The Distortive Effects of Antitrust Fines Based on Revenue

Vasiliki Bageri¹, Yannis Katsoulacos² and Giancarlo Spagnolo³

July 23, 2012

Abstract
In most jurisdictions antitrust fines are based on affected commerce rather than on collusive profits, and in some others caps on fines are introduced based on total firm sales rather than affected commerce. We uncover a number of distortions that these policies generate, propose simple models to characterize their comparative static properties, and quantify them with simulations based on market data. We conclude discussing the obvious need to depart from these distortive rules-of-thumbs that appear to have the potential to substantially reduce social welfare.

Keywords: Antitrust, Deterrence, Fines, Law Enforcement

JEL Codes: K21, L40

¹ Athens University of Economics and Business; ysk@hol.gr
² Athens University of Economics and Business; ysk@hol.gr
³ SITE-Stockholm School of Economics, Tor Vergata University and CEPR; giancarlo.spagnolo@hhs.se
1. Introduction

How should competition authorities set the fines and how they actually do it in practice is a highly debated issue among antitrust practitioners. In Europe, where fines are often set directly by the Competition Authorities (CAs), appeal courts have often slashed CAs’ decisions precisely on the ground of how they set the fines. An illuminating example is the UK Competition Appeal Tribunal decision in 2011 to substantially cut the fines set by the OFT for members of the construction recruitment cartel on the ground that the “wrong” measure of affected commerce was used.

One reason behind these debates is that antitrust regulations, CAs, but also courts where in charge, use rules-of-thumbs to set the fines that - although well established in the legal tradition and in sentencing guidelines, and possibly easy to apply - are very hard to justify and interpret in logical economic terms.

In contrast to what the voluminous literature on optimal fines suggests, starting with Becker’ seminal paper (1968), antitrust rules or the practice of CAs in most jurisdictions base fines on on affected commerce rather than on unlawful profits (or on the loss of consumer surplus). Sine it is hard to find a logical foundation why affected commerce should be the benchmark for setting fines, no wonder we get surreal conflicts like the one between the CAT and OFT mentioned above.

In addition, several jurisdictions impose caps to maximum fines, sometimes linked to firms’ total yearly turnover, some other times just “falling from heaven”.

In this paper we highlight a number of “distortions” that arise as a result of these policies towards antitrust violations, concentrating on the case of cartels.

A first and obvious distorting effect of fine caps (or fines) linked to total (worldwide) firm revenue is that specialized firms active mostly in their core market expect lower fines (when caps bind) than more diversified firms active in several other markets than the relevant one.

Since the many (other) distortive effects generated by fine caps have been widely discussed elsewhere, we will consider this distortion only briefly and focus on other two, somewhat less obvious distortions, that occur when the volume of affected commerce is used as a base to calculate antitrust fines:
If expected fines are not sufficient to deter the cartel, which seems to be the norm given the number of cartels that CAs continue to discover, fines based on revenue rather than on collusive profits push firms to increase cartel prices above the monopoly level to reduce the penalty, thus exacerbating the anticompetitive harm caused by the cartel.

- **Firms with low profit/revenue ratio**, for example firms at the end of a vertical production chain, *expect larger fines* relative to the same collusive profits *than firms that have a larger profits/revenues ratio*, for example because they are at the beginning of the production chain.

In this paper we propose simple models of cartel pricing and antitrust enforcement to characterize these distortions and their comparative static properties, we try to quantify their likely impact empirically using simple simulations based on market data, and discuss the obvious need to take action against them. Section 2 briefly discusses how fines should be set in antitrust and contrast that with current antitrust regulation and sentencing guidelines. Section 3 briefly discussed the first distortion mainly linked to price caps. Section 4 and 5, the core of the paper, analyze the other two distortions within a simple theoretical model and estimate their likely empirical relevance. Section 6 concludes discussing how to amend this unsatisfactory situation.

## 2. Background

*Optimal Monetary Fines in Antitrust*

One of the fundamental principles of the modern economic analysis of the public enforcement of law, based on the seminal paper of Becker (1968), is that penalties should be set in order to deter inefficient offences, that is, offences that create greater social welfare harm than the gain to the offender(s). When the crime always produces higher harm than benefits, as for cartels (assuming they don’t produce efficiencies), then maximizing deterrence net of enforcement cost becomes

---

4 Another early contribution is Stigler (1970). For a very good relatively recent extensive review see Polinsky and Shavell (2000).

5 This is the net social harm to “others”. See for example Landes (2003), p. 656.
optimal. Risk-aversion may reduce optimal fines, but risk-neutrality seems a natural assumption in the case of managers and firms and given this, enforcement errors by diluting deterrence imply higher optimal fines than in their absence\(^6\).

In the case of cartels, the benefits are discounted expected collusive profits from collusion and harm is to the loss of consumer surplus. Since harm and benefits are very correlated, they are both good proxies of what drives firm managers decisions, so that to obtain efficient deterrence fines could be based on either of them. Since the loss of consumer surplus is a bit harder to estimate, that basing fines on an estimate of collusive may be an optimal way to go.

This very simple logic is contradicted by the current fining policy adopted by most jurisdictions, which typically base fines on *affected commerce*, i.e. on *revenue* in the relevant market rather than collusive profits; and, they often imposes caps to maximum applicable fines in terms of percentage overall firm turnover.\(^7\)

**Real World Fining Policies: Leading Examples**

In the EU a violation of the cartel prohibition constitutes an administrative offence. In order to ensure transparency of this enforcement procedure the EC published in 2006 new guidelines refining the methodology which has been applied so far (since 1998). Under these penalty guidelines, fines are calculated in the following way: First, the Commission determines a basic amount which may be adjusted afterwards due to aggravating and mitigating elements. The basic amount is calculated by taking into account the undertaking’s *relevant turnover* (of the last year of the cartel), the gravity and the duration of the infringement, as well as an additional amount of between about 15% - 25% of the value of sales to achieve deterrence. For cartels the proportion of the relevant turnover is set “at the higher end of the scale”\(^8\) which is 30%. Additional uplifts or reductions are then made when certain aggravating or attenuating circumstances exist. However, the maximum amount of the fine imposed shall not exceed the cap of 10% of annual *worldwide turnover* of the undertaking in the preceding business year.

\(^6\) See for example Polinsky and Shavel (2000), p. 60-61. This analysis also suggests that we should not use costly imprisonment before having set fines maximal, in order to save on imprisonment costs – see for example, Buccirossi and Spagnolo (2007), p.10.

\(^7\) One reason why most public enforcers have maximum statutory limits is that they are interested in not jeopardizing the viability of the convicted firm in future. See Buccirossi and Spagnolo 2007 for a list of reason why this policy is flowed.

\(^8\) 2006 EU Guidelines
In the US cartels are prosecuted as criminal offences and sentences are imposed by a non-specialized court. The courts use the US Sentencing Guidelines (USSG) as a consulting tool regarding the appropriate form and severity of punishment for offenders. According to these guidelines both pecuniary and non-pecuniary penalties can be imposed: fines on firms and individuals and imprisonment of individuals involved in the cartel. As regards fines on firms, the process of their assessment begins with the calculation of a base fine. To determine the base fine a percentage of the volume of affected commerce, that is, of total sales from the relevant market, is taken into account. The USSG suggests that a 20% of the volume of affected commerce can be used as a good proxy. This volume of affected commerce covers the entire duration of the infringement. Once the amount of the base fine has been calculated, aggravating and mitigating elements are taken into consideration. However, the final fine for undertakings must not exceed a maximum statutory limit which is the greatest of 100 million USD or twice the gross pecuniary gains the violators derived from the cartel or twice the gross pecuniary loss caused to the victims.\(^9\)

When referring to caps on fines in international cartels the USSG will use the volume of US affected commerce unless the undertaking’s involvement in the infringement is substantially serious. In this case worldwide turnover will be considered.

Most other OECD countries follow the lead of the US and EU on one or both dimensions. For example, in the UK the starting point for calculating antitrust fines is a fraction of the relevant turnover, i.e. affected commerce; and the cap on the fines is set at 10% of the undertaking’s global turnover, exactly as in the EU.

3. Distortion 1: Fine Caps liked to Total Revenue

Our main objective in this paper is to examine some of the potential implications for social welfare and for the incidence of fines in different industries

---

\(^9\) The maximum level of fines against individuals is the greatest of 1 million USD or twice the gross pecuniary gains or twice the gross pecuniary loss caused to the victims, while a maximum imprisonment sentence can be up to 10 years.
(call them, for short, “distortions”) that result from the current fining policies in EU, US and most other jurisdictions that follow their lead. The first “distortion” is linked to fine caps rather than fines themselves, and will only be discussed briefly.

**Distortion 1:** If total firm turnover is used (either as a base for the fine or) for a cap of fines that is binding for at least some firms, those firms that are more diversified, acting on many other markets than the relevant one where the infringement occurs, expect higher fines than firms that have a narrow focus on their core business, i.e. for whom affected revenue in the relevant market is not very different from total revenue.

This somewhat obvious distortion – why for God’s sake should diversified firms active face higher fines than more narrowly focused firms? – could in principle induce firms that feels at risk of antitrust legal action, like technology leading dominant firms, to inefficiently under-diversify or split their business in separate legal entities to reduce their legal liability.  

This distortion is reminding of how firms react, inefficiently increasing leverage, when courts take into account their financial situation when establishing fines, the so called “Judgment Proof” problem (see e.g. Shavell 1986, Che and Spier 2008, and with reference to Antitrust, Buccirossi and Spagnolo 2007, 2008).

We don’t believe this is commonly happening, we do hope that antitrust liability concerns are still of secondary importance for the strategic decision of which markets to enter. Still, it is not clear that risking this distortion is necessary for an effective enforcement of competition policy.  

Moreover, the ratio of imposing pre-established caps on fines is by itself problematic. It is apparently justified by the need not to drive infringing firm bankrupt. High fines may lead to bankruptcy, the argument goes, which may be associated with a reduction of the number of active competitors in a market which, *ceteris paribus*, may be an undesirable outcome for competition (not if it increases

---

10 This distortion could in principle be prevented by adjusting probabilities of detection, increasing auditing efforts for industries where firms are less diversified. However, this would not be a solution as long as even firms within the same industry have different degrees of diversification.

11 There are many additional reasons why such caps are not a sound rule of thumb, some of which are discussed in Buccirossi and Spagnolo (2006, 2007, 2008).
asymmetry). However, as Buccirossi and Spagnolo (2007) stress this argument is suspect for a number of reasons:

First, in assessing the actual effect that bankruptcy in an industry due to high fines has on competition one needs to take into account the impact of the level of fines on so-called general deterrence, that is, its impact, through the ex ante deterrence of cartels in many other industries, on competition in these other industries, in addition to the one examined.

Second, if bankruptcy procedures are efficient they could lead in a relatively short period of time to the replacement of a “bankrupt” colluding firm, say firm A, by a “new” firm – the firm A under new ownership – which then gets a “fresh start” and which may well be less likely to engage in collusive practices, having less “established connections” with other firms.

Third, designing fining policy so as to avoid bankruptcies may well distort firms’ decisions re-their financial (debt-equity) structure. Specifically, it may induce cartel members to issue more debt reducing their ability to pay antitrust fines, thus adding a further distortion to the other social costs of collusion.

Allowing for the possibility of decision errors in enforcement provides the basis for another reason against the imposition of high fines. In the presence of decision errors, the assumption that fines are socially costless may be inappropriate to the extent that fines may deter firms from undertaking actions that are socially benign. For example, Katsoulacos and Ulph (2012) show that if a competition authority makes mistakes and firms face legal uncertainty in that they do not know the true nature of their actions (harmful or benign) nor the estimate of harm that the authority will reach if their action comes under investigation, then in certain cases the optimal fine should be low – indeed, it should be zero. However, it is hard to think that this result could be relevant to the case of “hard-core” cartels (continuing to assume that these cartels do not generate efficiencies).

Removing caps on fines would eliminate the above mentioned distortion and possibly increase deterrence. But if removing fine caps is not politically viable, then the cap should not be related to total firm turnover, as in the EU, but to firms’ collusive profits or to the consumer surplus loss they induce, as in the US.

---

12 Ibid., p. 10–12.
13 Though it can discriminate, which means that it condemns a “harmful” action with higher probability than it condemns a “benign” action.
4. Analysis of Distortion 2: Fines, Revenue and Cartel Pricing

The second distortion we want to discuss is not linked to caps, but to sentencing guidelines or analogous regulation suggesting that fines should be linked to affected commerce – i.e. total sales/revenue from the relevant market the year before the conviction or the detection. In summary:

**Distortion 2**: A fining rule proportional to affected commerce – i.e. to total revenue in the relevant market - distorts the price-setting incentives of the cartels that it does not deter, inducing them to optimally increase the cartel’s price above the monopoly level.

This effect tends to reduce social welfare relative to a monopolized situation with similar fines related to profits, or even relative to a situation with no fines, due to the distortive effects of the higher price and, in the case where the comparison is to a situation with no fines, the presence of antitrust enforcement costs.

Of course, it could be argued that the practical significance of this distortion is likely to be small because it requires managers of firms involved in cartels to be well informed and forward looking and formulate strategic decisions at a level that may not be easily met in reality.

However: (a) the escalation of fines as a percentage of revenues in recent years on both sides of the Atlantic as well as the much stronger public emphasis on effective detection and enforcement of antitrust law by competition authorities often backed by additional resources, makes it more likely that managers will be anticipating and incorporating into their decisions the potential impact of being investigated and found to be in breach of antitrust law; (b) as we will show below, if managers do adjust their behavior taking into account the likelihood that they may face a penalty for acting illegally, the “cost” of this in terms of the loss in consumers’ welfare may well be substantial.
**Formal Investigation of Distortion 2**

Assume a homogeneous product industry with constant marginal cost \( c \). In obvious notation, expected cartel profits are given by:

\[
\Pi(Q) = (1 - \beta)[R(Q) - cQ] - (\beta \varphi) R(Q) \tag{1}
\]

where \( \beta \) is the probability of successful enforcement (probability of detection multiplied by probability that the Competition Authority’s investigation leads to a ban) and \( \varphi \) is the fraction of revenue fined. The Competition Authority (CA) sets \( \varphi \) exogenously. We can re-write expected profits as:

\[
\Pi(Q) = [1 - \beta(1 + \varphi)] R(Q) - (1 - \beta)cQ
\]

The first order condition for maximum profit is:

\[
\pi_Q = [1 - \beta(1 + \varphi)] R'(Q^*) - (1 - \beta)c = 0 \tag{2}
\]

Or:

\[
R'(Q^*) \frac{c}{1 - \theta} = 0 \tag{3}
\]

where

\[
\theta = \frac{\beta \varphi}{1 - \beta}
\]

Thus, assuming \( R''(Q) < 0 \) - so there is declining marginal revenue – the second order condition for profit maximization is satisfied.

Note now that if the fine was on profits or firms ignored fines or if there were no fines, then the f.o.c. for profit maximization would be:

\[
R'(Q^*) - c = 0 \tag{4}
\]

So, given declining marginal revenue, comparing (3) to (4), we have that:

**Result 1:**

\( Q_d^* < Q^*_v \)

The fine based on revenues distorts output to a lower (“distorted”) level relative to the “undistorted” (monopoly) output that would emerge if the fine was on profits, or if firms ignored fines, or if there were no fines.

The result is illustrated in Fig. 1.
If fines don’t deter the cartel then anti-trust Authorities put fines functional of turnover, destroys welfare the higher are the costs relative to profits.

Further, from (3), we observe the following:

**Result 2:**

*The distortion on output generated by fines on revenue is increasing in the marginal cost (*)$, in the probability of successful enforcement (β) and in the percentage of revenue fined (φ).*

The comparative static result assumes the representative cartel to remain in place while parameters change. However, since higher $c$, $β$ and $φ$ imply higher expected fines relative to expected collusive profits, the deterrence effect of the policy is also typically increasing in these parameters, and if the cartel is deterred there will be no expected fine nor distortions.

We have therefore the following.
**Result 3:**

*For a representative cartel, the largest welfare loss linked to distortion is present at intermediate levels of c, β and φ, where the cartel is not yet deterred but the expected fine is a substantial fraction of revenues.*

Since the distortion is only present for cartels that are not deterred, our distortion can be thought of being - at least partly - self-correcting. An increase in the expected fine will have ambiguous effects in general, as on one hand it increases the size of the per-cartel distortion, on the other it reduces the number of operating cartels, i.e. of firms subject to the distortion.

The welfare effect is clear at the corners of course. Where enforcement is very poor, because the expected fine is very low, an increase in the expected fine will increase the distortion considerably while having little effects on deterrence. Where enforcement is almost perfect, an increase in the expected fine could lead to full deterrence and the distortion will disappear with cartels.

At intermediate levels of enforcement instead, the effect of an increase in the expected fine on welfare will depend on whether the increase in deterrence or the increase in per-cartel distortion will dominate.

It also is illuminating to re-write (3) in terms of the own-price elasticity of demand, that is as:

\[ p_o^* (1 - \varepsilon) - \frac{c}{1 - \theta} = 0 \]  

(5)

where \( \varepsilon \) is the inverse own price elasticity of demand. It follows from (5) that:

\[ \frac{p_o^*}{c} = \frac{1}{(1 - \varepsilon)(1 - \theta)} \]  

(6)

While, from (4):

\[ \frac{p_o^*}{c} = \frac{1}{1 - \varepsilon} \]  

(7)

Thus, we get:
Result 4:

Comparing (6) and (7), the cartel price overcharge with fines on revenues is higher than the normal monopoly overcharge that would emerge if the fine was on profits or firms ignored fines or if there were no fines, and

From (6), the cartel price overcharge with fines on revenue is decreasing in the elasticity of demand ($\varepsilon$) and is increasing in $\beta$ and $\varphi$. On the other hand:

From (6) and (7), the magnitude of the price distortion (the ratio of distorted to undistorted prices) due to fines on revenue is independent of the elasticity of demand and is increasing in the probability of successful enforcement ($\beta$) and in the percentage of revenue fined ($\varphi$).

Given (6), we note that demand elasticities will differ across sectors as well as across jurisdictions. So even assuming the same $\beta$ across sectors and jurisdictions (which is unrealistic) it is not easy to test empirically whether the price overcharge is been affected by fining policies that involve fines on revenues.

Nevertheless, if colluding firms do take into account in their decisions the likelihood that they will be fined, then what the above analysis suggests is that even if expected fines are small the incidence on consumers due to this fining policy in terms of the consumers’ surplus loss can be quite substantial\(^{14}\).

To see this, assume now that the duration of a cartel is normalized to unity and that $\delta$, $0 < \delta < 1$, is the fraction of time since the cartel was set up that it takes the authority to ban it. Then expected profit is going to be:

$$\Pi(Q) = (1 - \beta)[R(Q) - cQ] + \beta \delta[R(Q) - cQ] - (\beta \varphi \delta)R(Q)$$  \hspace{1cm} (8)

So, with

$$\eta = \frac{\beta \varphi \delta}{1 - \beta (1 - \delta)}$$

the f.o.c. for profit maximization becomes now:

$$R'(Q^*) - \frac{c}{1 - \eta} = 0$$  \hspace{1cm} (9)

\(^{14}\) We are grateful to David Ulph for pointing out and discussing with us this point.
Thus we get from (9):

**Result 5:**

*The distortion generated by a policy of fines based on revenue is larger the larger is the duration of the cartel – the time that lapses before the cartel is banned (δ).*

Note here that while the expected fine is

\[ F^e = (\beta q \delta) R(Q_d^e) \]  (10)

The loss in consumer surplus (CS) while the cartel lasts is given by:

\[ CS^{Loss} = [(1 - \beta) + \beta \delta] [CS(Q_d^e) - CS(Q_n^e)] \]  (11)

So we have:

**Result 6:**

*Even if φ (and so the expected fine) is very small the loss in consumer surplus from a policy of fines on revenue can be quite large.*

A question then naturally emerges: significant is this second distortion?

**Simple Empirically-driven Simulations**

Below we assume a linear inverse demand function, \( p(Q) = a - Q \), with \( a = 100 \) and examine the magnitude of the price distortion due to the policy of fines on revenues as well as the magnitude of the consumer surplus loss, for various values of the parameters \( \beta, \phi \) and \( \delta \). Tables 1 and 2 below show the results of this exercise. Table 1 shows the magnitude of the price distortion not taking into account parameter \( \delta \) – the duration of the cartel - while Table 2 shows the Consumer Surplus loss allowing the duration of the cartel to vary. The first row of Table 1 shows how the price distortion varies with the marginal cost for values of \( \beta = 0.4 \) and \( \phi = 0.3 \). The price distortion increases to a value of about 10% when \( c \) reaches the value of \( c = 60 \). For all other simulations we use a benchmark value of \( c = 30 \).
As shown in Table 1 for a value of $\phi = 0.3$ - the value usually applied at present by most jurisdictions, the price distortion will be close to 10% if $\beta = 0.5$. With $\beta = 0.4$, the price distortion is about 11.5% if $\phi = 0.5$.

<table>
<thead>
<tr>
<th>Table 1: Price Distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(P_d - P_u)/P_u$</td>
</tr>
<tr>
<td>C*</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>$(P_d - P_u)/P_u$</td>
</tr>
<tr>
<td>$\beta$**</td>
</tr>
<tr>
<td>0.1</td>
</tr>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>0.3</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>0.6</td>
</tr>
<tr>
<td>0.7</td>
</tr>
<tr>
<td>$(P_d - P_u)/P_u$</td>
</tr>
<tr>
<td>$\phi$***</td>
</tr>
<tr>
<td>0.1</td>
</tr>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>0.3</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.5</td>
</tr>
</tbody>
</table>

* $\alpha=100, \beta=0.4, \phi=0.3$
** $\alpha=100, c=30, \phi=0.3$
*** $\alpha=100, c=30, \beta=0.4$

Table 2 indicates the consumer surplus due to the distortion can be quite sizable. At the benchmark value of $\phi = 0.3$, the loss is 7.78% with $\beta = 0.4$ and $\delta = 0.7$. The loss with the same $\phi$ and $\beta$ values rises to 11.35% when there is a large delay in getting the cartel banned, i.e. $\delta = 1$.

<table>
<thead>
<tr>
<th>Table 2: Consumer Surplus Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>$CS_{Loss}/CS_u$</td>
</tr>
<tr>
<td>$\beta$*</td>
</tr>
<tr>
<td>0.1</td>
</tr>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>0.3</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>$CS_{Loss}/CS_u$</td>
</tr>
<tr>
<td>$\phi$**</td>
</tr>
<tr>
<td>0.1</td>
</tr>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>0.3</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>$CS_{Loss}/CS_u$</td>
</tr>
<tr>
<td>$\delta$***</td>
</tr>
<tr>
<td>0.1</td>
</tr>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>0.3</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.5</td>
</tr>
</tbody>
</table>

* $\alpha=100, c=30, \phi=0.3, \delta=0.7$
** $\alpha=100, c=30, \beta=0.4, \delta=0.7$
*** $\alpha=100, c=30, \beta=0.4, \phi=0.3$

5. Analysis of Distortion 3: Revenue and Profit Across Industries

The third distortion we mentioned was linked to the very different ration between profits or value added and revenue/turnover in different industries and for different firms when they are active in several industries. We can summarize it as follows:
**Distortion 3:** Firms forming cartels at the end of a long value chain, with a low profit/revenue ratio expect, *ceteris paribus*, larger fines relative to collusive profits than firms that are either at the beginning of the value chain or are vertically integrated that have a larger profit/revenues ratio.

The importance of this distortion depends on differences across markets and at different levels of the production chain. Let us first do a simple formal analysis of this problem. Then we will try to quantify the difference in the fines/profit ratio that fine caps in terms of revenues can generate, using real world data on revenues and profits for different firms in different sectors.

**Formal Analysis of Distortion 3**

Consider two industries, A and B, that differ in terms of their collusive profit to revenue ratios, \( \frac{\Pi_i}{R_i}, i = A, B \). Specifically, assume that:

\[
\frac{\Pi_A}{R_A} < \frac{\Pi_B}{R_B}
\]

(12)

So, A is the industry with the low profit to revenue ratio. Note that since \( \frac{\Pi_i}{R_i} = \frac{R_i - C_i}{R_i} \), where \( C \) is total cost, inequality (12) immediately implies that:

\[
\frac{C_A}{R_A} > \frac{C_B}{R_B}
\]

(13)

that is, A is the industry with the high cost to revenue ratio.

With a policy of fines on revenue, the expected fine in the two industries if the percentage of revenue fined is the same in both and equal to \( \varphi \), is:

\[
F_i = \varphi R_i, i = A, B
\]

(14).

Substituting from (14) onto (12) and rearranging yields that:

\[
\frac{F_A}{\Pi_A} > \frac{F_B}{\Pi_B}
\]

(15)

That is,

**Result 7:**

*Larger fines relative to collusive profits are imposed on industries with lower profit/revenue ratio (inequality (12)) or on industries with higher cost/revenue ratio (inequality (13)).*
On the other hand, Beckerian fines or fines as a fraction of profits, that do not distort price decisions, would lead to a fine/profit ratio that is equal for both industries.

This distortion implies that, for example, industries with high R&D (fixed) costs will, ceteris paribus, pay higher fines as a fraction of their profit than industries with low R&D costs! Also industries with large human capital rents that are paid as bonuses out of profits, as e.g. in consultancy, where these payments are not included in costs, pay, ceteris paribus, lower fines as a fraction of their profit.

*Simple Empirically-driven Simulations*

We collected some data on the profit/revenue ratio in different industries where a cartel has been discovered in recent decades to get an idea of how large this third distortion could be. This simple exercise revealed that the total revenue/profit can range:

- from the about 5.8 of Nippon Electric Glass (convicted by the EU Commission for the cartel of cathode ray tubes glass used in television),
- to the 12 of Exxon Mobile (convicted by the EU Commission for the cartel on paraffin waxes and slack wax),
- to the 91.7 of Unipetrol (convicted by the EU Commission for the cartel on synthetic rubber),
- and to the 117.4 of Panasonic (convicted by the EU Commission on household and commercial refrigeration compressors).

This simple exercise suggests that for the very same infringement and the same collusive profits obtained from it (benefits from the cartel) firms in one industry may face, ceteris paribus, fines **20 times larger** than counterparts in another industry, for no logical reason but the accident to be at the end of the value chain.
6. Concluding Remarks

Enforcement costs often justify the use of simple rules of thumbs that are easier to implement although they are not optimal. However, as we have seen, basing fines on a firms’ affected commerce rather than on collusive profits and basing fine caps on the firms’ total revenue rather than on that from the relevant market is likely to create large distortions.

Fine caps based on total revenue, as set by the EU Commission, when binding tend to generate much higher fines for more diversified firms, potentially inducing inefficient under-diversification as a mean to reduce legal exposure.

Fines based on affected commerce, as required by the US Sentencing Guidelines and the EU Commission, induce firms that are not deterred to price higher that they would if fines were based on profits or in the absence of antitrust enforcement, and even to price above monopoly price.

Moreover, fines based on affected commerce tend to generate much larger fines for firms that are at the end of the value chain, than for firms at the beginning of the value chain or that are vertically integrated.

Our empirically-based simulations suggest that the deadweight losses produced by these distortions can be very large, and that they may generate fines differing for over a factor of 20 for firms that should instead have the same fine.

It is worth noting that, in the US case, this rule of thumb does not produce any saving in enforcement costs, because both the cap on fines prescribed by the USSG require courts to calculate firms collusive profits anyway.

It is also worth noting that the distortions we identified are not substitutes, so that either one or the other is present. Instead, they are all present simultaneously and add to one another in terms of poor enforcement.

Developments in economics and econometrics make it possible to estimate illegal profits from an antitrust infringement with reasonable precision or confidence, as regularly done to assess damages. It is time to change these distortive rules-of-thumb that make revenue so central for calculating fines, if the only thing the distortions buy for us is saving the costs of data collection and illegal profits estimation.
References


