The Distortive Effects of Antitrust Fines Based on Revenue*

Vasiliki Bageri[†], Yannis Katsoulacos[‡] and Giancarlo Spagnolo[§]

April 2012

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Abstract

In contrast to what the voluminous literature on optimal fines, starting with Becker' seminal paper (1968) suggests, the fining policy of Competition Authorities in most jurisdictions continuous to set fines as a fraction of the revenues earned by those caught to be involved in anticompetitive conduct, imposing a cap to maximum fines typically on the basis of total firm revenue. A justification for the cap is that Competition Authorities are interested in deterring antitrust violations - e.g. cartels – but also ensuring that fines do not jeopardize the survival of firms. Moreover, since there is always a possibility of decision errors, the assumption that fines are costless can be rejected. Excessive fines potentially discourage benign actions by firms and, thus, reduce social welfare.

In this paper we analyze a number of "distortions" that arise as a result of current fining policies towards antitrust violations concentrating on the case of cartels. A first rather obvious distortive effect of a cap based on total firm revenue is that, when it binds, specialized firms active in the core relevant market expect a lower fine/profit ratio than diversified firms active in several other markets than the relevant one.

We focus here on two other, somewhat less obvious distortions that occur even if only the revenue from the relevant market affects the fines:

- If expected fines are not sufficient to deter the cartel, fines based on firm revenue would induce profit maximizing firms to reduce the penalty by increasing cartel prices even above the monopoly level, thus exacerbating the anticompetitive harm caused by the cartel.
- Firms at the end of the production chain, with low profit/revenue ratio expect – ceteris paribus – larger fines relative to collusive profits than firms that have a much larger profits/revenues ratio.

We propose simple models of cartel pricing and antitrust enforcement to characterize these distortions and their comparative static properties, try to quantify them and discuss the obvious need to adjust fining policy.

*We would like to thank the participants in the ACLE Conference, Amsterdam, Netherlands, April 20, 2012 in which the ideas of this paper have been presented. In particular we have benefitted from the comments of Jo Sedeslach and Maarten Pieter Schinkel.

[†]PhD candidate, Athens University of Economics and Business

[‡]Professor of Economics, Athens University of Economics and Business; ysk@hol.gr

[§]Professor of Economics, Stockholm School of Economics and CEPR.

1 Introduction

Background – Brief Literature Review

One of the fundamental principles of the modern economic analysis of the public enforcement of law, based on the seminal paper of Becker (1968)[1], is that penalties should be set in order to deter inefficient offences, that is, offences that create greater social welfare harm[2] than the gain to the offender(s). Assuming that the harm is h, the offender is risk neutral, the enforcement is costless and the probability that there is successful enforcement is β[3], then the optimal fine should be set equal to $f^* = \frac{h}{\beta}$ so that the expected fine $\beta \cdot f^*$ is just equal to the harm h. If the offence generates a benefit b to the offender, this fine will deter the offence if $\beta \cdot f^* > b$ or if $h > b$, that is, offences creating greater social welfare harm than the gain to the offender(s) – so-called inefficient offences – are deterred. Offences for which harm is smaller than the benefit to the offender(s) ($h < b$) are not deterred. In the case of cartels, the antitrust offence in which we are interested in this paper, assuming that they do not generate efficiencies (e.g. cost savings), the net social harm to others is the collusive profit (or aggregate overcharge) plus the deadweight welfare loss as a result of the reduction in output while the benefit is equal to the collusive profit. Thus, in the absence of any efficiency effects, the cartel's harm will always exceed the benefit to the offenders and so a fine set at f^* or even at $f^b = \frac{b}{\beta} < f^*$ will deter its formation[4].

The implication that immediately follows from the above analysis is that fines should be set sufficiently high so as to deter all possible cartels. Also, while one can achieve the desired level of deterrence by many combinations of β and f, since β depends on the enforcement expenditure of the government and authorities, if one accepts the conventional assumption that fines are socially costless, as they represent mere transfers of money, then it immediately follows that, to achieve the desired level of deterrence, fines should be set at their maximal level in order to save on enforcement costs. Further, while risk-aversion may reduce optimal fines, 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[5].

These prescriptions are however contradicted by the current fining policy adopted by most jurisdictions which recommend the imposition of caps to maximum applicable fines, in terms of percentage of affected commerce or of overall firm turnover. The first reason why most public enforcers have maximum statutory limits is that they are interested in not only deterring cartels but also ensuring that fines on infringing firms cannot jeopardize the viability of their future. High fines may lead to bankruptcy which is associated with a reduction of the number of active competitors in a market which, *ceteris paribus*, is an undesirable outcome for competition. However, as Buccirossi and Spangolo (2007) stress this argument is suspect for a number of reasons[6]:

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,

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

[2] This is the net social harm to "others". See for example Landes (2003), p. 656.

[3] That is, β is the probability of detection multiplied by the probability that the investigation of the offence leads to a ban.

[4] For an early extensive analysis of sanctions in antitrust see Landes (1983).

[5] 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, Buccirosi and Spagnolo (2007), p.10.

[6] Ibid. p. 10 – 12.

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[7] 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). In this case, though some practices that firms undertake may be "wrongly" verified and then wrongly assessed as constituting practices of "hard-core" cartels, for as long as we believe that *on average* these practices lower social welfare (as is usually assumed for "hard-core" cartels), so it is *on average* correct to treat these as actions that should be disallowed, the optimal fine should be set high enough to deter all of them.

So, according to the received theory, cartel fines should be proportional to the *profit* that firms get from acting anti-competitively. However, jurisdictions in practice relate fines to *turnover* – the usual excuse being that it is difficult to have access to accurate data on the size of collusive profits. The following brief review of the current fining policies against cartels in the EU and US should be enough to illustrate the significance of fine caps, in terms of percentage of affected commerce or of overall firm turnover, in these jurisdictions.

In the EU a violation of the cartel prohibition constitutes an administrative offence. Firms guilty of cartel conduct may thus be subject to administrative and not criminal sanctions while individuals are not prosecuted. Anti-cartel enforcement is done by the European Commission in cooperation with the National Competition Authorities. 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. In the EU recidivism, refusal of cooperation and obstructions of justice could lead to increases in the level of the fine, whereas limited participation in the cartel is the main factor for reducing it. As the basic fine may undergo some adjustments, EC will consider a further

[7] Though it can discriminate, which means that it condemns a "harmful" action with higher probability than it condemns a "benign" action.

[8] 2006 EU Guidelines

increase to meet the twin objectives of specific and general deterrence. 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. Moreover, according to the 2002 Leniency Notice the violators can be given full immunity if they are the first that self-report the illegal action or receive reduction if they cooperate with the enforcers. Finally, the EC may, in exceptional cases, reduce the fine if the undertaking is unable to pay without jeopardizing its economic viability.

In the US cartels are prosecuted as criminal offences and sentences are imposed by a non-specialized court which adjudicates in competition cases. The courts use the US Sentencing guidelines 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 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. In the US recidivism and refusal to comply with procedural obligations can be considered as the main factors for increasing the fine while effective cooperation and limited participation in the cartel are the main factors for reducing it. Of course, after the introduction of leniency programs a firm can even avoid fines by being the first to confess the illegal action. 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 cap 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.

Objective

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 (call them, for short, "distortions") that result from the current fining policies in EU and US jurisdictions towards cartels, specifically, from the fine caps in terms of percentages on turnover, which were described in the previous section.

The "distortions" that we have in mind are the following:

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

This somewhat obvious distortion – why should diversified firms active on multiple markets face higher fines than narrower firms – could in principle have firms react to incentives and under-diversify their business, as they react when their financial structure affects fines[10] (see e.g.

[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.

[10] This distortion can be prevented by adjusting probabilities of detection, increasing auditing efforts for industries where firms are less diversified. However this is quite difficult since even firms within the same industry have different degrees of diversification.

Che and Spier 2008). We don't believe this is happening, antitrust fines concerns are by luck of secondary importance in terms of the strategic decision of which markets to enter, but still it is not clear that this distortion is necessary for an effective enforcement of competition policy[11].

In the following we would like to concentrate on two other "distortions".

Distortion 2: If expected fines are not sufficient to deter a cartel, a fining rule based on revenue distorts the price-setting incentives of the cartel and further increases the cartel's optimal price above the monopoly level, reducing welfare relative to a monopolized situation with fines on profits or relative to a situation with no fines, due to the distortive effects of the higher price and also due to, in the case where the comparison is to a situation with no fines, the presence of antitrust enforcement costs. It certainly seems undesirable if competition authorities' actual penalty-setting procedures lower social welfare, when the stated objective of the enforcement procedures towards antitrust offences is to improve welfare relative to a laissez-faire outcome.

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.

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.

In the next sections we set up simple models to describe Distortions 2 and 3 and we then simulate their significance. For Distortion 3 we 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 in different sectors. We also discuss the need to revise the current fining policies consisting of such poorly conceived legal rules of thumb.

2 Analysis of Distortion 2: Fines, Revenue and Cartel Pricing

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

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

where β is the probability of successful enforcement (probability of detection multiplied by probability that the Competition Authority's investigation leads to a ban) and φ is the fraction

[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, 2008).

of revenue fined. The Competition Authority (CA) sets φ exogenously. We can re-write expected profits as:

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

The first order condition for maximum profit is:

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

Or:

$$R'(Q_d^*) - \frac{c}{1 - \theta} = 0 \tag{3}$$

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:

$$R'(Q_u^*) - c = 0 \tag{4}$$

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

Result 1:
$Q_d^* < Q_u^*$

The fine 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 firms ignored fines or if there were no fines.

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

Result 2:

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

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

$$p_d^*(1 - \varepsilon) - \frac{c}{1 - \theta} = 0 \tag{5}$$

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

$$\frac{p_d^*}{c} = \frac{1}{(1 - \varepsilon)(1 - \theta)} \tag{6}$$

While, from (4):

$$\frac{p_u^*}{c} = \frac{1}{(1-\varepsilon)} \tag{7}$$

Thus, we get:

Result 3:

(a) 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

(b) From (6), the cartel price overcharge with fines on revenue is decreasing in the elasticity of demand (ε) and is increasing in β and φ. On the other hand:

(c) 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 (β) and in the percentage of revenue fined (φ).

Given (6), we note that demand elasticities will differ across sectors as well as across jurisdictions. So even assuming the same β 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 the expected fine (in terms of the size of parameter φ) is small the incidence on consumers due to this fining policy in terms of the consumers' surplus loss can be quite substantial[12].

To see this, assume now that the duration of a cartel is normalised to unity and that δ, $0 < \delta \leq 1$, 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:

$$\prod(Q) = (1-\beta)[R(Q) - cQ] + \beta\delta[R(Q) - cQ] - (\beta\varphi\delta)R(Q) \tag{8}$$

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

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

$$R'(Q_d^*) - \frac{c}{1-\eta} = 0 \tag{9}$$

Thus we get from (9):

Result 4:

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

[12] We are grateful to David Ulph for pointing out and discussing with us this point.

$$F^e = (\beta\varphi\delta)R(Q_d^*) \tag{10}$$

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

$$CS^{Loss} = [(1-\beta) + \beta\delta][CS(Q_d^*) - CS(Q_u^*)] \tag{11}$$

So we have:

Result 5:

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.

How significant is the distortion? Some simple simulation results

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 β, φ and δ. 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 δ – 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 $\varphi = 0,3$. 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 $\varphi = 0,3$ - 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 $\varphi = 0,5$.

Table 1: Price Distortion

$(P_d - P_u)/P_u$	4,17%	5,77%	7,14%	8,33%	9,38%		
c^*	20	30	40	50	60		
$(P_d - P_u)/P_u$	0,80%	1,87%	3,40%	5,77%	9,89%	18,88%	53,85%
β^{**}	0,1	0,2	0,3	0,4	0,5	0,6	0,7
$(P_d - P_u)/P_u$	1,65%	3,55%	5,77%	8,39%	11,54%		
φ^{***}	0,1	0,2	0,3	0,4	0,5		

*α=100, β=0,4, φ=0,3
** α=100, c=30, φ=0,3
*** α=100, c=30, β=0,4

As Table 2 indicates the consumer surplus loss due to the distortion can be quite sizable. At the benchmark value of $\varphi = 0,3$, the loss is 7,78% with $\beta = 0,4$ and $\delta = 0,7$. The loss with the same φ and β values rises to 11,35% when there is a large delay in getting the cartel banned, i.e. $\delta = 1$.

Table 2: Consumer Surplus Loss										
CS^{Loss}/CS_u	-1,83%	-3,73%	-5,71%	-7,78%	-9,96%	-12,26%	-14,72%			
β^*	0,1	0,2	0,3	0,4	0,5	0,6	0,7			
CS^{Loss}/CS_u	-2,46%	-5,05%	-7,78%	-10,66%	-13,69%					
φ^{**}	0,1	0,2	0,3	0,4	0,5					
CS^{Loss}/CS_u	-1,04%	-2,12%	-3,21%	-4,33%	-5,46%	-6,61%	-7,78%	-8,96%	-10,15%	-11,35%
δ^{***}	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1

*α=100, c=30, φ=0,3, δ=0,7
** α=100, c=30, β=0,4, δ=0,7
*** α=100, c=30, β=0,4, φ=0,3

3 Analysis of Distortion 3

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

$$(\prod_A / R_A) < (\prod_B / R_B) \tag{12}$$

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

$$(C_A/R_A) > (C_B/R_B) \tag{13}$$

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 φ, is:

$$F_i = \varphi R_i, i = A, B \tag{14}$$

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

$$(F_A/\prod_A) > (F_B/\prod_B) \tag{15}$$

That is, 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.

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 the total revenue/profit can range from the about 5.7 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 the 117.4 of Panasonic (convicted by the EU Commission on household and commercial refrigeration compressors).

This 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.

4 Discussion and Conclusions

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 revenue and basing fine caps on the firms' total revenue is likely to create large distortions in the fining policy – or, deviations of first order relevance from optimal fines. Fine caps based on total revenue tend to generate higher fines for more diversified firms. Fines based on revenue may induce firms that are not deterred to price higher than they would if fines were based on profits or in the absence of antitrust enforcement, even above monopoly price. Moreover, fines based on revenue 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. Note that these three distorsions we have discussed are not substitutes, they are likely to be 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. It is perhaps time to change the rule of thumb that makes revenue so central for calculating fines, if the only thing the distortions linked to this rule buys for us is saving the costs of data collection and illegal profits estimation.

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