

Institutional Design and Antitrust Evidentiary Standards

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Abstract

The purpose of this paper is to study the relative impact of public and private competition law enforcement on antitrust liability. We develop a model with asymmetric information during trial, where the number of cases filed depends on the amount of damages awarded and on the standard of evidence applied either by the public authority or by the judge. Our model predicts that higher damages result in a higher standard of evidence, which is not always welfare improving. We also show that public enforcement better incentivizes pro-competitive practices by allowing a lower standard of evidence. This may lead the public enforcement to outperform the private enforcement.

Keywords: antitrust, public and private enforcement, evidentiary standard

JEL classification: K21, L41, D82

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1 Introduction

Over the past two decades, the EU and US competition policies appear to have evolved towards greater convergence in the enforcement of cartels and merger control (Kovacic, 2008). On the contrary, the treatment of abuse of dominant position/market monopolization illustrates the persistent dissimilarity between the two antitrust systems¹. Consider predatory pricing and its three acknowledged elements: sacrifice with below cost pricing, market power and probability of recoupment. Whereas the approach in the EU focuses on the first two, the US policy on predation emphasizes all three of them, which makes predatory conduct harder to prove. More generally, the decisions of the US courts under Section 2 of the Sherman Act such as *Brooke Group*², *Trinko*³ or *Weyerhaeuser*⁴ have shown greater skepticism about abuse of dominance claims and weaker liability for dominant firms than the European judicial decisions in mirror cases such as *France Telecom/Wanadoo*⁵, *Michelin II*⁶ or *British Airways*⁷.

One possible explanation for this more lenient treatment of dominant firm conduct in the US may be the role played by private rights and the delegation of the decision to prosecute (Kovacic, 2003). Accordingly, if courts fear that private rights of action (with mandatory treble damages, asymmetric shifting of costs, and class actions) may excessively deter legitimate business conduct, the courts will use measures within their control to correct the perceived imbalance. In particular and following Kovacic (2008), the courts may “equilibrate” the antitrust system by adjusting evidentiary requirements that must be satisfied to prove violations, or alter substantive liability rules in ways that make it more difficult for the plaintiff to establish the defendant’s liability.

¹See Larouche and Schinkel (2013) for a review of other differences between Art. 102 TFEU and Section 2 of Sherman Act.

²*Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209 (1993).

³*Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398 (2004).

⁴*Weyerhaeuser Co. v. Ross-Simmons Hard-Wood Lumber Co., Inc.*, 127 S.Ct. 1069 (2007).

⁵Case T-340/03, *France Telecom SA v. Commission*, 2007.

⁶Case T-203/01, *Manufacture Francaise des Pneumatiques Michelin v. Commission*, 2003.

⁷Case T-219/99, *British Airways PLC v. Commission*, 2003.

It is our purpose in this paper to devise a model to deal with the relative impact of public and private competition law enforcement on antitrust liability. Our model predicts that higher damages result in a higher standard of evidence and that this is not always welfare improving. We also show that to some extent the public enforcement better conciliates detection of anticompetitive practices and incentives to pro-competitive behavior than the private enforcement. As a result, as long as encouraging pro-competitive conduct is preferred, the public enforcement may be more efficient than the private enforcement. In so doing we hope to contribute to the debate on the opportunity of introducing private claims and litigation for antitrust damages in the EU⁸.

We develop a model where either the court or the antitrust authority sets the standard of evidence for antitrust liability. Our model also considers two private parties, the plaintiff and the defendant. The defendant chooses a certain type of market behavior, pro- or anticompetitive. The decision-maker, either the public antitrust authority or the judge (depending on the type of enforcement, public or private), does not observe perfectly the defendant's behavior, but has to rule on the defendant's liability and consequently inflicts a fine or awards damages and delivers an injunction to cease the alleged behavior. A procedure against the defendant is triggered only by a complaint filed by the plaintiff, who observes the defendant's conduct and incurs some cost of gathering evidence. Even after a formal investigation, the evidence gathered does not allow to perfectly discriminate between pro- and anticompetitive behavior. The liability decision is reached based on the standard of evidence chosen in the beginning. Private and public antitrust enforcement differ in many respects, but we only focus on one: whereas the plaintiff receives the amount of the damages awarded by the judge, he does not receive the amount of the fine inflicted by the antitrust authority. Consequently, the incentives to bring suit will likely differ between the two procedures, and therefore we expect the optimal choice of a standard of evidence to differ as well.

Before turning to the model itself, let us briefly discuss the relevant literature for this topic.

⁸In November 2014 a European Directive was adopted to facilitate damages claims by victims of antitrust damages in the EU.

Besanko et Spulber (1990), Briggs et al (1996) and more recently Bourjade et al (2009) have tackled private claims for antitrust damages to assess the impact of treble damages and cost shifting. In contrast, we explicitly add in the present paper the public enforcement procedure and the choice of standard of evidence. Rubinfeld (2006), Segal et Whinston (2007), Wils (2009) and Peyer and Hüschelrath (2013) investigated the relationship or optimal mix between public and private enforcement of competition law. McAfee et al (2008) explicitly dealt with this, and reached the conclusion that adding private claims to the already existing public enforcement is welfare improving if the ensuing litigation does not give rise to too many judgment errors. Our analysis emphasizes that the amount of errors depends on the standard of evidence, which is possibly endogenous and affected by both the type of procedure and the level of damages. Kaplow (2011) is the first to provide a formal model of public enforcement with endogenous standard of evidence. We depart from his analysis by considering an antitrust context with both private and public enforcement.

The rest of the paper is organized as follows: first we present the model, then discuss the choice of optimal standard of evidence with private antitrust enforcement. We go on to highlight how the results may change with public enforcement, and compare the two procedures before concluding. All proofs are grouped in a final Appendix.

2 The model

The players and their information

Consider first the defendant (D) and the plaintiff (P), two risk-neutral firms. The defendant can be of two types. The first, denoted D^A , may adopt an anticompetitive conduct, at a cost K^A , generating an extra profit equal to Δ . The second type of defendant, denoted D^P , has the opportunity to undertake a pro-competitive practice, also leading to an extra profit of Δ , but at a cost K^P . Both types are equiprobable but lead to opposite welfare outcomes: the practice induced by D^A leads to a welfare loss equal to the welfare gain generated by type D^P . We further normalize to 1 the welfare gain. In addition, the defendant's conduct

also leads to a profit loss for the plaintiff equal to⁹ Δ . The adoption of the practice is public information but the type of the defendant remains private information. For instance, the defendant sets a very low price (the practice) but the nature of that low price (exclusionary versus explained by very low costs) is private information. The plaintiff P observes the defendant's true type, and may file a complaint for abusive conduct when D^i undertakes the practice. To file the complaint, the plaintiff needs to gather evidence, at a cost f . The plaintiff's evidence-processing cost is his private information, and is uniformly distributed over the interval $[0, \bar{f}]$ according to the cumulative function $F(u) = \frac{u}{\bar{f}}$.

The private and public antitrust enforcement

We consider two polar and mutually exclusive types of antitrust enforcement: a purely private procedure and a purely public one.

The private enforcement is a three-player game where the plaintiff may bring suit in front of the civil judge (J). We assume that a formal procedure takes place against firm D^i only if firm P chooses to file a complaint. The judge does not observe D^i 's type. P provides some evidence on the alleged conduct, but not enough to perfectly discriminate between both practices. The judge receives a signal based on P 's evidence and summarizing the confrontation between P and D^i . The signal is imperfectly correlated with the true type or behavior of firm D^i , and it is used to establish D^i 's liability. The risk of judgement errors depends on the standard of evidence imposed. A higher standard of evidence means that more criteria must be met to establish the liability of the defendant¹⁰. It follows that under a high standard of evidence, the probability for the judge to find guilty a firm is lower. We denote by s the standard of evidence. Then the probability to receive the signal enabling to establish liability given that the true type is D^A is equal to $a(s)$, whereas the probability of the same signal given that the true type is D^P is equal to $p(s)$. The signal is

⁹Note that we deliberately assume the same profit change for both defendant and plaintiff in order to avoid any exogenous impact on the plaintiff's incentives to file a complaint.

¹⁰A typical example is the evidentiary standard required for predatory pricing. Under a low standard of evidence only the dominance/market power and the cost test are used to establish the liability. A higher standard of evidence would also include the lost profits recoupment test.

informative ($a(s) \geq p(s)$) and a higher standard reduces both probabilities ($p'(s) < 0$ and $a'(s) < 0$). Let the evidentiary standard belong to the interval $[0, 1]$ with $a(0) = p(0) = 1$ and $a(1) = p(1) = 0$. If the defendant is found liable, she will have to stop the practice and pay a damage x to the plaintiff.

Concerning the public enforcement that we consider in the present model, the only difference with the private enforcement concerns to whom the monetary sanction is paid. With public enforcement, the defendant found liable pays a fine x to the antitrust authority (AA) instead of to the plaintiff. Obviously, in practice, the two types of antitrust enforcement differ in several respects, but we focus here on the recipient of the fine or damage paid by the defendant if found liable.

For both types of enforcement we assume that the decision-maker, the judge or the AA, is credibly bound by the decision rule (set for instance by the law). Accordingly, liability is established when the signal is received, and the defendant has to stop her conduct and pay either damages or an administrative fine. Finally, the objective of both the AA and the judge is to maximize the expected welfare.

The timing of the game

Stage 1 - The decision-maker (judge or AA) chooses a standard of evidence s .

Stage 2 - The defendant observes its type and chooses whether to undertake or not the conduct.

Stage 3 - If the defendant adopted the practice, the plaintiff P decides to file or not a complaint based on its evidence-processing cost and the observation of the defendant's type.

Stage 4 - If the plaintiff filed a complaint, the AA or the judge observes the signal and applies the decision rule.

In what follows, we determine the Perfect Bayesian Equilibrium for each type of game (public or private antitrust enforcement), so as to identify the optimal standard of evidence under each type of procedure and eventually compare them.

3 Private enforcement of antitrust claims

Solving the game requires us to detail the plaintiff's choice at the third stage.

If the plaintiff P observes type D^A adopting the anticompetitive conduct, it files a suit whenever the expected profit, equal to $a(s)(x + \Delta)$, exceeds the filing, evidence-gathering, cost. Then, the probability for the defendant D^A to face a suit is equal to $F(a(s)(x + \Delta))$. Similarly, if type D^P chooses the pro-competitive behavior, her probability to face a suit is $F(p(s)(x + \Delta))$. First, recall that although the signal is imperfect, it is informative, therefore the probability for type D^A to face a complaint is always higher than for type D^P . Furthermore, this probability is increasing in the amount of damage to be paid, x , because it enters the plaintiff's expected gain from filing suit. Finally, a lower standard of evidence is associated with a higher probability of filing a complaint, since the resulting expected gain is higher.

Going back to the previous stage, we can now determine the defendant's choice to undertake or not the allegedly abusive practice. This choice is based on a cost-benefit analysis, putting into balance the private gain from the practice and the probability to be held liable for it. The probability to be found liable of an abusive conduct equals $a(s)F(a(s)(x + \Delta))$ for D^A and $p(s)F(p(s)(x + \Delta))$ for D^P , leading to an expected private gain of $\Delta - a(s)(x + \Delta)F(a(s)(x + \Delta))$ and $\Delta - p(s)(x + \Delta)F(p(s)(x + \Delta))$ respectively.

Given the trade-off that the defendant faces between the private benefit from undertaking the allegedly abusive practice and the expected cost in case she is held liable for it, we determine below the conditions under which the defendant of type i adopts the practice:

Lemma 1 *A firm D^i ($i = A, P$) undertakes the practice iff $s > s_{priv}^i(x)$, where the standard $s_{priv}^i(x)$ increases with x .*

In addition, $s_{priv}^P(x) > s_{priv}^A(x)$ if K^P is sufficiently high, but $s_{priv}^A(x) < s_{priv}^A(x)$ for a high level of x only if $p'(s)$ is sufficiently lower than $a'(s)$.

Lemma 1 provides the condition on the standard s leading the defendant to adopt the practice: a higher standard of evidence provides higher incentives to undertake the practice,

since the chances of being held liable for it are lower. Moreover, the critical standard of evidence that tips the balance in favor of the adoption of the practice depends on x , the damages payment that the defendant will incur if found liable. Because higher awarded damages lower the defendant's incentive to adopt the practice, whatever its nature, Lemma 1 also stresses the substitutability between the level of damages x and the standard of evidence s . As a result, if x increases, then a higher s is required to induce the adoption of the pro-competitive practice by D^P .

The comparison of both thresholds turns out to be crucial. Whenever $s_{priv}^P(x) > s_{priv}^A(x)$, there is a conflict of incentives, since it is not possible to simultaneously see adopted the pro-competitive practice and deter the anticompetitive one. Instead, if $s_{priv}^P(x) < s_{priv}^A(x)$, it is possible to conciliate both incentive constraints, i.e. encourage the adoption of the pro-competitive conduct and deter the anticompetitive behavior for a continuum of evidentiary standards in $[s_{priv}^P(x), s_{priv}^A(x)]$. Note that both the cost parameters K^i and the amount of damages x modify the ranking of these two thresholds. For instance, $s_{priv}^P(x)$ is higher than $s_{priv}^A(x)$ as long as the cost of the pro-competitive practice is high enough. Moreover, the role of damages x depends on the relative impact of the standard on the detection probability. In particular, if a higher standard makes it much harder to establish liability for a pro-competitive practice than for an anticompetitive one, then a higher damage may lead to $s_{priv}^P(x)$ lower than $s_{priv}^A(x)$. Instead, if a higher standard makes converge both liability probabilities (p and a), then a higher level of damage keeps $s_{priv}^P(x)$ higher than $s_{priv}^A(x)$. In other words, higher damages make it easier to conciliate both incentives only if a higher standard better discriminates between both practices.

The next step of our analysis is to identify the optimal standard of evidence set by the judge at the first stage. For that we derive the expected welfare for both types of defendant, and emphasize the role of the standard of evidence on the expected welfare.

We denote $W_{priv}(s)$ the expected welfare under private enforcement which depends on the standard of evidence.

As far as the pro-competitive behavior is concerned, the expected welfare is equal to $W_{priv}^P(s) = \left[1 - \frac{1}{f}p(s)^2(x + \Delta)\right] > 0$ if type D^P actually adopts the pro-competitive practice (that is the case if $s > s_{priv}^P(x)$), and 0 otherwise. A higher standard of evidence provides higher incentives to adopt the pro-competitive conduct and reduces the probability to be wrongly held liable if this practice is undertaken, due to both a lower probability of liability ruling and fewer suits being filed. As a result, the expected welfare from the pro-competitive behavior increases with the level of standard of evidence. In turn, the expected welfare when D^A undertakes the anticompetitive practice (this is the case if $s > s_{priv}^A(x)$), equals $W_{priv}^A(s) = -\left[1 - \frac{1}{f}a(s)^2(x + \Delta)\right] < 0$, and 0 otherwise. It is straightforward to see that a lower standard of evidence leads to a higher expected welfare, thanks to higher chances to rightfully hold D^A liable and thanks to the possibility to deter the anticompetitive practice if s becomes lower than $s_{priv}^A(x)$.

If both types of defendant undertake the practice, there exists an optimal standard of evidence that strikes the balance between the associated cost and benefit. We denote \hat{s} such an optimal standard that maximizes the expected welfare $W_{priv}^{A+P}(s) = \left[1 - \frac{1}{f}p(s)^2(x + \Delta)\right] - \left[1 - \frac{1}{f}a(s)^2(x + \Delta)\right]$. Note that the expected benefit comes from punishing the anticompetitive conduct, whereas the associated welfare loss stems from not detecting and punishing it often enough and wrongfully fining pro-competitive behavior. Standard \hat{s} aims at optimally discriminating both practices by maximizing $a^2(s) - p^2(s)$.

The following proposition determines the optimal standard of evidence and the impact of the level of damages on the expected welfare:

Proposition 1 *Denote $s_{priv}^*(x)$ the optimal standard of evidence with private enforcement:*

- (i) *if $s_{priv}^A(x) < s_{priv}^P(x)$, then $s_{priv}^*(x) = \text{Max}(\hat{s}, s_{priv}^P(x))$;*
- (ii) *if $s_{priv}^A(x) > s_{priv}^P(x)$, then $s_{priv}^*(x) = \hat{s}$ if $W_{priv}^P(s_{priv}^A) < W_{priv}^{A+P}(\hat{s})$ and if $s_{priv}^A < \hat{s}$;*
otherwise, $s_{priv}^(x) = s_{priv}^A$.*

The optimal standard $s_{priv}^(x)$ is always increasing in the amount of damages x .*

The expected welfare may decrease in x whenever a higher standard is insufficiently discriminatory, i.e. for high enough $\frac{a'(s)}{p'(s)}$.

Proposition 1 first provides the optimal standard of evidence and then discusses the impact of higher damages on the optimal evidentiary standard as well as on the expected welfare. Below we discuss these results according to the existence or absence of the previously mentioned conflict of incentives.

Conflict of incentives

If there is a conflict of incentives, it is always better to encourage pro-competitive practices at the cost of also inducing anticompetitive practices rather than deterring both types of practices. That is the case simply because the signal is informative and makes the judge always rightly punish the anticompetitive behavior more often than wrongly fine the pro-competitive conduct. Therefore the optimal evidentiary standard, denoted \hat{s} , aims at discriminating at best both types of defendants. Yet, if the level of damages is very high, the optimal standard \hat{s} may fail to satisfy the incentive constraint of the defendant D^P . In that case, the optimal standard is the one that satisfies the incentive constraint of the pro-competitive defendant, i.e. $s_{priv}^P(x)$. In the end, the optimal standard is the result of a conflict between optimizing the screening of types and satisfying the incentive constraint of type D^P . This conflict is not binding as long as the level of damages x remains low enough. Otherwise, the optimal standard is given by the incentive constraint at the cost of a lower discriminating power of the standard.

Next, we establish the impact of an increase in awarded damages: in order to preserve the incentives in favor of pro-competitive practices, the optimal standard must increase in the damages paid. This is a perfect illustration of how the monetary sanction in the form of damages to be paid is actually expected to work for the private enforcement of antitrust. First, a higher sanction leads to more suits being filed, because the plaintiff stands more to gain. Ensuing increased litigation helps detect more often anticompetitive practices, but also chills the pro-competitive ones. This risk of type I errors and resulting chilling of pro-competitive practices will make the judge increase the standard of evidence, so as to preserve the incentives encouraging the pro-competitive behavior¹¹.

¹¹This argument offers a possible explanation for the gradual leniency towards dominant firm conduct in

In terms of welfare, higher damages trigger more suits being filed, and this is potentially welfare-improving thanks to the informativeness of the signal received by the judge. However, and as before argued, in order to preserve the incentives to undertake pro-competitive practices, the judge is also constrained to increase the standard of evidence. This has a negative impact for the detection of anticompetitive practices. The net outcome of both effects depends on the impact of the higher standard on the liability probabilities. If the higher standard is less able to screen the alleged conduct, then welfare may decrease. Instead, if the higher standard still allows to sufficiently discriminate between both practices, the net effect is positive and welfare will increase.

No conflict of incentives

If there is no conflict of incentives, the optimal standard is either the highest standard that conciliates the incentives to adopt the pro-competitive behavior and the deterrence of the anticompetitive practice, that is $s_{priv}^A(x)$, or the best discriminating standard \hat{s} . The trade-off is simple here: the judge decides either to deter the anticompetitive practice with a standard $s_{priv}^A(x)$, or to accommodate by adopting the standard \hat{s} that better discriminates both types of defendant.

A higher level of damages relaxes even more the constraint for the optimal standard determination by increasing the standard $s_{priv}^A(x)$ that deters the type D^A . Thus, higher damages weakly increase the optimal standard, as in the (previous) case of a conflict of incentives. Moreover, the increase in the standard unambiguously leads to a higher expected welfare by relaxing the incentive constraint. However, the increase in the number of complaints against type D^P due to a higher level of damages lowers the expected welfare. Thus, here damages also have an ambiguous impact on the expected welfare.

the US over the past 30 years (Kovacic, 2008). Accordingly, if the courts fear that the mandatory treble damages excessively deter pro-competitive practices, the judges may "equilibrate" the antitrust enforcement by adjusting the evidentiary requirements that must be satisfied in order for violations to be proved. In other words, they apply a higher standard of evidence to avoid type I errors.

4 Public vs. private enforcement

We begin this section by outlining the solution of the game with public enforcement. As before mentioned, the difference between the two procedures that we focus on is the fact that the public, administrative procedure involves a monetary sanction for the defendant in the form of a fine, which is not a transfer to the plaintiff. It is straightforward to see that the direct consequence is a lower incentive to file a complaint for the plaintiff. Thus, the evidentiary thresholds above which each type of defendant will choose to undertake the practice are lower under public enforcement than under private enforcement: $s_{pub}^P(x) = p^{-1}(\sqrt{\frac{f \times (\Delta - K^P)}{(\Delta + x)\Delta}}) < s_{priv}^P(x)$ for type D^P and $s_{pub}^A(x) = a^{-1}(\sqrt{\frac{f \times (\Delta - K^A)}{(\Delta + x)\Delta}}) < s_{priv}^A(x)$ for type D^A . Anticipating on the impact of the procedure for the expected welfare, the lower number of complaints might be good news if the binding constraint is to encourage the pro-competitive defendant D^P : it is then possible to satisfy it for a lower evidentiary standard, and a lower standard allows a better detection of the anticompetitive behavior. Instead, the lower number of complaints filed is bad news if the binding constraint is to deter type D^A , because then incentivizing type D^P is not relevant and the lower number of complaints makes it more difficult to detect the anticompetitive practice.

In order to determine the optimal standard, we need first to derive the expected welfare. If type D^P adopts the practice, the expected welfare is equal to $W_{pub}^P = \left[1 - \frac{1}{f}p^2(s)\Delta\right]$, and 0 otherwise. Likewise, if type D^A adopts the practice, the expected welfare is given by $W_{pub}^A = -\left[1 - \frac{1}{f}a^2(s)\Delta\right]$, and 0 otherwise. Unsurprisingly, the lower number of complaints filed increases the expected welfare W_{pub}^P but decreases the expected welfare W_{pub}^A .

We proceed below to compare the two types of antitrust enforcement in terms of optimal standard of evidence. The following results hold:

Proposition 2 *Denote $s_{pub}^*(x)$ the optimal standard of evidence with public enforcement.*

(i) *If $s_i^A < s_i^P$ ($i = priv, pub$), then the optimal standard under private enforcement is always higher than under public enforcement ($s_{priv}^*(x) \geq s_{pub}^*(x)$).*

Otherwise, we cannot exclude a case where the optimal standard under private enforcement

is lower than under public enforcement ($s_{priv}^*(x) < s_{pub}^*(x)$).

(ii) For a given level of monetary sanction (fine or damages awarded), the public enforcement may lead to a higher expected welfare than the private one if a higher standard reduces the ability to discriminate between practices.

Proposition 2 first compares the optimal evidentiary standards under both types of antitrust enforcement. It then goes on to compare the resulting expected welfare levels. To better grasp the intuition behind these results, let us again discuss them according to the existence or not of a conflict of incentives regarding the two types of defendant.

Let us first start with the case where there is such a *conflict of incentives*.

Then, according to Proposition 2, the optimal evidentiary standard is always higher with private enforcement. This is due to the incentive constraint of type D^P being the binding constraint. For a given amount of monetary sanction inflicted to the defendant, either administrative fine or awarded damage, the plaintiff will have always higher incentives to bring suit with private enforcement, simply because he will pocket the payment made by the defendant. The resulting increased litigation decreases the incentive of the defendant to undertake the practice, and therefore the standard of evidence required to provide incentive to the pro-competitive defendant must be higher under private enforcement ($Max(\hat{s}, s_{priv}^P) \geq Max(\hat{s}, s_{pub}^P)$).

Note that this may provide a possible explanation for the difference in the antitrust treatment of market power abuses between the EU and the US. So far, the European antitrust enforcement has been a purely administrative procedure, and as such conducive to fewer complaints being filed. As a result, the risk of chilling the pro-competitive practices is considerably lower compared with American antitrust enforcement, which relies heavily on private claims. Following the above argument, the European Commission could afford to apply a low standard of evidence to establish liability, whereas the American judges optimally require a higher standard of evidence, so as to avoid the increase in type I errors and the ensuing chilling of pro-competitive practices on account of the intensive litigation.

Proposition 2 also compares the two types of enforcement in terms of expected welfare:

the public enforcement may lead to a higher level of welfare. This may appear surprising given the lower number of complaints under public enforcement, but is explained by the endogenous standard of evidence. A high standard of evidence increases the expected welfare derived from the pro-competitive practice, by reducing the risk of wrongful conviction, but also lowers the expected welfare from the anticompetitive practice, which is less often adopted. The net effect depends, again, on the impact of a higher standard on the liability probabilities. If a higher standard is less able to screen the alleged conduct, then the expected welfare may very well be lower with private enforcement.

In the *absence of conflict of incentives* we cannot exclude the case where the optimal standard is lower under private enforcement. Indeed, if there is no conflict of incentives, focusing on encouraging type D^P is no longer relevant. Instead, and as previously explained with private enforcement, the optimal standard is either the highest standard that deters the anticompetitive practice or the best discriminating standard \hat{s} . In that case, the low number of complaints under public enforcement may push the AA to prefer the higher standard \hat{s} . Indeed, if under public enforcement the AA decides to set the standard at the highest level compatible with both constraints, i.e. $s_{pub}^A(x)$, the low number of complaints leads to a lower evidentiary standard (we have $s_{pub}^A(x) < s_{priv}^A(x)$). It could then be better, under public enforcement, to increase the standard in order to reduce the wrongful detection of pro-competitive practices although at the cost of lower deterrence of anticompetitive conduct, and therefore to set the standard at \hat{s} . Under private enforcement, the constraint on the evidentiary standard deterring the anticompetitive behavior is less stringent (we have $s_{priv}^A(x) > s_{pub}^A(x)$), and thus the standard $s_{priv}^A(x)$ may be optimal and also lower than the optimal standard under public enforcement as long as $s_{priv}^A(x) < \hat{s}$.

Thus, in the absence of conflict of incentives, the expected welfare is higher under private enforcement, since with public enforcement the low number of complaints puts a constraint on the evidentiary standard effectively deterring type D^A from adopting the harmful practice.

5 Concluding remarks

This paper proposes a model to deal with the relative impact of public and private competition law enforcement on the substantive doctrine of antitrust liability. We compare the two types of antitrust enforcement, public and private, in terms of number of complaints filed, optimal standard of evidence, and also expected welfare. Our results provide a possible explanation for the likely evolution of the European doctrine of antitrust liability, given the recent (November 2014) introduction of private claims for antitrust damages. Our analysis may further be improved by additional assumptions that have been left aside for the time being, such as the respective enforcement costs of the public and private procedures, or the unique possibility of the public authority to open a case independently from a private claim, which a judge cannot do.

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6 Appendix

Proof of Lemma 1. Firm D^i undertakes the alleged abusive practice iff its expected profit is positive: $\Delta - p(s)(x + \Delta)F(p(s)(x + \Delta)) - K^P \geq 0$ for D^P and $\Delta - p(s)(x + \Delta)F(a(s)(x + \Delta)) - K^A \geq 0$ for D^A . This is equivalent to $s \geq s_{priv}^P(x) = p^{-1}\left(\frac{\sqrt{f \times (\Delta - K^P)}}{\Delta + x}\right)$ for type D^P and $s \geq s_{priv}^A(x) = a^{-1}\left(\frac{\sqrt{f \times (\Delta - K^A)}}{\Delta + x}\right)$ for type D^A .

The impact of x on both thresholds is the following: $s_{priv}^P(x) = \frac{\sqrt{f \times (\Delta - K^P)}}{(\Delta + x)^2} \times \frac{1}{-p'(s_{priv}^P(x))}$ and $s_{priv}^A(x) = \frac{\sqrt{f \times (\Delta - K^A)}}{(\Delta + x)^2} \times \frac{1}{-a'(s_{priv}^A(x))}$. Thus, if $-p'(s)$ is sufficiently high with respect to $-a'(s)$, we may have $s_{priv}^P(x) < s_{priv}^A(x)$ for x high enough.

■

Proof of Proposition 2. Optimal standard of evidence

(i) If $s_{priv}^A(x) < s_{priv}^P(x)$, the expected welfare equals:

$$W_{priv}(s) = \begin{cases} 0 & \text{if } s < s_{priv}^A(x), \\ W_{priv}^A(s) < 0 & \text{for } s_{priv}^A(x) < s < s_{priv}^P(x), \\ W_{priv}^{A+P}(s) \geq 0 & \text{for } s \geq s_{priv}^P(x). \end{cases}$$

Below we determine s that maximizes the welfare function $W_{priv}(s)$.

First, because $W_{priv}^{A+P}(s) \geq 0$, the maximum is achieved for $s \geq s_{priv}^P$.

In addition, we have $W_{priv}^{A+P}(s) \geq 0$ for all s with $W_{priv}^{A+P}(1) = W_{priv}^{A+P}(0) = 0$ and $W_{priv}^{A+P}(s) > 0$ for $0 < s < 1$.

We have also $W_{priv}^{A+P}(s) = 2(a(s)a'(s) - p(s)p'(s))$. We assume for simplicity that there is a unique interior solution for $W_{priv}^{A+P}(s) = 0$. This is the case for instance for $a(s) = (1 - s)^n$ and $p(s) = (1 - s)^m$ with $1 < n < m$. We denote by \hat{s} this unique interior solution, which does not depend on x .

Thus the optimal solution of the maximization of $W_{priv}(s)$ is $s_{priv}^* = \text{Max}(\hat{s}, s_{priv}^P)$.

(ii) If $s_{priv}^P(x) < s_{priv}^A(x)$, the expected welfare equals:

$$W_{priv}(s) = \begin{cases} 0 & \text{if } s < s_{priv}^P(x) \\ W_{priv}^P(s) & \text{for } s_{priv}^P(x) < s < s_{priv}^A(x) \\ W_{priv}^{A+P}(s) & \text{for } s \geq s_{priv}^A(x) \end{cases} .$$

Then, two cases are possible:

If $W_{priv}^{A+P}(\hat{s}) > W_{priv}^P(s_{priv}^A)$, then $s_{priv}^* = \hat{s}$.

If $W_{priv}^{A+P}(\hat{s}) < W_{priv}^P(s_{priv}^A)$, then $s_{priv}^* = s_{priv}^A(x)$.

Impact of an increase in x on the level of expected welfare $W_{priv}(s_{priv}^*)$.

(i) If $s_{priv}^A(x) < s_{priv}^P(x)$.

If $s_{priv}^* = \text{Max}(\hat{s}, s_{priv}^P) = \hat{s}$, then an increase in x leads to an increase in the optimal welfare. The envelope theorem ensures that the marginal impact of x on $W_{priv}(\hat{s})$ is equal to $\left[\frac{1}{f}(a^2(\hat{s}) - p(\hat{s})^2)\right] > 0$.

If x is high enough, we have $s_{priv}^* = \text{Max}(\hat{s}, s_{priv}^P) = s_{priv}^P(x)$ since $s_{priv}^P(x)$ increases with x while \hat{s} is constant.

Then the marginal effect of x on $W_{priv}(s_{priv}^P(x))$ is:

$$\left[\frac{1}{f}(a^2(s_{priv}^P) - p^2(s_{priv}^P))\right] + s_{priv}^{P'}(x) \cdot 2(x + \Delta) \frac{1}{f} \left[a'(s_{priv}^P) a(s_{priv}^P) - p'(s_{priv}^P) p(s_{priv}^P) \right]$$

We have:

$$\frac{1}{f}(a^2(s_{priv}^P) - p(s_{priv}^P)^2) > 0,$$

$$a'(s_{priv}^P) a(s_{priv}^P) - p'(s_{priv}^P) p(s_{priv}^P) < 0 \text{ since } s_{priv}^P > \hat{s},$$

$$s_{priv}^{P'}(x) = \frac{\sqrt{f} \times (\Delta - K^P)}{(\Delta + x)^2} \cdot \frac{1}{-p'(s_{priv}^P(x))} > 0$$

Therefore the marginal impact is the following:

$$\left[\frac{1}{f}(a^2(s_{priv}^P) - p(s_{priv}^P)^2)\right] - 2 \frac{\sqrt{f} \times (\Delta - K^P)}{(\Delta + x)} \frac{1}{f} \left[\frac{a'(s_{priv}^P)}{p'(s_{priv}^P)} a(s_{priv}^P) - p(s_{priv}^P) \right].$$

Thus, if $\frac{a'(s_{priv}^P)}{p'(s_{priv}^P)}$ is sufficiently high, the expected welfare may decrease if x increases.

(ii) If $s_{priv}^P(x) < s_{priv}^A(x)$.

If $s_{priv}^* = \hat{s}$, an increase in x has a positive impact on $W_{priv}(\hat{s})$.

If $s_{priv}^* = s_{priv}^A(x)$, the marginal effect of x is equal to:

$$-2 \frac{1}{f}(x + \Delta) p'(s_{priv}^A) p(s_{priv}^A) s_{priv}^{A'}(x) - \frac{1}{f} p(s)^2.$$

Because $p'(s) < 0$ and $s_{priv}^{A'}(x) > 0$, the impact of x is also ambiguous here.

■

Proof of Proposition 2. (i) Comparison of optimal standards

If $s_i^A < s_i^P$ ($i = priv, pub$):

Following the proof of proposition 1, we deduce that:

- under public enforcement: $s_{pub}^* = Max(s_{pub}^P, \hat{s})$;
- under private enforcement: $s_{priv}^* = Max(s_{priv}^P, \hat{s})$.

Because $s_{priv}^P(x) > s_{pub}^A(x)$, we get that $s_{priv}^* > s_{pub}^*$.

If $s_{pub}^A(x) > s_{pub}^P(x)$:

Here, we cannot exclude the case where $s_{priv}^* < s_{pub}^*$. For instance, $s_{pub}^* = \hat{s}$ and $s_{priv}^* = s_{priv}^A(x) < \hat{s}$.

This case exists if:

- under public enforcement $W_{pub}^{A+P}(\hat{s}) = \frac{1}{f}(a^2(\hat{s}) - p^2(\hat{s}))\Delta > W_{pub}^{A+P}(s_{pub}^A) = 1 - \frac{1}{f}p^2(s_{pub}^A)\Delta$.

This could be the case if $p(s_{pub}^A)$ is high due to a low level of $s_{pub}^A(x)$.

- under private enforcement $W_{priv}^{A+P}(\hat{s}) = \frac{1}{f}(a^2(\hat{s}) - p^2(\hat{s}))\Delta < W_{priv}^{A+P}(s_{priv}^A) = 1 - \frac{1}{f}p^2(s_{priv}^A)\Delta$. This could be the case if $p(s_{priv}^A)$ is low enough due to a high level of $s_{priv}^A(x)$.

(ii) Comparison of expected welfare

We show here that there exist cases where $W_{pub}(s_{pub}^*) > W_{priv}(s_{priv}^*)$.

Let us consider the case where $s_{priv}^* = s_{priv}^P(x) > \hat{s} = s_{pub}^*$:

- under private enforcement we have:

$$W_{priv}^{A+P}(s_{priv}^*) = \left[1 - \frac{1}{f}p^2(s_{priv}^P)(x + \Delta)\right] - \left[1 - \frac{1}{f}a^2(s_{priv}^P)(x + \Delta)\right].$$

- under public enforcement we have:

$$W_{pub}^{A+P}(s_{pub}^*) = \left[1 - \frac{1}{f}p^2(\hat{s})x\right] - \left[1 - \frac{1}{f}a^2(\hat{s})x\right].$$

$$\text{Thus } W_{priv}^{A+P}(s_{priv}^*) - W_{pub}^{A+P}(s_{pub}^*) = \frac{1}{f} \left[a^2(s_{priv}^P) - p^2(s_{priv}^P) \right] (x + \Delta) - \frac{1}{f} \left[a^2(\hat{s}) - p^2(\hat{s}) \right] x.$$

Because $s_{priv}^P > \hat{s}$, we have $\left[a^2(s_{priv}^P) - p^2(s_{priv}^P) \right] < \left[a^2(\hat{s}) - p^2(\hat{s}) \right]$.

Thus, if $a(s)$ and $p(s)$ are close enough for $s = s_{priv}^P(x)$, the public enforcement leads to a higher welfare than the private enforcement.

■