ The ex-ante expected value of a reporting strategy (denoted by subscript R) in the subgame of the anticompetitive action (denoted by superscript AC) in no-trial setting (denoted by subscript NT) is given by the following recursive equation:

$$V_{NT,R}^{AC} = \frac{((1-\sigma)\theta + \sigma)(1-\beta)\frac{D}{1-\delta} - ((1-\sigma) + \sigma\beta(1-\lambda))cD}{1 - (1-\sigma)(1-\theta)\delta}. \quad (1)$$

Firm 2 expects to gain a damage payment of D and a quasi-payoff of the same size in all future periods (because of the desistance) if the AA prosecutes, either alone or using the reported information. However, firm 2 must pay reporting costs when it believes (possibly incorrectly) that the AA has not investigated the action and submits a report. If (even on the basis of reported information) the AA does not investigate the action, desistance is still possible in future periods. Similarly, the ex-ante expected value of the entire subgame for not reporting (denoted with subscript NR) is given by

$$V_{NT,NR}^{AC} = \frac{\sigma(1-\beta)\frac{D}{1-\delta}}{1 - (1-\sigma)\delta}. \quad (2)$$

The decision of whether to report must only be taken by firm 2 at Stage II of the subgame after the AA did not successfully prosecute firm 1 alone and firm 2 did not observe a failed prosecution, which occurs with probability $(1-\sigma) + \sigma\beta(1-\lambda)$. The cost of reporting must be borne independent of the reason for non-conviction (i.e., failed prosecution or lack of prosecution), but prosecution at Stage II is only possible if the AA has not previously investigated the action. Firm 2 constructs its belief according to Bayes' rule; thus, the expected payoffs of conviction, either in this or in later periods, must be discounted with

$$\frac{(1-\sigma)}{1 - \sigma + \sigma\beta(1-\lambda)}, \quad (3)$$

which is the probability that the AA did not investigate the action, given that non-prosecution was observed by firm 2 (left node of the information set at stage II of Figure 1). Comparing the payoffs, reporting is the dominant strategy only if

$$\frac{(1-\sigma)}{1 - \sigma + \sigma\beta(1-\lambda)} \left(\theta(1-\beta)\frac{D}{1-\delta} + (1-\theta)\delta V_{NT,R}^{AC} \right) - cD \geq \frac{(1-\sigma)}{1 - \sigma + \sigma\beta(1-\lambda)} \delta V_{NT,NR}^{AC}, \quad (4)$$

since whenever reporting is optimal in the given period, it will also be optimal in all

¹³Frezal (2006) reports that non-stationary investigation probabilities might be a better enforcement strategy for the AA.

future periods. This is equivalent to

$$c \leq \frac{(1-\sigma)(1-\beta)\theta}{(1-\sigma+\sigma\beta(1-\lambda))(1-(1-\sigma)\delta)} \equiv \bar{c}_{NT}^{AC}. \quad (5)$$

Now consider the case, in which private stand-alone trials for damages are allowed. This condition additionally incorporates the expected payoff and costs from a private trial, which is ex-ante only necessary with probability $(1-\sigma)$ (when firm 2 did not report to the AA) or $(1-\sigma)(1-\theta)$ (when firm 2 did report to the AA). If firm 2 goes to trial, there must be a (stochastic) decision by either the authority or the court, precluding any chance of prosecution in future periods if it is though investigation unsuccessful in the given period. For this reason, is it unnecessary to define the values of reporting and not-reporting strategies recursively as in the trial setting.

Assume for the moment that firm 2 goes to trial whenever it is allowed to do so. Then in the trial setting, it will report information to the AA if¹⁴

$$\begin{aligned} & \frac{(1-\sigma)}{1-\sigma+\sigma\beta(1-\lambda)} \left(\theta(1-\beta) \frac{D}{1-\delta} + (1-\theta) \left((1-\rho\beta) \frac{D}{1-\delta} - \rho\beta c\tau D \right) \right) - cD \\ & \geq \frac{(1-\sigma)}{1-\sigma+\sigma\beta(1-\lambda)} \left((1-\rho\beta) \frac{D}{1-\delta} - \rho\beta c\tau D \right). \end{aligned} \quad (6)$$

Some transformations deliver

$$c \leq \frac{(1-\sigma)\beta\theta(\rho-1)}{(1-\delta)((1-\sigma)(1-\rho\beta\theta\tau) + \sigma\beta(1-\lambda))} \equiv \bar{c}_T^{AC}, \quad (7)$$

where we assume for the moment that the denominator is positive. For a negative denominator reporting would always be optimal in the trial condition; this would render our analysis void, as we are looking for parameter constellations under which firm 2 does not report in the trials setting. We will show later that this constraint is non-binding.

Firm 2 must also report in the no-trial setting; consequently we seek the conditions for the existence of an interval $[\bar{c}_T^{AC}, \bar{c}_{NT}^{AC}]$. This is fulfilled for

$$\begin{aligned} & \bar{c}_T^{AC} < \bar{c}_{NT}^{AC} \Leftrightarrow \\ \rho \leq 1 + & \frac{(1-\beta)(1-\delta)((1-\sigma)(1-\beta\theta\tau) + \sigma\beta(1-\lambda))}{\beta(1-(1-\sigma)\delta)(1-\sigma+\sigma\beta(1-\lambda)) + \beta(1-\beta)(1-\delta)\tau\theta(1-\sigma)} \equiv \bar{\rho}_R^{AC}, \end{aligned} \quad (8)$$

which imposes, due to the restriction $\rho > 1$, the requirement

$$\tau < \frac{1-\sigma+\sigma\beta(1-\lambda)}{(1-\sigma)\beta\theta} \equiv \bar{\tau}_1. \quad (9)$$

This guarantees that the second term of condition (8) is positive, such that the re-

¹⁴For technical simplicity, we assume that having reported will not lower the cost of trial. Lawsuits must be begun from scratch, even if firm 2 has previously reported to the AA. This is justified, as presenting evidence to a judge is a different task than providing evidence to the AA.

quirement that the court is more likely to err than the AA is fulfilled. If the trial cost is too large, then firm 2 would also report in the trial setting, in an attempt to avoid the litigation expense. Above, we implicitly assumed that firm 2 will always go to trial if it can. In the appendix, it is shown that this is always true if firm 2 only reports when private trials are not possible, that is $c \in [\bar{c}_T^{AC}, \bar{c}_{NT}^{AC}]$, whose existence is guaranteed by $\rho < \bar{\rho}_R^{AC}$. This also guarantees the implicit assumption above that the denominator of the right-hand side of condition (7) will be positive. Then Lemma 1 summarizes how the reporting of anticompetitive actions depends on the possibility of private trial.

Lemma 1. *If $\rho < \bar{\rho}_R^{AC}$, there exists an interval $[\bar{c}_T^{AC}, \bar{c}_{NT}^{AC}]$ in which firm 2 goes to trial if the legal setting so allows and reports information only if it cannot go to trial.*

The critical value $\bar{\rho}_R^{AC}$ decreases with τ , β , θ , λ and δ and is ambiguously affected by σ .

The lemma has the following intuitive explanation: If the error spread is large, then firm 2 will have a strong incentive to avoid trial. The cost of reporting c that firm 2 is willing to bear in order to avoid trial increases with ρ . This effect is especially strong when the cost of going to trial is large. If it is too large, then firm 2 might even report if the court is as accurate as the AA. This happens only at a cost multiplier strictly larger than one because the AA reacts to information only with a probability smaller than one. If the effectiveness of reporting increases, this condition is less likely to be fulfilled, because it affects the condition for reporting more in the trial setting; in both legal settings is the condition for reporting affected by the fact that the likelihood of prosecution is increased, in the trials setting the condition is additionally affected by the potential avoidance of litigation costs.

2.2.2 Procompetitive actions

The first best for procompetitive actions requires that firm 2 does not report information, as this would be falsified information about non-existent infringements and would result in higher probabilities of false conviction. We will show that the trial possibility might crowd out false reported information; thus, the trial option might have a positive effect on the number of type I enforcement errors. The analysis of the no-trial setting is very similar to the case of anticompetitive actions, except that the action is prosecuted with probability β rather than $1 - \beta$ (given an investigation) and $\rho\beta$ rather than $1 - \rho\beta$ (given a trial). The ex-ante value of reporting a procompetitive action (denoted with superscript PC) in the no-trial setting is therefore given by

$$V_{NT,R}^{PC} = \frac{(\sigma + (1 - \sigma)\theta)\beta \frac{D}{1-\delta} - ((1 - \sigma) + \sigma(1 - \beta)(1 - \lambda))cD}{1 - (1 - \sigma)(1 - \theta)\delta}, \quad (10)$$

and

$$V_{NT,NR}^{PC} = \frac{\sigma\beta \frac{D}{1-\delta}}{1 - (1 - \sigma)\delta} \quad (11)$$

for not reporting. As was the case with anticompetitive actions, the reporting decision only becomes relevant when the AA has not prosecuted the action based on its own information. Consequently, reporting is optimal for firm 2 if

$$\frac{(1-\sigma)}{1-\sigma+\sigma(1-\beta)(1-\lambda)}\left(\theta\beta\frac{D}{1-\delta}+(1-\theta)\delta V_{NT,R}^{PC}\right)-cD > \frac{(1-\sigma)}{1-\sigma+\sigma(1-\beta)(1-\lambda)}\delta V_{NT,NR}^{PC}, \quad (12)$$

which is equivalent to

$$c \leq \frac{(1-\sigma)\beta\theta}{(1-\sigma+\sigma(1-\beta)(1-\lambda))(1-(1-\sigma)\delta)} \equiv \bar{c}_{NT}^{PC}. \quad (13)$$

Under the trial system, firm 2 would, under the assumption that it goes to trial, report information to the AA, analogously to the anticompetitive case if

$$cD\left(1-\sigma+\sigma(1-\beta)(1-\lambda)+(1-\theta)(1-\rho\beta)(1-\sigma)-\theta(1-\sigma)\tau(1-\rho\beta)\right)(1-\delta) \leq -D(1-\sigma)\beta\theta(\rho-1). \quad (14)$$

A necessary condition for reporting in the trial setting is that the left-hand side must be negative, as the right-hand side is always negative, which is guaranteed if

$$\rho \leq 1 + \frac{(1-\beta)\theta\tau(1-\sigma) - (1-\sigma+\sigma(1-\beta)(1-\lambda))}{\beta(1-\sigma)\theta\tau} \equiv \bar{\rho}_R^{PC}; \quad (15)$$

the sufficient condition is $c > \bar{c}_T^{PC}$, which is defined by fulfilling condition (14) with equality. It should be noted that the reverse condition $\rho > \bar{\rho}_R^{PC}$ is a sufficient condition for not reporting; this is the state in which we are interested. Here, firm 2 only reports if the cost of reporting is great enough. This is the case because the cost of suing is high (τ large) and positively related to the cost of reporting. Thus, it is important for firm 2 to avoid trial when the reporting cost is high. The two states - reporting when trials are not possible ($c \leq \bar{c}_{NT}^{PC}$) and not reporting when trials are possible ($\rho > \bar{\rho}_R^{PC}$ or $\rho < \bar{\rho}_R^{PC}$ together with $c \geq \bar{c}_T^{PC}$) - must be compatible with each other; and moreover, going to trial must be optimal for firm 2. In the appendix it is demonstrated that this can only be the case for $\rho > \bar{\rho}_R^{PC}$; however, is then fulfilled for all $c < \bar{c}_{NT}^{PC}$. Lemma 2 concludes:

Lemma 2. *For $\rho \geq \bar{\rho}_R^{PC}$, there exists a set $[0, \bar{c}_{NT}^{PC}]$ in which firm 2 goes to trial over procompetitive actions if allowed to do so and reports information only if it cannot sue.*

The condition is fulfilled for all $\rho > 1$ if τ is small enough. Otherwise the critical value $\bar{\rho}_R^{PC}$ increases with θ , σ , λ and decreases with β .

Here, reporting in the no-trial setting only requires a large error spread. If the spread is small, firm 2 will prefer to avoid the cost of trial and will accept the lower probability of conviction. However, if the error spread is large, going to trial will be profitable because the probability of desistance by a court decision is much higher. A high trial costs is also a sufficient condition. As for anticompetitive actions, the condition is less likely to

be fulfilled if reporting becomes more effective, because its effect in the trial setting is stronger as litigation costs are saved.

3 Anticompetitive actions

3.1 Desistance of anticompetitive actions

One of the goals of the AA is to halt existing violations. We are interested in the question of whether introducing private suits for damages increases or decreases desistance. In our model, this is straightforward. We restrict our analysis to the case of Lemma 1, in which firm 2 reports only if the legal setting does not allow stand-alone trials. By assumption, desistance of the violation occurs whenever either public or private prosecution is successful. This is an important assumption, as it implies that suing and reporting are substitutable strategies for firm 2. The welfare effects of desistance have to be recursively calculated, since an unsuccessful prosecution precludes possible prosecution in future periods. We assume that the action causes a welfare harm of size $-W_0$ per period. Thus, the total desistance value of antitrust enforcement is given by

$$\overline{W}_{NT}^{AC} = \frac{(1-\beta)(\sigma + (1-\sigma)\theta)W_0}{1 - (1-\sigma)(1-\theta)\delta}, \quad (16)$$

$$\overline{W}_T^{AC} = \sigma(1-\beta)W_0 + (1-\sigma)(1-\rho\beta)W_0 \quad (17)$$

for the two legal regimes. Not allowing trials is thus a better strategy for the desistance antitrust violations if

$$\rho \geq 1 + \frac{(1-\beta)(1-\theta)(1-\delta)}{\beta(1-(1-\sigma)(1-\theta)\delta)} \equiv \overline{\rho}_{Des}^{AC}, \quad (18)$$

that is, if the error spread is large enough. Otherwise, with high probability, the court decision will be correct and furthermore will be accomplished with certainty in the current period, making private trial a strong enforcement mechanism. The condition is more easily fulfilled if θ increases, because then the effect of reporting is great, thus strengthening public enforcement. It is more easily fulfilled for large σ , as then trials become less important. For larger β , public prosecution also dominates, as an increase in the error probability is by the factor $\rho > 1$ more harmful for private prosecution. Finally, it is more easily fulfilled if the discount factor is high, since then desistance in future periods will not imply too great of a loss in comparison to current desistance. Lemma 3 concludes:

Lemma 3. *Given $c \in [\overline{c}_T^{AC}, \overline{c}_{NT}^{AC}]$, the desistance of anticompetitive actions is higher without private trials only if the error probability spread is large enough. The critical value $\overline{\rho}_{Des}^{AC}$ decreases with θ , σ , β and δ .*

Note that the conditions for more reporting and higher desistance in the non-trial setting require moving in opposite directions with regard to the accuracy spread ρ . However, they

can be simultaneously fulfilled if

$$\tau \leq \frac{1 - \sigma + \sigma\beta(1 - \lambda)}{(1 - \sigma)((1 - \beta)(1 - \theta)(1 - \delta) + \beta(1 - (1 - \sigma)(1 - \theta)\delta))} \equiv \bar{\tau}_2, \quad (19)$$

where $\bar{\tau}_2$ is more restrictive than $\bar{\tau}_1$.

Proposition 1. *Desistance of anticompetitive actions can decrease through the introduction of private trials if $\bar{p}_R^{AC} \geq \rho \geq \bar{p}_{Des}^{AC}$. This interval exists if $\tau \leq \bar{\tau}_2$.*

Reversal of the reasoning that predominates in previous literature on type II errors requires that the error spread is neither too large (in which case information provision would be identical in both trial and no-trial setting) nor too small (whereby the additional enforcement effects from reporting would not outweigh the enforcement effects from private trials). This follows quite naturally. On the one hand, if the courts are as accurate as the bureaucracy, then we should expect that trials will improve enforcement: the courts act with certainty in a given period on evidence by a injured party, whereas the AA will only react with a probability smaller than one. On the other hand, if the error spread is too large, then the trial option makes no difference, because firm 2 will expect that the court will err with high probability and will therefore provide information to the AA. In addition, it is necessary that τ be small enough, because otherwise reporting will always be a less costly alternative to suing. The stronger the effect of reporting, the smaller the cost of trial can be for which the novel effects still hold.

3.2 Deterrence of anticompetitive actions

The crowding-out of useful information provided to the AA by the introduction of private trials will harm deterrence if it offsets the gain in deterrence resulting from the private damages the violator expects to pay from stand-alone private trials. Independent of whether private trials are possible or not, firm 1 will base its decision of whether to undertake the harmful action by comparing expected profits with expected fines. The firm will additionally take into consideration that it cannot be prosecuted in periods following a false acquittal. Assume that firm 2 will invest in gathering evidence only if it can not sue privately, as described in Lemma 1. Then, the critical profit levels above which firm 1 will undertake the anticompetitive action are given by

$$\pi \geq (1 - \delta) \frac{\sigma(1 - \beta)(1 + \phi)D + (1 - \sigma)(1 - \rho\beta)(1 + c\tau)D}{1 - (1 - \beta(\sigma + (1 - \sigma)\rho))\delta} \equiv \bar{\pi}_T^{AC} \quad (20)$$

if private trials are possible and

$$\pi \geq (1 - \delta) \frac{(\sigma + (1 - \sigma)\theta)(1 - \beta)(1 + \phi)D}{1 - (1 - \beta(\sigma + (1 - \sigma)\theta))\delta} \equiv \bar{\pi}_{NT}^{AC} \quad (21)$$

otherwise. In each of these equations, the left-hand side reflects the per-period profit, the numerator of the right-hand side reflects the expected costs (which remain constant over all periods), and the denominator reflects the profit multiplier resulting from the

dynamic structure of the game.¹⁵ Comparison of the two critical levels yields a condition under which the no-trial setting deters more violations than the trial setting:

$$\rho \geq 1 + \frac{(1 - \beta)(1 - (1 - \beta(\sigma + (1 - \sigma)\theta))\delta)((1 + c\tau) - \theta(1 + \phi)(1 - \sigma))}{\beta(1 - (1 - \beta(\sigma + (1 - \sigma)\theta))\delta)(1 + c\tau) + \beta(1 - \beta)\theta(1 + \phi)(\sigma + (1 - \sigma)\theta)\delta} \equiv \bar{\rho}_{Det}^{AC}. \quad (22)$$

Lemma 4. *Given $c \in [\bar{c}_T^{AC}, \bar{c}_{NT}^{AC}]$, the deterrence of anticompetitive actions is higher without private trials only if the error probability spread is large enough. The critical value $\bar{\rho}_{Det}^{AC}$ decreases with θ , σ , β , ϕ and δ and increases with τ and c .*

As is for desistance the case, the condition for greater deterrence imposes requirements on ρ in contrast to the condition for more reporting. However it can be seen, that the two conditions are compatible with each other, as the last product in the numerator of condition (22) becomes negative if the fine multiplier ϕ is large enough, implying that the condition for greater deterrence of anticompetitive actions absent of the possibility of trial is fulfilled for any $\rho > 1$. Generally speaking, this compatibility is ensured whenever $\phi > \bar{\phi}^{AC}$, where $\bar{\phi}^{AC}$ is defined by ϕ , such that $\bar{\rho}_R^{AC} = \bar{\rho}_{Det}^{AC}$.

Proposition 2. *Deterrence of anticompetitive actions decrease through the introduction of private trials if $\bar{\rho}_R^{AC} \geq \rho \geq \bar{\rho}_{Det}^{AC}$. This interval exists for $\phi \geq \bar{\phi}^{AC}$.*

3.3 Numerical example

The section above has argued that there is some parameter space in which an injured firm that is informed about the illegality of an action only reports the breach to the corresponding authority if it cannot sue directly. The resulting lower probability of prosecution can dominate the additional probability of prosecution in a private trial. Moreover, the lower probability of a fine can dominate the expected damage payment, such that deterrence decreases. But is this in fact a relevant case or is it just a theoretical possibility? With the help of a numerical example, this subsection illustrates that all specified conditions are likely to be fulfilled for a realistic selection of parameters. In accordance with Harrington (2006), we assume that the AA is unlikely to err (low β) and has only a low probability of initial evidence (low σ). The fine multiplier corresponds to treble damages. This is common in the US, where public prosecution and hence fines play only a small role. The factor τ assumes that legal fees are 50% of the cost of providing evidence, and $\lambda = 0.2$ implies a rather low probability that the AA will reveal an acquittal. We depict the critical values $\bar{\rho}_R^{AC}$, $\bar{\rho}_{Des}^{AC}$ and $\bar{\rho}_{Det}^{AC}$ as a function of θ , assuming numerical values as described in Table 1.

¹⁵The costs remain identical due to the non-cumulative nature of fines and damage payment, a common assumption in economic theory. Some of the exceptions we are aware of are Motchenkova (2004) in antitrust enforcement and Baumann and Friehe (2010) in tax evasion. A justification is the temporal limitation of liability.

Parameter	Value
β	0.05
τ	1.5
δ	0.9
σ	0.2
ϕ	3
λ	0.2

Table 1: The numerical values of the example.

Notice that the values guarantee the restrictions on conditions (19) and (22). With the numerical value of $\beta = 0.05$, it is reasonable to restrict the error spread to values $\rho < 10$, because otherwise the court would commit fewer errors by flipping a coin. The first graph shows the existence of an interval in which desistance of anticompetitive actions decreases as a result of the trial option. As has been proven above, both critical values decrease with θ . The length of the interval increases for the given values. As θ increases, the constraint requiring more reporting in the absence of trials drops, but only moderately, while the restriction of greater desistance falls more dramatically. For $\theta = 1$ firm 2 only reports if it cannot sue and desistance is higher in the no-trials setting if $1 < \rho \lesssim 5$.

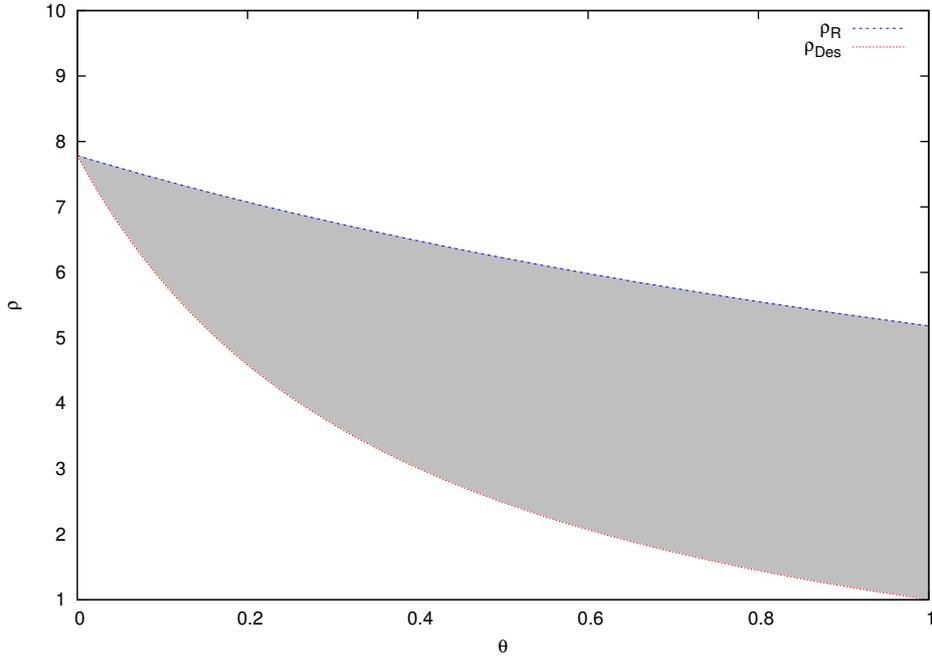


Figure 2: The numerical example for desistance of anticompetitive actions

With regard to deterrence, we additionally require a value for the reporting cost c . Remember, however, that c must be in the interval $[\bar{c}_T^{AC}, \bar{c}_{NT}^{AC}]$. The critical value $\bar{\rho}_{Det}^{AC}$ increases with c . We consider the case of the maximum value of the cost, $c = \bar{c}_{NT}^{AC}$, which is thus the strictest case possible. Note that for lower values of c the parameter space

might increase. As Figure 3 depicts, the interval in question does not exist for every value of θ . In the numerical example, $\bar{\rho}_R^{AC}$ and $\bar{\rho}_{Det}^{AC}$ cannot be fulfilled simultaneously if θ is too small. However $\bar{\rho}_{Det}^{AC}$ drops sharply while $\bar{\rho}_R^{AC}$ falls only moderately as θ increases. The conditions can here be simultaneously fulfilled if $\theta \gtrsim 0.18$. For $\theta = 1$, the court can be between two and five times as erroneous as the AA for the described effect to hold.

We believe the identified parameter space to be a strong indicator that the effects of trials differ from what is commonly believed. These effects must be reconsidered in light of the direct communication between injured parties and the AA.

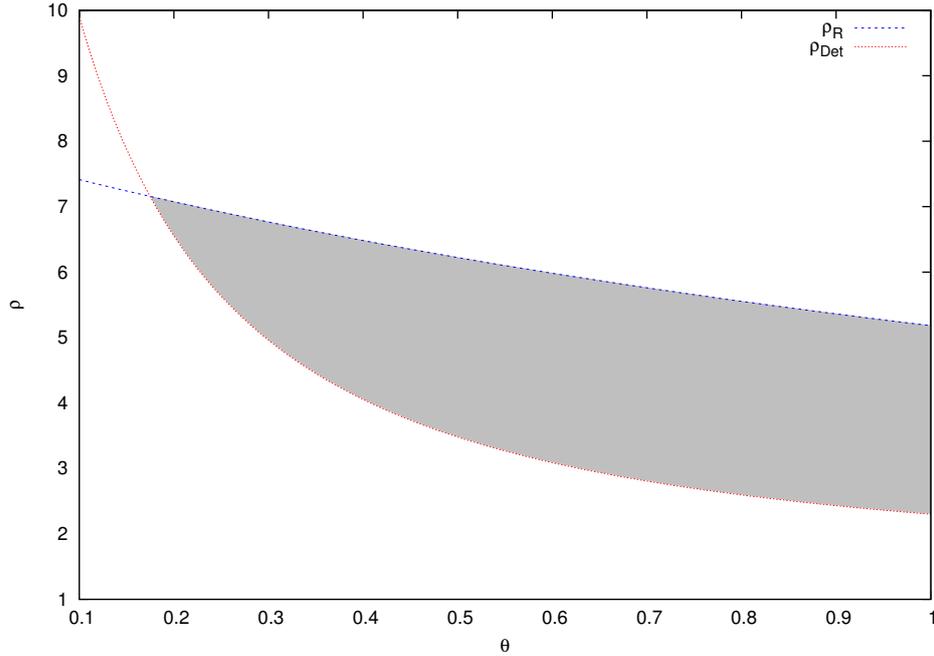


Figure 3: The numerical example for deterrence of anticompetitive actions

4 Procompetitive actions

4.1 Desistance of procompetitive actions

Which legal system better avoids type I errors? Remember that the condition $\rho \geq \bar{\rho}_R^{PC}$ together with $c \leq \bar{c}_{NT}^{PC}$ states the conditions under which there will only be reporting (i.e., manipulation of the AA) in the no-trial setting. If this condition is fulfilled, there will be more reports in the absence of the private possibility to sue. In the no-trials setting procompetitive actions are prosecuted with probability $\sigma\beta + (1 - \sigma)\theta\beta$, and with the same probability in future periods should the AA not investigate. In the trial setting, actions are wrongfully prosecuted with probability $\sigma\beta + (1 - \sigma)\rho\beta$ and zero probability in future periods by both the AA and the courts. A simple comparison shows that for $\rho > 1$ the value of welfare loss due to desistance is always higher when private trials are possible.

Proposition 3. *Welfare losses through false convictions increases as a result of the in-*

troduction of private trials if courts are more erroneous than the AA even when harmful reporting is crowded out.

Here, the prevailing theory regarding the effect of private antitrust enforcement on procompetitive actions holds: Such actions are less likely to cease, as McAfee et al. (2008) and Calcagno (2012) predict. Their result cannot be qualified by introducing a reporting stage, since an action has a higher probability of being falsely convicted in private prosecution. Thus, desistance is increased when weight is shifted from public to (more erroneous private prosecution) and additionally taken with higher probability in the same period. However, this result arises not because the condition for greater desistance opposes the condition for more reporting, but rather directly from the assumption that the court is more erroneous.

4.2 Deterrence of procompetitive actions

We now consider what happens to the deterrence of procompetitive actions when firm 2 only reports in the no-trial setting. In such a situation, the additional deterrent effect of private trials is ambiguous. Analogous to the anticompetitive case, critical profit levels are given by

$$\pi \geq (1 - \delta) \frac{(1 + \phi)\beta(\sigma + (1 - \sigma)\theta)D}{1 - (1 - (1 - \beta)(\sigma + (1 - \sigma)\theta))\delta} \equiv \bar{\pi}_{NT}^{PC}, \quad (23)$$

$$\pi \geq (1 - \delta) \frac{\sigma(1 + \phi)\beta D + (1 - \sigma)\rho\beta(1 + c\tau)D}{1 - (1 - (1 - \beta)(\sigma + (1 - \sigma)(1 - \rho\beta))\delta)} \equiv \bar{\pi}_T^{PC}. \quad (24)$$

Type I errors in deterrence are higher without the possibility of private trials whenever the critical threshold is lower in the trial setting than in the no-trial setting. That is if

$$\rho \leq 1 + \frac{(1 + \phi)(\sigma\delta(1 - \beta)(1 - \theta) + \theta(1 - \delta\beta)) - (1 + c\tau)(1 - \delta(1 - (1 - \beta)(\sigma + (1 - \sigma)\theta)))}{\beta(1 + \phi)\delta(\sigma + (1 - \sigma)\theta) + \beta(1 + c\tau)(1 - \delta(1 - (1 - \beta)(\sigma + (1 - \sigma)\theta)))} \equiv \bar{\rho}_{Det}^{PC}. \quad (25)$$

Lemma 5. *Given $c \in [0, \bar{c}_{NT}^{PC}]$, private trials decrease the deterrence of procompetitive actions, if $\rho \leq \bar{\rho}_{Det}^{PC}$. The critical value $\bar{\rho}_{Det}^{PC}$ increases with θ , ϕ , β , σ and δ and decreases with c and τ .*

This condition imposes a restriction on ρ directionally opposed to the necessary condition for more reporting in the no-trial setting. It should be noted, however, that the critical value for deterrence increases with the fine multiplier. Thus the two conditions can be simultaneously fulfilled if $\phi > \bar{\phi}^{PC}$ where $\bar{\phi}^{PC}$ is defined by equalizing $\bar{\rho}_R^{PC}$ and $\bar{\rho}_{Det}^{PC}$. From this follows the next proposition:

Proposition 4. *Deterrence of procompetitive actions decreases as a result of the introduction of private trials if $\bar{\rho}_{Det}^{PC} \geq \rho \geq \bar{\rho}_R^{PC}$. This interval exists if $\phi \geq \bar{\phi}^{PC}$.*

The results from McAfee et al. (2008) and Calcagno (2012) can be reversed for the deterrence of procompetitive actions, but cannot be reversed for the desistance. The probability of prosecution cannot decrease through the introduction of private trials, but the legal consequences (namely, the total fine, which only matters for deterrence but not for desistance) can become less severe when private trials are possible. Note that this result relies on the fact that the AA does not follow up with fines after a private trial, which is in accordance with real-world practice.

4.3 Numerical example

Assume that the same parameters hold as in the example for anticompetitive actions. Remember that desistance of procompetitive actions can never be lower with the private trial option, even when false reports are crowded out through trials. Deterrence of procompetitive actions can decrease through the the implementation of the trial option as described above. Figure 4 depicts the conditions specified by $\bar{\rho}_R^{PC}$ and $\bar{\rho}_{Det}^{PC}$. As has been shown above, $\bar{\rho}_{Det}^{PC}$ is slackened and $\bar{\rho}_R^{PC}$ tightens as θ increases. Again, we must consider the limitations of c as specified above, since this affects the value of $\bar{\rho}_{Det}^{PC}$. The strictest possible case is again the maximum $c = \bar{c}_{NT}^{PC}$ as $\bar{\rho}_{Det}^{PC}$ decreases with c . With this value, deterrence can only decrease with the private trials option if $\theta \lesssim 0.95$. For an intermediate value of $\theta = 0.5$ the court may be as much as three times as likely to commit an error as the AA in order for the described effect to occur. Thus, it is highly plausible that private trials would in fact decrease the deterrence of procompetitive actions.

5 Conclusion

The question of the welfare effects of private antitrust trials is currently hotly debated, both in academia and among practitioners. Previous research has established clear predictions about the types of errors we should expect to increase and decrease with the implementation of private trials. Allowing for the communication of evidence from private parties to the AA puts these results into question. Under certain parameter constellations, (some of) the results are reversed. The numerical illustrations show that for reasonable quantitative assumptions, the reversal of the effects is quite likely to occur. Of course, a general policy recommendation cannot very well be derived from our results. However, they do indicate that not only the total effect on welfare, but also that the effects decomposed on error types are ambiguous. It is essentially an empirical question as to which type of error increases and which decreases. From a theoretical perspective, both are equally possible, depending on whether the trial possibility crowds out cooperation between private parties and the AA, and on whether this can outweigh the direct effects. Finally, some inferences regarding the general discussion on regulation vs litigation can be

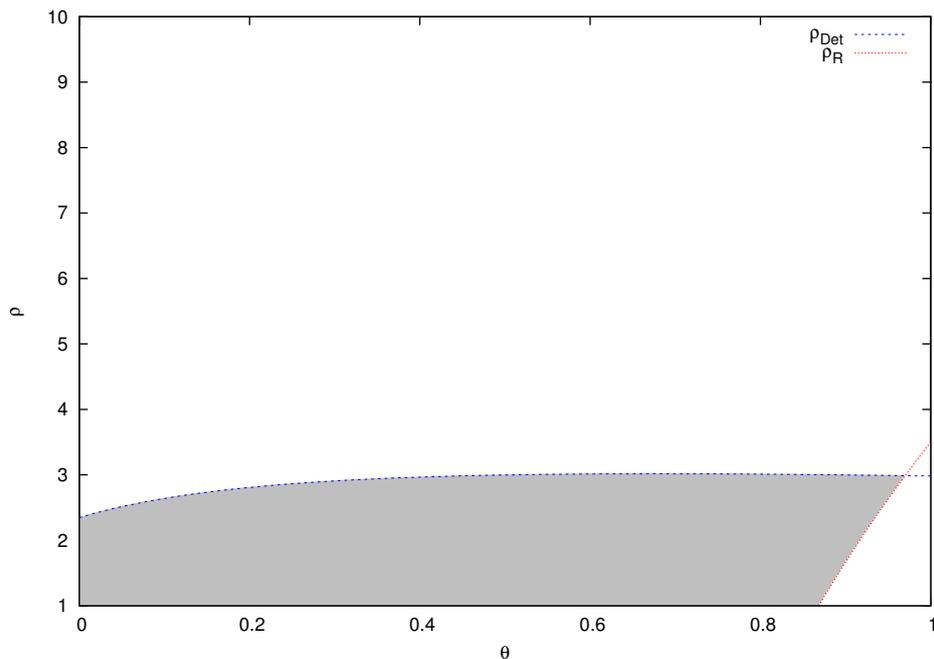


Figure 4: The numerical example for deterrence of procompetitive actions

drawn from this paper. Consider the parameter ρ , which measures the difference in error probabilities between the bureaucracy and the judicial system. If this variable is either very small or very large, our analysis does not provide new insights, and errors persist as previously determined. This is somewhat at odds with the discussion of Shleifer (2010), who shows that regulation is superior to litigation if the bureaucracy is more effective than the courts are (ρ high). However, this conundrum can be resolved. Consider the anticompetitive case for an illustration. In accordance with Shleifer (2010), in our model regulation is superior to litigation if the court is erroneous (condition (18)). However, effective regulation in our model also requires input from a private party, that it would not provide if the judicial system were sufficiently accurate (condition (7)). Thus, an efficient legal system weakens the efficiency of regulation. This is an important issue that might be interesting to generalize beyond the context of antitrust enforcement. It is an interesting question, both theoretically and empirically, whether and how much the quality of a bureaucracy is degraded by the availability of efficient litigation, since contributions to public enforcement become less necessary from an individual perspective. The optimality of regulation or litigation cannot be determined by a simple comparison; rather it is affected by interaction between the two different means of law enforcement. Allowing litigation can lead to an underinvestment problem (see Shavell (1997)), which is mitigated when parties can only enforce their rights in collaboration with a regulator.

Appendix

Proof of Lemma 1

Above it was shown that there exists an cost interval within which firm 2 only reports in the trial setting if $\rho \leq \bar{\rho}_R^{AC}$, where it was implicitly assumed that firm 2 goes to trial if the legal setting allows to do so. We will now show that this is the case for all relevant cases. Assume that the AA did not investigate an action. Then firm 2 has the choice of either suing firm 1 or waiting for an investigation from AA in a following period (in which it will report as long a $c < \bar{c}_{NT}^{AC}$, which we assume to hold as only this is a relevant case for our analysis).

$$(1 - \rho\beta) \frac{D}{1 - \delta} - \rho\beta\tau cD \geq \delta V_{NT,R}^{AC}. \quad (26)$$

This is equivalent to

$$\begin{aligned} \frac{D}{1 - \delta} \left((1 - \rho\beta)(1 - (1 - \sigma)(1 - \theta)\delta) - (1 - \beta)(\sigma + (1 - \sigma)\theta)\delta \right) \\ \geq cD \left(\rho\beta(1 - (1 - \sigma)(1 - \theta)\delta)\tau - (1 - \sigma + \sigma\beta(1 - \lambda))\delta \right). \end{aligned} \quad (27)$$

Define $\bar{\rho}_{LHS}^{AC}$ as the ρ equalizing the left-hand side to zero (where it is positive if ρ is below the critical value) and $\bar{\rho}_{RHS}^{AC}$ as the ρ equalizing the right-hand side to zero (where it is positive if ρ is above the critical value). Then two orderings to $\bar{\rho}_{LHS}^{AC}, \bar{\rho}_{RHS}^{AC}$ and $\bar{\rho}_R^{AC}$ are possible. If

$$\tau \geq \frac{(1 - \beta)(1 - \delta) + \beta(1 - (1 - \sigma)(1 - \theta)\delta)}{\beta(1 - \sigma + \sigma\beta(1 - \lambda))} \quad (28)$$

it holds that $\bar{\rho}_{LHS}^{AC} > \bar{\rho}_R^{AC} > \bar{\rho}_{RHS}^{AC}$ and the inverse direction otherwise. In the first case the condition is obviously fulfilled without further constraints for $\rho < \bar{\rho}_{LHS}^{AC}$, because the LHS is positive and the RHS is positive. For $\bar{\rho}_{LHS}^{AC} < \rho < \bar{\rho}_R^{AC}$ firm 2 goes to trial only if $c > \bar{c}_S^{AC}$, which is defined to equalize the trial condition. Further it can be shown that $\bar{c}_S^{AC} < \bar{c}_T^{AC}$ holds, such that for all costs for which firm 2 only reports absent of the trial possibility it also sues if it can. In the second case the condition is fulfilled without further constraints for $\rho < \bar{\rho}_{RHS}^{AC}$, as again the LHS is positive while the RHS is negative. For $\bar{\rho}_{RHS}^{AC} < \rho < \bar{\rho}_R^{AC}$ firm 2 goes only to trial if $c < \bar{c}_S^{AC}$. However, this is no further constraint because $\bar{c}_S^{AC} > \bar{c}_{NT}^{AC}$ is implied by $\rho > \bar{\rho}_R^{AC}$. This concludes that suing is always optimal in the cases where reporting is only optimal if trial is not allowed. This is summarized in Lemma 1.

Proof of Lemma 2

Consider now, whether firm 2 will go to trial against procompetitive actions. This is the case if

$$\rho\beta\frac{D}{1-\delta} - (1-\rho\beta)c\tau D \geq \delta V_{NT,R}^{PC}, \quad (29)$$

which is equivalent to

$$\begin{aligned} cD\left(\tau(1-\rho\beta)(1-(1-\sigma)(1-\theta)\delta) - (1-\sigma + \sigma(1-\beta)(1-\lambda))\delta\right)(1-\delta) \\ \leq D(\rho\beta(1-(1-\sigma)(1-\theta)\delta) - \beta(\sigma + (1-\sigma)\theta)\delta). \end{aligned} \quad (30)$$

The right-hand side is for all $\rho > 1$ positive. Thus firm 2 goes to trial if either the left-hand side is negative, that is if

$$\rho \geq 1 + \frac{\tau(1-\beta)(1-(1-\sigma)(1-\theta)\delta) - (1-\sigma + \sigma(1-\beta)(1-\lambda))\delta}{\beta\tau(1-(1-\sigma)(1-\theta)\delta)} \equiv \bar{\rho}_T^{PC}, \quad (31)$$

or if the LHS is positive and if $c < \bar{c}_S^{PC}$, where \bar{c}_S^{PC} is defined by fulfilling condition (30) with equality. Remember that we are looking for a condition where firm 2 goes to trial, but does not report to the AA. Notice first, that $\bar{\rho}_T^{PC} > \bar{\rho}_R^{PC}$ holds. Thus not reporting and trial are optimal, if either $\rho < \bar{\rho}_R^{PC}$ and $\bar{c}_T^{PC} < c < \bar{c}_S^{PC}$, or if $\rho > \bar{\rho}_T^{PC}$, or finally, if $\bar{\rho}_R^{PC} < \rho < \bar{\rho}_T^{PC}$ together with $c \leq \bar{c}_S^{PC}$ holds. The first case can be excluded as $\bar{c}_T^{PC} < \bar{c}_S^{PC}$ is not compatible with $\rho < \bar{\rho}_R^{PC}$. Finally, for $\rho > \bar{\rho}_R^{PC}$ it holds that $\bar{c}_{NT}^{PC} < \bar{c}_S^{PC}$, thus for all relevant cases, that is reporting in the NT setting only, firm 2 will also go to trial. Lemma 2 concludes this analysis.

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