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Cartel behavior and efficient sanctioning by criminal sentences

by

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Abstract

Hardcore cartels that make agreements on quantities, prices, or areas, risk receiving both administrative fines from the cartel authority and civil law claims for damages. In addition to these risks, there is a recurring legal policy discussion that cartelist should also face criminal law consequences, such as fines and imprisonment with or without probation. In Germany, for example, companies may be found guilty of an administrative offence or have to answer for damages they cause. The cartel authority may fine employees who contribute significantly to the establishment and enforcement of the cartel within a company. As well, such as in the case of a tendering cartel, individuals may face prosecution.

According to Becker's theory of crime, penalties must be at least as high as expected benefits to deter crimes. For example, we start by multiplying cartel infringement by the reciprocal of the probability of detection and punishment. When we factor in expected reductions due to leniency and settlements, it's easy to see there must be an increase in penalties for them be effective. From the company perspective, there is a substitutive relationship between administrative penalties and compensation payments under private law. Criminal penalties such as fines or imprisonment have a negative impact on an employees' concept of personal benefits. In theory, deterrence to participate in cartel activities must be based both on the incentives of firms as a whole, and on the individual participants' perspectives.

Sanctions by the Bundeskartellamt in the last decade provide information on the profits made from cartel offences despite current restrictions, and take into account cartel surcharges discussed in the literature. By applying the empirically determined probabilities of punishment, we can calculate the minimum level of fines required to deter cartel infringement ex-post for each case, and compare the figures to the actual penalties. In many cases, the calculated minimum penalties would result in a considerable increase in fines, which would have to be covered either by compensation payments, or criminal sanctions. If custodial sentences were based on the probability of zero compensation payments, and the monetary loss of benefit, the result would sometimes equal an impractically long criminal sentence. Sensitivity analyzes that use alternative values for the probability of punishment usually still result in long prison sentences.

In light of these estimates, the practicality of achieving a sufficient degree of deterrence through criminal sanctions is highly questionable. From a legal policy perspective, it would be more effective to raise administrative sanctions to a sufficient level, especially against individuals, if compensation payments cannot be increased substitutionally.

JEL-Classification: L41, K14, K21

Keywords: hard-core-cartels, deterrence, criminal penalty

Introduction

In Germany, companies that violate cartel law can be fined for an administrative offence or have to accept civil liability for damages. Company employees who made a significant contribution to the establishment and enforcement of a cartel within a company run the risk of individual fines from the cartel authority, or of being prosecuted in the case of a tendering cartel. From a legal policy point of view, there is a recurring discussion that hardcore cartelists who have made agreements on quantities, prices, or regions, should face the risk of criminal law consequences, such as fines, or imprisonment with or without probation. These criminal penalties would be in addition to personal and company administrative fines and civil damages (OECD, 2003; Monopolies Commission, 2015; Wagner-von Papp, 2016; and very supportive Wirz, 2016).

Proponents of such penalties stress the responsibility of individuals in their arguments. Ultimately, they say, it is individuals, not the organization or company, that agree to hardcore cartels. In some cases, middle management or sales staff violate antitrust laws without upper management awareness. When violators are not individually sanctioned, the legal consequences of hardcore cartels do not sufficiently deter individuals from continuing their behaviors. In these cases, criminal sanctions would be particularly dissuasive against committing violations because of enormous personal negative consequences.

In its Special Report 2015, the Monopolies Commission proposed concrete verbiage to make general criminal sanctions for hardcore cartels legally binding. The Conference of Interior Ministers of the Länder has not yet adopted the proposals. Hombrecher (2017), who prepared the opinion for this commission, sees general criminal liability (Beaton-Wells, 2007, and Stephan, 2016), but points to the many practical problems of implementing such criminalization. Among other things, special knowledge for such problems lies within the cartel authority, not within the decentralized public prosecutor's office. There are demarcation problems between the authority of criminal prosecutors and the cartel office. The cartel law leniency program would need to be reflected in criminal law to be enforceable.

The criminal prosecution of all hardcore cartels, not just state tenders, is possible in some countries. Ireland (Massey, 2004, and Gorecki, 2008), France (Viros, 2016), Great Britain (Wagner-von Papp, 2016) and the USA (Kovacic, 2016) have a long tradition of white color criminalization in this regard. In Germany, there are only a few cases of bid-ridding, and those are not well known due to decentralized and non-public prosecution, as well the fact that the Bundeskartellamt regularly imposes individual administrative fines (Wagner-von Papp, 2016; Zimmer, 2016). Although criminal law sanctions can have a considerable deterrent effect, a number of implementation problems often

arise. For example, proof of fraud and involvement in the offence can be difficult to prove. Often, only fines or suspended prison sentences are imposed. The actual imprisonment often fails because the offender is a first-time offender, or because the imposed short prison sentence can or must be relegated to probation.

Fines imposed on company employees become ineffective if the companies indemnifies employees through ex-ante higher wages, payment of premiums for insurance policies that provide the necessary coverage, or through ex-post direct compensation for imposed penalties (Wirtz, 2016, 105-6). Wirtz points out that companies cannot compensate for a prison sentence, and therefore the penalty would have a greater effect on maintaining deterrence.

General principles of proportionality also apply to the determination of the penalty. From an economic perspective, the severity of the offence, as well as the probability of punishment, must be taken into account (Ginter, 1999). The severity of a capital offence is valued as a more severe crime in society than are cartel agreements to the detriment of competition. To this extent, criminal sanctions for hardcore cartels must be integrated into the punishment cascade of other offences, both for capital crimes and other white collar offences such as fraud and embezzlement.

In addition to administrative fines, compensation payments, and criminal sanctions, misconduct can also be sanctioned at an individual level by prohibiting cartel members from returning to professional positions that could form the basis for a new cartel offence, at least for a certain period of time (UKs Company Directors Disqualification Act; Stephan, 2011). Such a measure would prevent future high-income opportunities, a threat that could significantly deter hardcore cartel members.

It is often argued that an appropriate, sufficiently deterrent level of administrative sanctions are neither feasible nor desirable. Craycraft et al (1997) investigated whether companies were economically overburdened by the cartel fine imposed on them. Of the hardcore cartels sanctioned in the USA between 1955 and 1993, 262 cases were assessed on the basis of published flow and stock figures on solvency. Each of the companies was able to pay their fines solely through their cash flow, and by refraining from short-term investments. There were no hardship cases for creditors or threatened bankruptcies. If the optimal (i.e. sufficiently deterrent) fines had been imposed, between 18 and 43 percent of all companies would have been insolvent, depending on the flows and stock figures used. It is often argued that the desire to avoid side effects would not lead to the imposition of sufficient administrative penalties. As well, there would be undesirable side effects in terms of tax revenues for both creditors and suppliers, and job loss for redundant employees.

Economically, these arguments are not convincing. First, active suppliers and creditors will take into account financial risks and insure themselves, or charge risk premiums. Second, companies equally

face economic distress and job endangerment due to mistakes by company management beyond antitrust violations, and without legal prevention. Third, and most importantly, firms that only become illiquid through participation in a cartel can be continued by other players. Jobs are not necessarily lost, and tax payments are still expected. Fourth, redundant workers can switch to other employers if they are suitably qualified and if the labor market is in good shape. Despite the economic counterarguments, it is assumed that the side effect of bankruptcy as a result of cartel fines is so strong that the cartel authorities and legislators set upper limits for fines in case of bankruptcy.

Sokol (2012) used the Internet to survey 234 antitrust lawyers out of the 1203 existing American practitioners working in the field. Their survey included 51 lawyers who considered themselves "elite." The survey centered on whether the simple Becker model with penalties, punishment, and detection probabilities was sufficient to explain the motives and conditions for entering into cartels. It also included asking about reasons that go beyond Becker, such as ignorance of the illegality of cartels, the role of compliance programs in companies, and internal or individual incentives for cartels. Internal or individual incentives for cartels would be due to the insufficiency of the company to detect individual misconduct, or if employees were forced to enter into cartel agreements without informing company management about it. In this context, Fisse (2019) discusses the difficulties of separating corporate behavior from individual misconduct and how the problem insufficiently effects Australian competition law.

In experiments involving 180 students, Chowdbury and Wandschneider (2013) investigated the extent to which there is actually a choice between a higher probability of detection or punishment, and a higher monetary penalty in the sense of Becker (1968), to ensure the same deterrent threats against potential cartel members. In the multi-stage decision-making process, students first decided whether they would participate in a cartel on the basis of market results with an oligopolistic market structure. Then they had the opportunity to disclose their cartel behavior through a leniency program. The results suggest that fines could be increased without a loss of deterrent effect, at the expense of the probability of detection or punishment, in order to save enforcement costs.

Wils (2009) compared the effects of prosecuting cartel violations through administrative fines with the enforcement of private claims for damages by cartel victims. He sees the administrative fine as a clear advantage in deterring cartels, since the enforcing competition authority has more expertise, sophisticated investigative powers, and basic enforcement of competition law. Private actors fall significantly behind in all three of these areas. Private enforcement should focus on compensating injured parties, and a higher deterrent effect should be ensured by higher administrative fines where appropriate.

The following studies are relevant for the empirical evaluation of substitution relationships between administrative fines, civil damages, and criminal sanctions, particularly custodial sentences.

- Combe and Monnier (2011) examined whether fines imposed by the European Commission between 1979 and 2009 were effective enough to ensure sufficient deterrence. They analyzed 64 cases where sufficient information on cartel profits and periods of time were available. They assumed excessive prices were charged even in the absence of a cartel, as the reference price was not the usual marginal cost price. They used the cartel surcharge of 20 percent for national cartels, and 30 percent for international cartels; figures often used in the literature. They assumed a 100 percent cartel conviction at best, and 15 percent conviction at worst. They found that fines imposed are usually too low to ensure sufficient deterrence.

- Connor and Lande (2012/2019) have been studying American hardcore cartels since 1990. To find if there is sufficient deterrence against cartel participation, they take into account administrative fines imposed on companies by antitrust authorities, possible compensation payments under private law, and imposed criminal sanctions—particularly prison sentences. Their work is not based on hardly calculable ex-ante expected penalty costs, but rather on the retroactive question of whether it would have been reasonable from the point of view of the companies or individuals to form a cartel. Instead of looking at the profit made from the cartel, they calculated social damage with a probability of 25 to 30 percent for discovery, 80 percent for conviction, and an assumed monetary loss of benefit of $6 million per prison year. In almost all of the 75 cases investigated, administrative fines were far too low and would have to be more than five times higher to be effective. There was only one case where the penalty was higher than the required level, and two other cases where it was close to the required level.

- Allain et al. (2015) developed a dynamic cartel model and test for the second half of the 2000s. They looked into 121 companies and whether fines imposed by the EU Commission would have been sufficient, or would have created at least an ex-post sufficiently deterrent effect. In dynamic game theory modelling, potential cartel members decided not only whether they initially wanted to participate in a cartel, but also whether they would want to remain in the cartel in subsequent periods. In this scenario, they and their competitors could decide to leave the cartel. The incentive to leave was reinforced by a leniency program, although the program also reduced the general penalty costs in the event of cartel participation. According to their model, independent investigations by the cartel authorities could uncover and punish a cartel. In addition, they assumed that in the event of a unilateral deviation from the cartel, all companies would no longer cooperate (trigger strategy), and future earnings would lose value in line with a discount rate. The authors usually came up with significantly more cases than Combe and Monnier (2011), in which the corporate fines imposed were sufficiently deterrent. Their results depended on assuming

probability of detection or punishment, the price surcharges possible in incomplete competition without a cartel, and the alternative level of cartel surcharges.

The available empirical studies in the USA and European Union indicate that the deterrent effect of administrative cartel fines is too low. They also show how minimum fines can be calculated in monetary units that would deter cartel members, based on assumptions of detection and punishment probabilities with an orientation toward the usual cartel profit surcharges. Since it is hardly feasible to capture the ex-ante decision situation, we can only examine ex-post decisions. We can ask the question, if decision-makers had known the actual sizes would they have refrained from the cartel?

The following paper first describes the institutional and legal framework which administratively punishes hardcore cartels under German civil law and criminal law (Point 2). Next, Gary Becker's (1968) approach to the rational behavior of a criminal is applied as a theoretical analysis of the general conditions required for a deterrent effect to exist.

These conditions differ in the following ways: whether administrative fines against companies and company employees are regarded, if leniency and settlement bonuses are allowed, if compensation payments for cartel victims are considered, or if criminal fines and prison sentences with or without probation are considered enforceable. If legal consequences of the punished cartel affect companies, modeling with expected values is advisable. If the legal consequences affect individuals, the expected utility theory with the possibility of risk-averse behavior is more effective.

The third chapter presents the entire spectrum of theoretically possible sufficient deterrent sanctions. Point 4 reviews published hardcore cartel cases decided on by the Bundeskartellamt in the past decade. The usual assumptions of American and European studies are applied to calculate minimum custodial sentences to fill in deterrent gaps from administrative penalties. For Germany, such a calculation is only possible if one assumes the antitrust authority, in its assessment of fines, is strongly oriented toward additional profit gained from cartel behavior. The fifth and final chapter draws a preliminary conclusion as to whether the criminalization of cartel behavior should be comprehensive.

2 Institutional Background in Germany

Typical horizontal hardcore cartels (agreements on prices, quantities, or regions) in Germany may be sanctioned in three different ways: the Federal Cartel Office (Bundeskartellamt, BKartA) can impose fines, the injured parties can sue for damages in civil court, or individuals may be criminally prosecuted. BKartA's administrative measures may aim at terminating an infringement, ordering the

repayment of excessive revenues (Article 101 or 102 of the Treaty on the Functioning of the European Union [TFEU] and Sections 32 and 34 of the Competition Act [GWB]), or imposing an administrative penalty under the Administrative Offences Act (OWiG Section 81 GWB).

Cartelist may commit administrative offences intentionally or negligently, resulting in a punishment of monetary sanctions. The fine may not be less than five euros (Article 17 (1) OWiG) and not more than one thousand euros, unless the law provides otherwise; however, fines of up to one million euros may be imposed on individuals (Section 81 (4) sentence 1 GWB). If companies are punished, fines of more than one million euros may be imposed on up to ten percent of the company's total turnover in the financial year preceding the authority's decision (Section 81 (4) sentence 2 GWB). In the case of negligent conduct, the maximum fine may not exceed half of the maximum fine of ten percent, or five percent of the total turnover (Section 17 (2) OWiG).

OWiG guidelines of the BKartA (2013) explain Section 81 (4) sentence 6 GWB and Section 17 (3). According to these rules, fines are relevant depending on the severity of the infringement and its duration, the size of the enterprise measured by size classes and flexible factors, as well as possible negative consequences for other groups. In particular, rules are structured to avoid bankruptcy to protect employees. Ten percent of the total turnover is set as an upper limit, as the profit potential resulting from agreements as well as the economic damage caused is taken into account (principle of proportionality, guidelines of the BKartA 2013). According to the Leniency Guidelines (BKartA, 2006), the cartel member who first discloses the existence of a cartel generally receives a 100 percent reduction or "bonus" of the fine. Other cartel members can receive a 50 percent bonus if they make a significant contribution to the enforcement of the cartel prosecution and are fully cooperative. To receive leniency, members must fully disclose all relevant materials, and must not have been a leader or have forced others to participate in the cartel. If the BKartA and the cartel member agree on a negotiated solution or settlement, the cartel fine can be reduced by up to 10 percent of the fine including the leniency notice (BKartA, 2016). A settlement can save time and costs, as well as avoid a negative reputation for the company.

Cartelists must compensate all injured parties for damages resulting from hardcore cartels as codified in Section 33 a (2) GWB (Section 33 (1) and (2) GWB). Violations of Article 101 (TFEU), in particular infringements established by a competition authority (Section 33b GWB), provide for full liability for damages caused either intentionally or by negligence. The injured parties are not entitled to compensation if they were subsequently able to increase prices for customers (pass on, § 33c GWB). Due to many unclear legal terms and major problems in measuring the counterfactual competitive price (e.g. Inderst/Thomas, 2016), claims for damages are very difficult to enforce.

In Germany, criminal sanctions are only possible in the case of fraud (§ 263 StGB) and in the case of tender agreements (submission agreements; § 298 StGB), i.e. cartel agreements at the expense of the public sector. Submission agreements are punishable with up to five years of imprisonment (§ 298 (1) StGB). German criminal law prefers fines and probation, but penalties still have a very negative impact on the reputation of the convicted person, affecting personal friendships, professional opportunities, and in relation to society as a whole, as opposed to Bundeskartellamt. This is especially true if criminal penalties are entered in the central criminal register (see Monopolies Commission 2014, Notes 156-158). In addition, highly negative consequences of cartel violations can occur if criminally sanctioned executives are additionally punished with disqualification orders, i.e. excluded from engaging in all comparable commercial professions for several years (Stephan, 2011).

3 Deterrence effects

Based on the economic theory of crime (Becker, 1968), sanctions in the case of hardcore cartels must be different to create practical and effective deterrents. Consequences include: cartel authority administrative fines on companies or employees, financial payment for civil damages to other companies or private households that have suffered, or individual prison sentences with or without probation. The probability of punishment varies greatly in each case. Authorities or public prosecutors must conduct investigations and enforce the interests of injured parties. Associated procedural issues, such as leniency programs or settlements, also differ considerably.

According to Becker (1968) a rational, risk-neutral company will only participate in a cartel agreement, if the expected fine is less than the expected cartel profit. The variable f_a, which is to be imposed with a probability of τ_a, comes into consideration as sanction. With a counter probability of $(1-\tau_a)$, the cartel authority does not impose a sanction and the cartel profit π is collected (Figure 1).
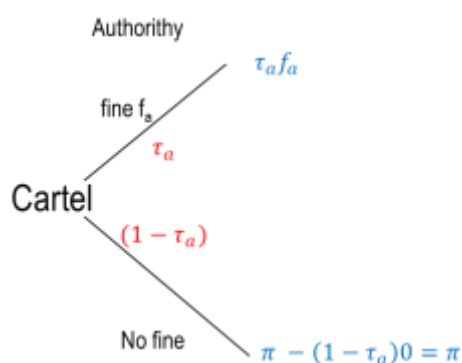

Figure 1: Pay-offs and probabilities in case of administrative fines – Simple case

Consequently, no cartel offence would be committed if the firm expected ex-ante that:

$$\tau_a f_a \geq \pi. \tag{1}$$

Rearranging the equation shows the necessary penalty level to sufficiently deter cartel behavior:

$$f_a \geq \frac{\pi}{\tau_a} \tag{1a}$$

To be effective, the fine must be at least high enough to exceed the amount of achievable profit from the cartel behavior, multiplied by the reciprocal value of the punishment probability.

Following Cooter and Ulen (2016, 463-467), the seriousness of a cartel infringement (x) can be measured on the abscissa from the amount of the targeted cartel profit (Figure 2). In the case of two cartel participants, who share the cartel profit equally, the original straight line with a 22.5-degree angle transforms the possible profits of the considered rational cartel participant to the ordinate ($\pi(x)$). The punishment function of the cartel authority $f_a(x)$ could, for example, increase quadratically with the severity of the cartel offence (x) and be greater than zero, even in the case of an unrealized profit. The punishment function must be above the 22.5-degree line to sufficiently deter cartels ex-ante. If one realistically assumes an uncertain penalty, the penalty function (f(x)) multiplied by the penalty probability function ($\tau_a(x)$) must lie above the 22.5 degree line for each level of (x) to effectively deter cartel behavior.
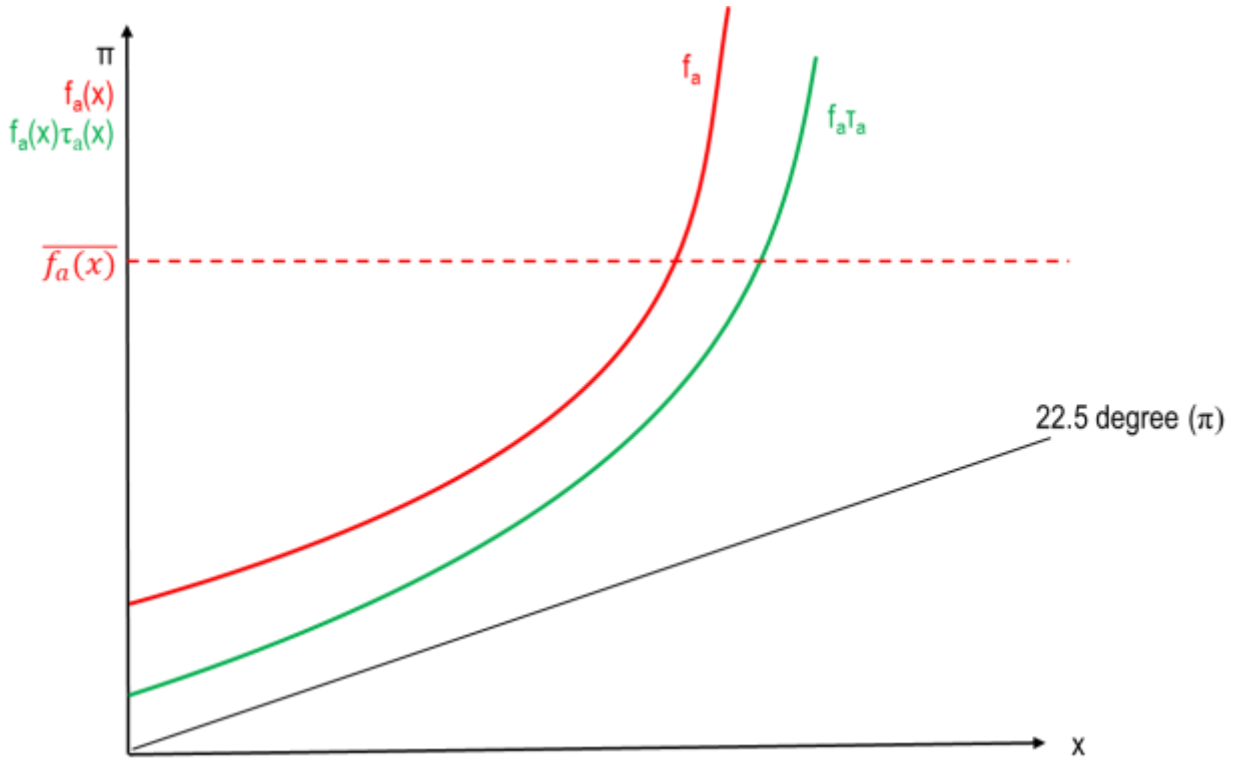

Figure 2: Deterrence of cartel behavior

Fine enforcement is limited to prevent a carteling company from going bankrupt. The aim is to protect shareholders such as suppliers, customers, and, above all, employees from dismissal. In Figure 2, $\overline{f_a(x)}$ shows the maximum fine. Above this value, the expected punishment function no longer exists. In contrast to Figure 2, it is now feasible that the fines are no longer a sufficient deterrent.

As Chapter 2 showed, in the event of detection, it is not simple for the competition authority to only impose a fine. There may be leniency and settlements that terminate cartel proceedings through mutual agreements. Supposing a one-time decision to participate in the cartel, each cartel member can act as a leniency witness, which is likely to happen at τ_{al}. Other cartel members may act as leniency witnesses, or the cartel authority may discover the cartel through its own initiative. In these cases, both variants are likely to occur together τ_{ao}. Settlements are likely to occur at τ_{als} if the leniency program applies or τ_{aos} without leniency. The respective counter-probabilities are $(1 - \tau_{als})$ or $(1 - \tau_{aos})$. If the leniency program goes into effect, the first cartelist receives full immunity from fines, Γ=1, and the second cartelist can only expect a 50 percent bonus (Γ=0.5). Settlements can reduce the fine by 10 percent (E=0.1). In the case of a full remission of the fine by the leniency program, no further reduction of the fine is provided for (E=0).
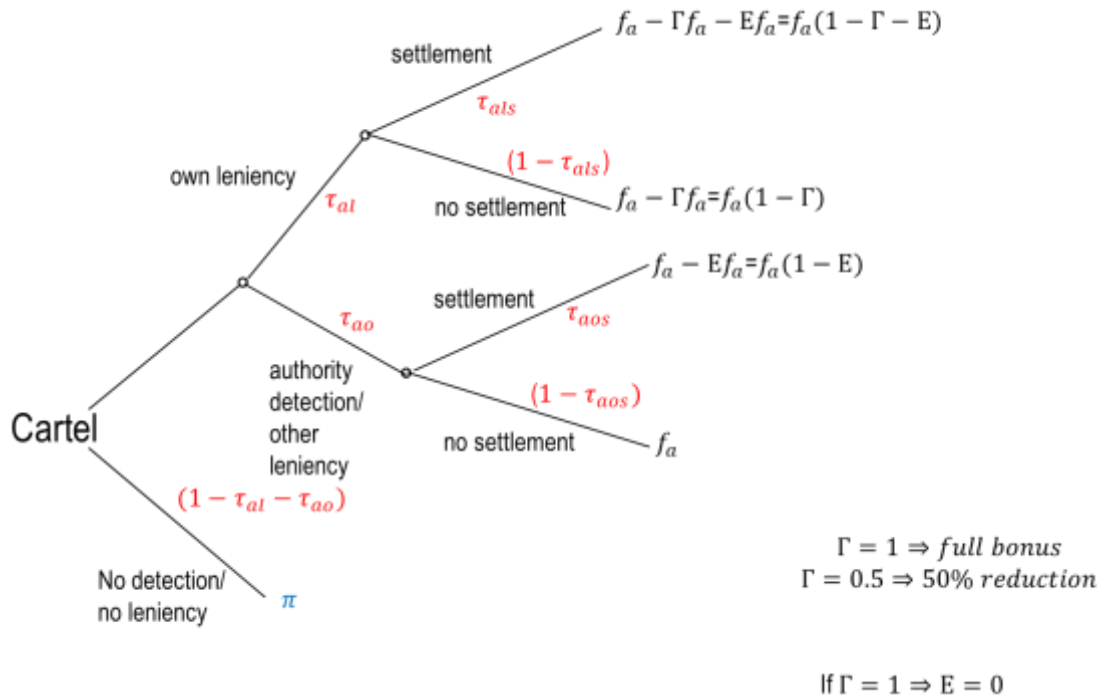

Figure 3: Pay-offs and probabilities in cases of administrative fines with leniency and settlement

The respective probabilities and possible penalties result in the expected penalty, which must be at least as high ex-ante as the profit from the cartel offence for a cartelist to be deterred from entering into the agreement:

$$\tau_{al}\tau_{als}f_a(1-\Gamma-E) + \tau_{al}(1-\tau_{als})f_a(1-\Gamma) + \tau_{a0}\tau_{aos}f_a(1-E) + \tau_{ao}(1-\tau_{aos})f_a \geq (1-\tau_{al}-\tau_{ao})\pi. \qquad (2)^{[1]}$$

In addition to administrative fines, there may be civil law claims for damages (f_p) by cartel victims. Legally, only claims for compensation as a result of administrative penalties (follow on) are likely to be considered.

Figure 4 shows the probability of civil damages being paid, which can be described as τ_p.
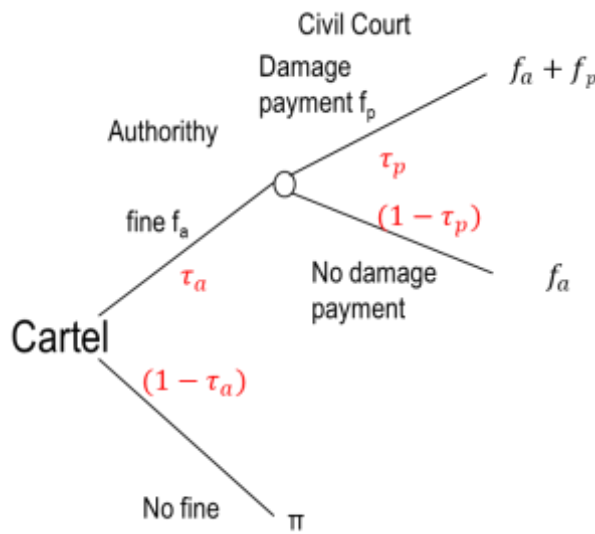

Figure 4: Pay-offs and probabilities in case of administrative fines and compensation payments

Potential cartel members are thus deterred if the following inequality is fulfilled:

$$\tau_a\tau_p(f_a + f_p) + \tau_a(1-\tau_p)f_a \geq (1-\tau_a)\pi. \qquad (3)^{[2]}$$

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[1] The sufficiently dissuasive penalty must therefore satisfy the following inequality:

$$f_a \geq \frac{(1-\tau_{al}-\tau_{ao})\pi}{\tau_{al}\tau_{als}(1-\Gamma-E)+\tau_{al}(1-\tau_{als})(1-\Gamma)+\tau_{a0}\tau_{aos}(1-E)+\tau_{a0}(1-\tau_{aos})}.$$ After some conversions:

$$f_a \geq \frac{(1-\tau_{al}-\tau_{ao})\pi}{\tau_{a0}-E\tau_{al}\tau_{als}-\tau_{al}\Gamma-\tau_{a0}\tau_{aos}E}. \qquad (2a).$$

[2] The administrative penalty is therefore sufficiently dissuasive:

$$f_a \geq \frac{(1-\tau_a)\pi-\tau_a\tau_pf_p}{\tau_a}. \qquad (3a)$$

Solving equation (3) according to f_p leads to a sufficiently deterrent payment of damages:

$$f_p \geq \frac{(1-\tau_a)\pi-f_a\tau_a}{\tau_a\tau_p}. \qquad (3b)$$

In addition to the condition that administrative penalties must prevent the bankruptcy of the company ($\overline{f_a(x)}$), there is another condition. Injured parties who expect too little payment of damages will shy away from the legal enforcement of their justified claims due to "rational ignorance." The expected damage payments $\tau_a \tau_p f_p$ will be low if the probability of damage payments under private law (τ_p) is low and, or if the damage payments are negligible (f_p). If a potential cartelist foresees rational ignorance, there are "critical" expected damage payments smaller than $\overline{\tau_a \tau_p f_p}$, which do not have a deterrent effect.

Figure 5 combines the administrative punishment in which there are possibilities of acting as a leniency witness or consensually terminating proceedings, but still includes conceivable civil damage payments.
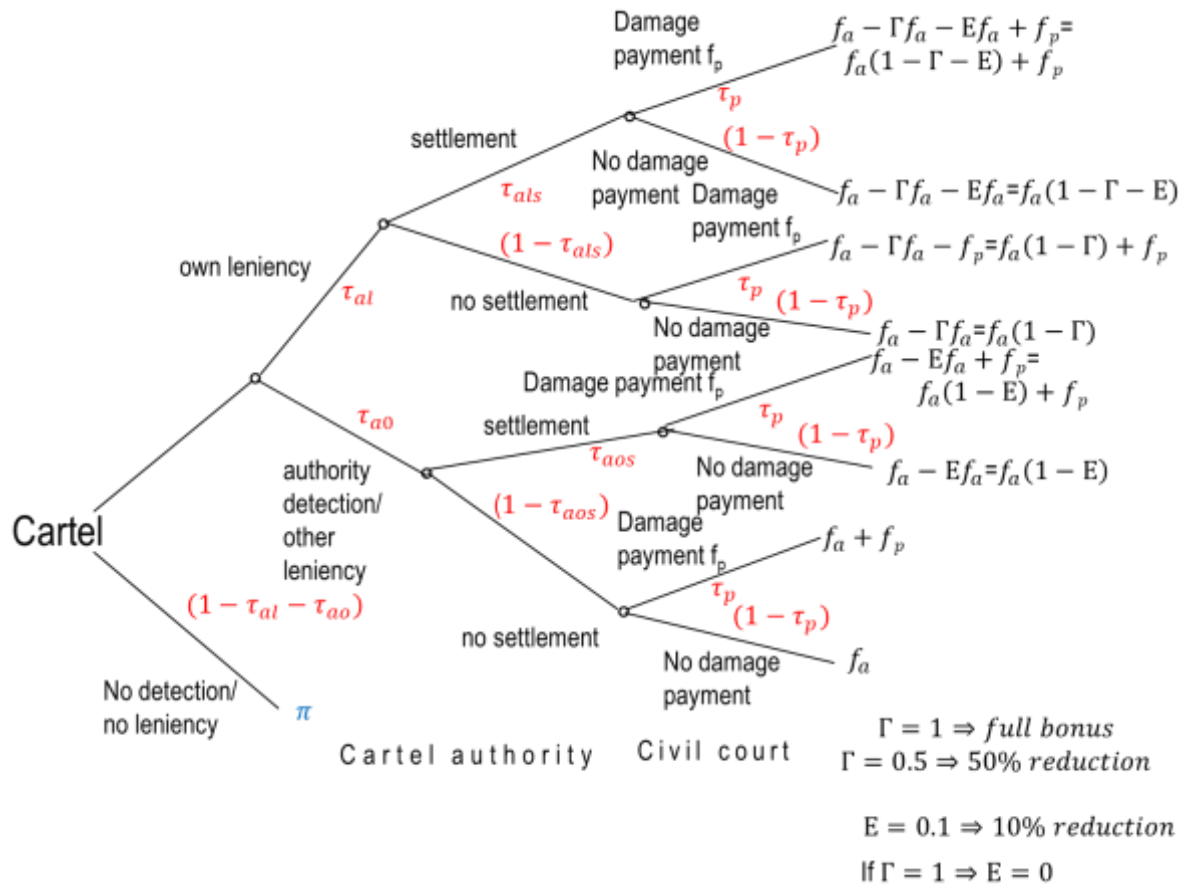

Figure 5: Pay-offs and probabilities in case of administrative fines with leniency, settlement, and compensation payment

Equation (4) shows the conditions for a non-rationality of a cartel infringement or a sufficiently deterrent administrative penalty and damages:

$$\tau_{al}\tau_{als}\tau_p[f_a(1 - \Gamma - E) + f_p] + \tau_{al}\tau_{als}(1 - \tau_p)f_a(1 - \Gamma - E) + \tau_{al}(1 - \tau_{als})\tau_p[f_a(1 - \Gamma) + f_p)] +$$
$$\tau_{al}(1 - \tau_{als})(1 - \tau_p)[f_a(1 - \Gamma)] + \tau_{ao}\tau_{aos}\tau_p[f_a(1 - E) + f_p)] + \tau_{ao}\tau_{aos}(1 - \tau_p)[f_a(1 - E)] +$$
$$\tau_{ao}(1 - \tau_{aos})\tau_p(f_a + f_p) + \tau_{ao}(1 - \tau_{aos})(1 - \tau_p)f_a \geq (1 - \tau_{al} - \tau_{a0})\pi. \qquad (4^3)$$

The necessary administrative penalty becomes smaller if the gain weighted by the leniency probability or the "other" detection probability falls. Similarly, the necessary administrative penalty is lower if damages are weighted by the leniency probability. In this case, the leniency probability and the "other" probability of detection falls. The denominator of the breach becomes larger, and thus the necessary administrative penalty becomes smaller if the bonuses of the leniency program (E) or the discounts for settlements decrease, each weighted by the relevant probabilities.[4]

The necessarily sufficiently deterrent payment of damages is of course all the lower if the cartel profit weighted by probabilities decreases. It is also lower if the administrative fine increases but is weighted by the respective probabilities, depending on the bonuses granted for leniency and settlement. The deterrent payment can be reduced with higher probabilities of detection of leniency if discovery by the authorities, which can reduce the deterrent of paying damages. Of course, the deterrent effect is reduced if the administrative penalty exceeds the non-bankruptcy condition $(\overline{f_a(x)})$ and, or if private law enforcement is not carried out due to "rational ignorance" of the injured parties (expected damage payments $< \overline{\tau_a\tau_pf_p}$).

If the decision to commit a crime is modeled as an individual decision of a decision-maker or executors in a company, the previous orientation toward the expected value is too simplistic. Risk neutrality is assumed to be the responsibility of the actors because they have sufficient possibilities to spread the risk. If one goes over to the individual level, the uncertainties of a cartel are usually illustrated by means of the expected utility calculus (for an overview see Chalfin/McCrary, 2017 and critically Garoupa, 2003). According to the simple calculation shown in Figure 6, only the cartel authority or the criminal court "acts." The cartel authority can discover a cartel agreement and then punish it with an individual fine f_{am}. Whether the discovery is made via leniency or investigations by the authority is ignored. Equally ignored is the administrative penalty against the company (f_a) or

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[3] Equation 4 solved to f_a, results:

$$f_a \geq \frac{(1 - \tau_{al} - \tau_{a0})\pi - f_p\tau_p(\tau_{al} + \tau_{ao})}{(1 - \Gamma - E)[\tau_{al}\tau_{als}] + (1 - \Gamma)[\tau_{als} - \tau_{al}\tau_{als}] + (1 - E)\tau_{ao}\tau_{aos} + [\tau_{ao}\tau_p + \tau_{ao} - \tau_a\tau_p - \tau_{ao}\tau_{aos}]} \qquad (4a)$$

[4] Equation (4) can also be resolved according to f_p:

$$f_p \geq \frac{(1 - \tau_{al} - \tau_{a0})\pi - f_a[(1 - \Gamma - E)[\tau_{al}\tau_{als}] + (1 - \Gamma)(\tau_{al}(1 - \tau_{als})) + (1 - E)\tau_{ao}\tau_{aos} + [\tau_{ao}\tau_p + \tau_{ao} - \tau_a\tau_p - \tau_{ao}\tau_{aos}]]}{\tau_p(\tau_{al} + \tau_{ao})}. \qquad (4b)$$

possible civil compensation payments by the carteling company (f_p). The probability of the imposition of an individual fine is τ_{am}. With the counter probability of $(1 - \tau_{am})$, the authority does not impose an individual fine, the cartel remains undetected, and the individual receives an increase in income from the cartel participation of π in addition to his initial assets "y."

The model also assumes that criminal investigations in connection with hardcore cartels are only initiated if the cartel authority imposes an individual fine. Such sanctioning would be sufficient evidence for the public prosecutor to initiate criminal proceedings. As a "first level" of sanction, the criminal court can impose a criminal fine f_{cm} or acquit the accused. It then remains only with the administrative penalty f_{am}, which reduces initial assets. The criminal penalty is imposed with a probability of τ_{cm}. An acquittal is imposed with a probability of $(1\text{-}\tau_{cm})$. In addition to a fine, the criminal court can also sentence the cartelist to a prison sentence f_{ci} for a certain amount of time.

Punishment with imprisonment is likely to be τ_{ci}, as $(1 - \tau_{ci})$ is still a criminal fine. In this approach, periods of imprisonment are modeled as losses of income or assets, i.e. as monetary variables. In order to model the personal and social repercussions of a criminal conviction (such as a negative reputation for the convicted person in his private and social environment), criminal fines and the monetary loss due to imprisonment are weighted higher by the factor φ ($\varphi > 1$). The weighted factor for imprisonment is likely to be higher than for the criminal fine ($\varphi_{ci} > \varphi_{cm}$).
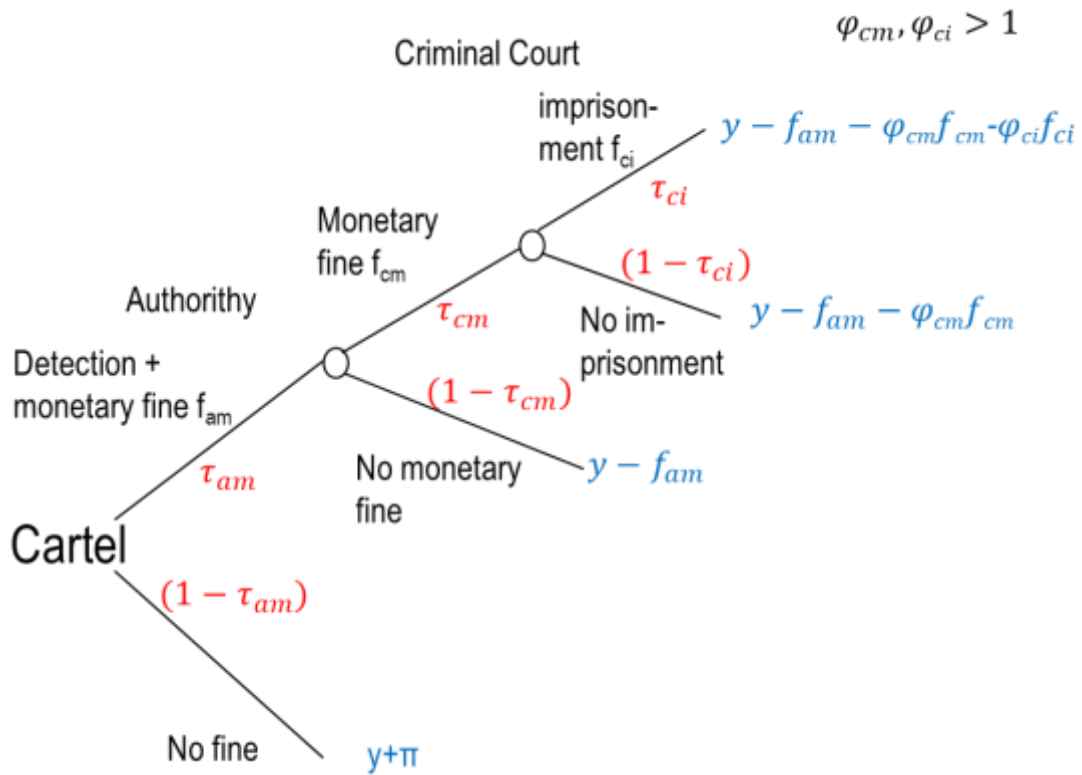

Figure 6: Expected utilities and criminal sanctions

According to this model, a cartel infringement will not occur if Inequality 5 is fulfilled:

$$\tau_{am}\tau_{cm}\tau_{ci}U(y - f_{am} - \varphi_{cm}f_{cm} - \varphi_{ci}f_{ci}) + \tau_{am}\tau_{cm}(1 - \tau_{ci})U(y - f_{am} - \varphi_{cm}f_{cm})$$
$$+ \tau_{am}(1 - \tau_{cm})U(y - f_{am}) \geq (1 - \tau_{am})U(y + \pi). \tag{5}$$

Converted, inequality results:

$$\tau_{cm}\tau_{ci}U(y - f_{am} - \varphi_{cm}f_{cm} - \varphi_{ci}f_{ci}) + \tau_{cm}(1 - \tau_{ci})U(y - f_{am} - \varphi_{cm}f_{cm}) + (1 - \tau_{cm})U(y - f_{am}) \geq \frac{(1 - \tau_{am})U(y + \pi)}{\tau_{am}}. \tag{5a}$$

The higher the probability of prosecution by the cartel authority, and the lower the benefit of the cartel[5], weighted by the probability of non-prosecution by the cartel authority, the smaller the right-hand side of the inequality (5a), then "relative" benefits of the cartel become smaller. On the other side of the inequality are the expected costs, which naturally increase with the probability of criminal prosecution and the lower certain benefit from fines and prison sentences imposed. The weighting factors ($\varphi_{ci} > \varphi_{cm} > 1$) are likely to reinforce this effect. Criminal sanctions are also subject to "system-immanent" restrictions, such as: a) The criminal fine must not exceed the income and financial circumstances of the convicted person ($f_{cm} \leq \overline{f_{cm}}$); b) The prison sentence must be high enough that incarceration is imposed instead of a fine or a suspended prison sentence ($f_{ci} \geq \overline{f_{ci}}$); c) the prison sentence imposed for cartel behavior must not be equal to or higher than "more serious" capital offences under the principle of proportionality ($f_{ci} \leq \widehat{f_{ci}}$), and criminal prosecution must not reduce the deterrent effect of the administrative penalty and civil damages. In particular, consistency of τ_a, τ_{al}, and τ_p must be given.

In addition to the extremely difficult empirical feasibility of the expected utility concept (e.g. measurability of assets and the utility functions based on them), the limitations mentioned above are highlighted in practice as important obstacles to criminal prosecution of hardcore cartelists. The feared negative repercussions for administrative penalties alone, e.g. the leniency program, are mentioned again and again (e.g. Hombrecher, 2017). At the theoretical level, both models show there are two groups to address in a cartel sanction. First, there is the firm, or company, which rationally avoids a cartel if the expected costs of the cartel exceed the benefits. Second, there are the acting individuals, who shy away from participation in a cartel if the expected benefits from the cartel are smaller than potential individual costs.

4 Calculation of Sufficiently Dissuasive Penalties

In order to examine whether there is a need for criminal sanctions on hardcore cartelists, one can refer to the cartels fined and published by the German cartel authority. These cases were imposed

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[5] Assuming U`( ) > 0, and U``( ) < 0.

on the basis of the current legal framework for administrative sanctions described above. Available since about the end of the 2000s, these examples are published on the Authority's homepage. There, we can find a description of the cartel sanction determined, the cartel periods detected, the companies involved, bonuses due to leniencies and settlements, amounts of fines imposed on the companies, and individual fines imposed on company members. We can also read about the circumstances that led to a reduction of the fine, such as economic difficulties or a lower degree of responsibility.

With the help of this information, it is possible to make a hypothetical calculation of the minimum amount of a prison sentence (f*) that would have to be imposed for it to at least equal the product of the increase in profits π from the cartel, and the reciprocal of the probability of detection and punishment τ. The monetary value of this hypothetical prison sentence can be converted into months if one initially sets a year in prison at a monetary loss of €6m. To estimate the sensitivity of the monetary loss, it is alternatively assumed that the loss is halved. For imposed fines, we use the fines reduced by bonuses, since potential cartelists can expect such discounts and the deterrent effect of the administrative penalties is lower.

For profits π the administrative fines are used as a benchmark, since—as described above—Cartel Office penalties are guided by the profit or damage potentials. Reductions of the fines due to economic difficulties, negligence in the cartel offence, and, or bonuses for leniency and settlement are added to the fine as one comes at least approximately closer to the real profit of the cartel members. For the probability of punishment, the usual value of 15 percent in the literature is assumed. Alternatively, a value of 30 percent is allowed. Consequently, it is possible to determine the fine for (f*), which would be at least sufficient to deter cartel infringements, provided that the individual in question behaves in a risk neutral manner and would have assessed ex-ante the consequences of his actions as they arose ex-post. Subtracting the actual penalties (f) from the hypothetical fine for (f*) results in a crime gap (f**), measured in monetary terms. We can divide the monetary gap by the monetary value a prison year yields, and the equivalent prison sentence in years or months. Because, as shown above, the enforcement of damages under private law in the case of a cartel is so difficult in legal and economic terms, the expected damages under private law f_p are set to zero. Table 1 summarizes the procedure.

Table 1: Calculation of hypothetical prison sentences

Basic assumption: Firm = one individual owner, no manager or other involved employee, $f_p=0$		
Imposed administrative fine, leniency and settlement bonus and further fine reductions included	Firm	f_{am}
	Individual	f_{ai}
Probability of detection and punishment	τ	0.15
		0.3
Profit π	Administrative firm or individual fine + Leniency bonus: $-1*f_{am}$ or $-0.5*f_{am}$ + settlement bonus: -0.1(or individually) $*f_{am}$. Individual fine restricted to € 0.5 m.	$f_{am}+ f_{ai}$, potentially $0.5*f_{am} + 0.1*f_{am}$
Monetary value of minimum fine for deterrence f^*	π/τ	$\dfrac{f_{am} + f_{ai}, \text{potentially } 0.5f_{am} + 0.1f_{ai}}{\tau}$
Criminality gap f^{**}	$f-f^*$	$f - \dfrac{f_{am} + f_{ai}, \text{potentially } 0.5f_{am} + 0.1f_{ai}}{\tau}$
Monetary loss of one year being in prison		€ 6m
		€ 3m
Criminality gap f^{**} in years	$\tau=0.15$	$f - \dfrac{f_{am} + f_{ai}, \text{potentially } 0.5f_{am} + 0.1f_{ai}}{0.15}$
	$\tau=0.3$	$f - \dfrac{f_{am} + f_{ai}, \text{potentially } 0.5f_{am} + 0.1f_{ai}}{0.3}$
Criminality gap f^{**} in months	$\tau=0.15$	$[f - \dfrac{f_{am} + f_{ai}, \text{potentially } 0.5f_{am} + 0.1f_{ai}}{0.15}]\dfrac{1}{12}$
	$\tau=0.3$	$[f - \dfrac{f_{am} + f_{ai}, \text{potentially } 0.5f_{am} + 0.1f_{ai}}{0.3}]\dfrac{1}{12}$

Individual fines are artificially set at € 0.5m, as the Cartel Office is legally allowed to impose a maximum fine of € 1m.

Table 2 shows the results of the model calculations for a sufficiently deterrent prison sentence, depending on whether the monetary loss of a one-year prison sentence is set at three or six million euros, or whether the probability of cartel detection or punishment is set at either 15 or 30 percent. For the "€6m/0.15" scenario, an average prison sentence of 193 months, or approximately 16 years, would have had to be imposed to precisely compensate for the current lack of deterrent effect for the administrative offence. Since extremely high fines were imposed in some cases, the assumed profit has become extremely large; consequently, the deterrent "residual prison sentences" had to also be very large. In some cases, the calculation is well over 1000 months, i.e. around 100 years. As this is obviously unrealistic, we should look at the median numbers for a legal-economic interpretation. With 57 months, 4 years and 8 months, an offender would still receive a relatively long sentence. For the scenario "€6m/0.3," an average of 82 months (just under 7 years), or if we look at the median, 28 months (2 years and 4 months) are required. If the monetary value is reduced to three million per prison year and the probability is set at 0.15, an average of 316 months (26.3 years) is required to reach the deterrence threshold. This sentence is still unenforceable compared to sentences for capital crimes. The median here is also quite high at 103 months or about 8.5 years. Compared to the last scenario, if the probability of punishment increases to 30 percent, one would have to serve an average prison sentence of 165 months (13 3/4 years), while the median would

require exactly four years. Table 2 also shows that a short prison sentence would commonly be enough to create sufficient deterrence.

Table 2: Potentially sufficient deterrent prison sentences in months

Reference number	Prison in months			
	Loss: €6m/ τ: 0.15	Loss: €6m/ τ: 0.3	Loss: €3m/ τ: 0.15	Loss: €3m/ τ: 0.3
B12–14/09	15	6	30	13
B12–15/12	15	6	29	12
B12–15/08	103	44	206	87
	66	28	133	56
B12-15/09	73	31	146	62
	1	0.4	2	0.8
B12–16/08	4	2	8	4
B12-11/11	1,305	549	2,609	1,099
	165	69	329	139
	57	24	114	48
	51	21	101	43
B12-16/12, B12- 19/12	1,238	521	2,474	1,041
	81	34	162	68
	25	11	51	21
	3	1	5	2
B12-16/13	52	23	103	46
B12-23/15	22	9	43	19
B12-13/09	82	34	164	69
B12-13/08	12	5	24	10
B12-11/09	126	56	251	113
B12-12/10	198	82	397	163
B12-11/08	243	100	486	200
B11-26/05	1,031	425	2,063	849
B11 -21/15	70	29	140	58
B1-20/05	247	101	495	202
B11-19/08	31	13	62	26
B11-18/08	647	272	1,294	544
B11-15/09	4	2	9	4
B11-13/13	150	57	299	113
B11-12/08	162	67	325	135
B11-11/08	53	22	106	43
B10-105/11	365	153	730	305
B10-104/11	51	21	101	43
B10-105/11	3	1	6	2
B10-101/11	689	284	1,377	567
B11-20/08	39	15	77	31
B1-189/13; B1-11/15	18	8	36	15
B7-50/16	3	1	6	2
B9-44/14	8	4	17	8
Average values	193	82	316	165

Prison sentences calculated on the information of the Bundeskartellamt's published decisions and case reports, see Annexes A1-A7 and Annex A8.

These calculations represent a very simplistic estimate, which depends crucially on the antitrust authority basing the severity of the offence on the profit made from the cartel, as well as taking into

account bonuses from leniencies and settlements. If these concerns are disregarded, very long prison sentences result, especially if the frequently determined punishment probability of 0.15 is assumed, and the principle of proportionality in sentencing is not fulfilled. In terms of legal policy, the only remaining options are to increase the probability of punishment, to make it easier to enforce private compensation damages, or preferably to considerably intensify administrative penalties. Limits set by the legislator, such as "antitrust fines must not endanger the existence of the company" are also highly questionable. Higher punishment probabilities would require significantly more resources from the cartel authority. The theoretically conceivable approach of reducing bonuses in leniencies and settlements would reduce the chances of detection and the effectiveness of the cartel authority.

5 Results and Conclusions

In Germany, companies that violate cartel law can be fined for an administrative offence or become liable for damages under civil law. Company employees who have contributed significantly to the establishment and enforcement of a cartel within the company run the risk of being fined individually by the cartel authority, or, in the case of a tendering cartel, of being prosecuted under criminal law. From a legal policy point of view, there is a recurring discussion that cartelists who have made agreements on quantities, prices or regions (hardcore cartels) should not only be exposed to the risk of a fine by the cartel authority (administrative offences or penalties) or civil law claims for damages, but they would have to reckon with criminal law consequences such as fines and imprisonment with or without probation. The aim of this contribution is to analyze the theoretical deterrent of adding criminal consequences, and to examine the feasibility of doing so based on Bundeskartellamt's cases of the last ten years.

So far, available empirical studies for the USA and the European Union suggest that the deterrent effect of administrative cartel fines is too low. These papers calculate minimum fines in monetary units that deter cartel members, assume certain detection and punishment probabilities, and are based on usual cartel profit surcharges. Of course, these numbers can only be checked in retrospect. Had the decision makers known about actual consequences, would they have refrained from the cartel? Information on the time of the cartel infringement is not available.

In theory, there are two liable groups cartel sanctions should affect. First, the company as a whole should be held responsible. The company will rationally avoid a cartel if the expected costs of the cartel exceed the benefits. Second, the actual decision makers should be held personally responsible. These people will shy away from a cartel if the expected personal benefit of the cartel is less than the personal costs. Administrative offences and civil damages imposed on companies can have sufficient deterrent effects if they are set high, given the probability of punishment. They are mutually

substitutive, and leniencies or settlements increase necessary sanctions if the decision to participate in a cartel is modeled as a one-off. Criminal fines and prison sentences, as well as individual administrative offences, can have a deterrent effect on the behavior of potential cartel members. In principle, both approaches are necessary for deterrence.

The Bundeskartellamt's hardcore cartel decisions of the last decade are published in relatively large quantities, and available to use for model calculations. Various model calculations were carried out to determine a sufficiently deterrent prison sentences, depending on whether the financial loss of a one-year prison sentence was set at three or six million euros, or if the probability of a cartel being punished is set at 15 or 30 percent. From these "optimal" penalties, the administrative offences actually imposed were deducted, and resulted in "gaps in the criminal law."

For the scenario "6 million euros/0.15," an average of 193 months, i.e. about 16 years, would have to be served in prison to compensate precisely for the lack of the deterrent effect of current administrative consequences. If the median of 4 years and 8 months is taken as a basis for the legal-economic interpretation, the penalty is still relatively high on a personal level. According to the median, 2 years and 4 months are required for the scenario "6 million euros/0.3." If the monetary value is reduced to 3 million per prison year and the probability is set at 0.15, the median calculation requires about 8.5 years in prison. If the probability of punishment increases to 30 percent compared to the last scenario, one would have to demand exactly four years for the median. Sometimes, very small prison sentences could be enough to achieve sufficient deterrence. In this respect, these calculations represent a very simplified estimate, and crucially depend on the antitrust authority basing penalties on profits made from the cartel, taking into account bonuses from the leniency program and settlements.

Overall, very long prison sentences would be necessary to deter people from entering cartels, especially if one assumes the frequently determined penalty probability of 0.15. The principle of proportionality would no longer be fulfilled when calculating the penalty. From a legal policy point of view, the only option left would be to either increase the probability of a criminal conviction, to facilitate the enforcement of private damages, or to substantially increase administrative penalties against individuals. Limits set by the legislator such as "cartel fines must not endanger the existence of the company" are also highly questionable.

Appendix

Table A1: German Cartel Cases – Administrative Fines and Potential Criminal Punishment I

Name	Short description	Time period	Number of fined firms	Admin fines (€m) Firms f_{am}	Admin fines (€m) Individual f_{ai}	Average fine in €m	"Mark-ups" Settlements	"Mark-ups" Leniency	Profit in €m	Prison in months Loss: €6m /τ: 0.15	Loss: €6m /τ: 0.3	Loss: €3m /τ: 0.15	Loss: €3m /τ: 0.3	Reference number
Ticket prices Turkey flights	SunExpress and Condor enter into joint distribution agreements for flights to Turkey, whereby Condor also commits itself not to fall below the minimum price of 99€ for Turkey-Germany.	Spring 2009 until November 2009	1	1.2	-	1.2	0.1	-	1.32	15	6	30	13	B12–14/09
Household tableware	Manufacturers of household tableware made of porcelain, ceramics, or glass exchanged data including prices. With the introduction of the euro, the truck toll and the increase in VAT, they collectively lifted prices.	February/March 2006 until the beginning of 2008, at least	2	Fines cannot be split between the two fined companies and the fined Ceramics Industry Association (VKI).										B12–15/08
Prefabricated garages	Southern German manufacturers of prefabricated garages met regularly to agree on minimum prices for standardized garages and to define local price areas.	2002, beginning until 2007, End	10	11	-	1.1	0.15	-	1.265	15	6	29	12	B12–15/12
Chipboard, OSB boards and other wood-based materials	For raw and coated particle board, medium and high-density fibreboard (MDF and HDF) and tongue and groove board supplied to the industry or distributed via traders, the cartel members agreed on joint price increases, minimum prices, processing surcharges and individual prices.	2002, beginning until 2007, End	4	31	0.14	7.8	0.15	-	8.9	103	44	206	87	B12–15/08
OSB-boards	Cartel members discussed prices of Oriented Strand Boards (OSB) used in the construction industry and distributed through wholesalers at secret meetings, by telephone or in the context of joint meetings.	2004, Spring - 2006, Autumn	2	10	0.14	5	0.15	-	5.8	66	28	133	56	
Concrete pipes and manholes	For concrete pipes and manholes for sewer construction, which are awarded on a project-related basis within the framework of tenders, the winners of the tenders approached the concrete manufacturers for renegotiation. *They agreed on quotas and limit prices among themselves, with the sales managers usually meeting weekly (Lower Saxony, Bremen and North Rhine-Westphalia) or*	2006, January – 2010, February	2	11	-	5.5	0.15	-	6.3	73	31	146	62	B12-15/09
	reaching bilateral agreements (Lower Saxony, North Rhine-Westphalia, Hamburg, Schleswig-Holstein).	2006, January – 2010, February	9	1	-	0.1	0.15	-	0.13	1	0.4	2	0.8	

Table A2: German Cartel Cases – Administrative Fines and Potential Criminal Punishment II

Name	Short description	Time period	Number of fined firms	Admin fines (€m) Firms f_{am}	Admin fines (€m) Individual f_{ai}	Average fine in € m	"Mark-ups" Settlements	"Mark-ups" Leniency	Profit in € m	Prison in months Loss: €6m /τ: 0.15	Prison in months Loss: €6m m/τ: 0.3	Prison in months Loss: €3m m/τ: 0.15	Prison in months Loss: €3m /τ: 0.3	Reference number
Printing Chemicals	For special chemicals used in printing, cleaning and maintenance products (RPM) and is prophylactic alcohol (IPA), the cartel members agreed prices among themselves and disclosed their prices among themselves.	1989/90 – End of September 2008	2	0.6	-	0.3	0.1	-	0.4	4	2	8	4	B12–16/08
Railway rails	Quota and price agreements for standard rails, head-hardened rails and switch tongues at the expense of Deutsche Bahn AG; versus ThyssenKrupp	2001 - 2011, May; 2001 - 2008	1	103	-	103	0.1	-	113,3	1305	549	2609	1099	B12-11/11
	versus Stahlberg-Rönsch		1	13	-	13		-	14.3	165	69	329	139	
	versus TSTG Schienen		1	4.5	-	4.5		-	5	57	24	114	48	
	Versus Voestalpine		1	4	-	4			4.4	51	21	101	43	
Track super-structure material	Price, quota and customer protection agreements at the expense of local transport companies, private, regional and industrial railways and construction companies for rails, switches and sleepers, versus ThyssenKrupp.	2001 - May 2011	1	97.6	-	97.6	0.1	-	107.4	1238	521	2474	1041	B12-16/12, B12- 19/12
	versus Voestalpine BWG		1	6.4	-	6.4		-	7.0	81	34	162	68	
	versus Schreck-Mieves		1	2	-	2			2.2	25	11	51	21	
	versus Fehlings Marl Sinsen, Narosch München, Künstler, Holzwickede, Heinrich Krug Dortmund, and Betzler Aalen		6	1.2	-	0.2			0.2	3	1	5	2	
Heat schilds	For heat shields that protect passenger cells and fuel tanks from radiant heat, manufacturers buy aluminum sheet and process it into shields. Aluminum producers had announced price increases due to higher costs for processing raw materials and high sales surcharges. Within the first eleven months of 2011, the companies involved contacted each other to exchange information about the individual negotiations with VW.	2011- November 2011	3	8.6	-	2.9	0.2	0.3	4.3	52	23	103	46	B12-16/13
Television studio operators	Television studios exchanged information on prices and products, in particular for the joint calculation of additional costs for electricity, gas or oil heating and water, the former being highly relevant for the technical equipment used. Personnel cost calculations were also exchanged. In a few cases, cooperation was also carried out in tendering procedures.	2011/9 - 2014/12	2	3.1	-	1.6	0.2		1.9	22	9	43	19	B12-23/15

Table A3: German Cartel Cases – Administrative Fines and Potential Criminal Punishment III

Name	Short description	Time period	Number of fined firms	Admin fines (€m) Firms f_{am}	Admin fines (€m) Individual f_{ai}	Average fine in € m	"Mark-ups" Settlements	"Mark-ups" Leniency	Profit in € m	Prison in months Loss: €6m /τ: 0.15	Prison in months Loss: €6m /τ: 0.3	Prison in months Loss: €3m /τ: 0.15	Prison in months Loss: €3m /τ: 0.3	Reference number
Meat and sausage products	The producers of meat and sausage products conducted negotiations among themselves in order to find common positions in their dealings with the food retailer, especially with regard to the amount, reasons and timing of price increases. Communication took place via telephone or regular meetings in a Hamburg hotel.	1982- 2011/5	11	71	-	6.5	0.1	-	7.1	82	34	164	69	B12-13/09
Standardized industrial chemicals (commodeties)	Chemical wholesalers had concluded price, quota and customer protection agreements for commodities; direct deliveries by manufacturers to customers were not included.	1966 - 2006	25	23.9	-	1	0.1	-	1.1	12	5	24	10	B12-13/08
Fire-fighting vehicles	Top managers of the manufacturers of fire-fighting vehicles often met at Zurich airport, supported by a local auditor, to exchange information on past sales, to define largely fixed quotas and to take countermeasures in the event of discrepancies between actual and required quotas; they also agreed in some cases on joint price increases. The agreements at the sales manager level concerned compliance with the agreements and the allocation of public contracts among themselves. Appropriate discounts ensured that the planned allocation was fulfilled.	2001 - 2009	3	19.5	-	6.5	0.1	-	10.4	126	56	251	113	B12-11/09
Fire service turntables	60 - 80 fire service turntables were sold to German municipalities, almost all of them by Iveco and Metz Aeralis. They divided the market into three sub-groups, "Metz Turntables," "Iveco Turntables" and "unspecified turntables," and kept lists of the public tenders due in the next 12 months according to these sub-groups. The tendering procedures were controlled by the use of uniform list prices and discounts. Communication was organized with prepaid mobile phones or via private postal addresses, and since 2006 with e-mails in the football language (meetings as football training and discounts as football results).	1998 - 11/2007	1	17.5	-	17.5	-	-	17.5	198	82	397	163	B12-12/10

Table A4: German Cartel Cases – Administrative Fines and Potential Criminal Punishment IV

Name	Short description	Time period	Number of fined firms	Admin fines (€m) Firms f_{am}	Individual f_{ai}	Average fine in € m	"Mark-ups" Settlements	Leniency	Profit in € m	Prison in months Loss: €6m /τ: 0.15	Loss: €6m /τ: 0.3	Loss: €3m /τ: 0.15	Loss: €3m /τ: 0.3	Reference number
Eyeglass lenses	In the "HERRZ-Kreis," managing directors and district managers of eyeglass lens manufacturers met annually in various hotels and discussed contract conditions, discounts and bonuses, surcharges, salaries of sales representatives, guarantee conditions, etc., also via emails. In the "Arbeitskreis Preisstrukturen ZVA," uniform non-binding price recommendations were developed. Since the craftsmen's shares of the local opticians were also included, uniform retail prices were easily possible.	Mid 2000 - Mid 2008	5	102	1	20.4	0.05	-	21.4	243	100	486	200	B12-11/08
Large steam generators	In 1990 Babcock, EV and Steinmüller ruled out competition in pending public tenders for large steam generators by coordinating their bids in such a way that each company became a leading company for a project that demonstrated technical competence. The market shares were to be determined over time.	1990 - 2003	1	91	-	91	-	-	91	1031	425	2063	849	B11-26/05
Luxury cosmetics	At the regular meetings ("Schlossrunde"), internal company information was shared, e.g. on quarterly sales figures, advertising expenditure or planned new product inventions for luxury cosmetics, in some cases also on the behavior towards individual perfumeries or planned price increases.	1995 - 09/2005	9	10		Fines are not separately reported							B11-24/05
Packed potatoes and onions	Packing undertakings purchase potatoes and onions from producer cooperatives or others, wash, sort, pack and sometimes store them. The two cartel members discussed their prices over telephone, applying uniform purchase prices or calculated additional costs in the same way. They largely coordinated their tenders for food retailers.	2005 - 2013/5/7	2	11.2	0.5	5.6	0.1	-	6.2	70	29	140	58	B11 -21/15
Liquid gas	As members of the German Liquefied Petroleum Gas Association (DFVG), the companies have agreed to refrain from all activities aimed at winning over customers. Tied customers were not informed about termination options. The other cartel members made no offers or only at excessive (list) prices. Coordination within the cartel was facilitated by the fact that liquid gas was partially sold in a common pool of cylinders.	At least: Tank gas, 7/1/1997 - 5/1/2005; cylinder gas, 7/1/1999 - 1/1/2005.	11	241	0.5	22	-	-	22	247	101	495	202	B1-20/05

Table A5: German Cartel Cases – Administrative Fines and Potential Criminal Punishment V

| Name | Short description | Time period | Number of fined firms | Admin fines (€m) | | Average fine in €m | "Mark-ups" | | Profit in €m | Prison in months | | | | Reference number |
				Firms f_{am}	Individual f_{ai}		Settlements	Leniency		Loss: €6m /τ: 0.15	Loss: €6m/τ: 0.3	Loss: €3m /τ: 0.15	Loss: €3m /τ: 0.3	
Coffee roaster for bulk consumers	From at least 2007 until mid 2008, a working group of the German Coffee Association (DKV; chairmen and sales managers of coffee roasters) coordinated price increases and in some cases also price reductions for roasted coffee in the "Außer-Haus-Bereich." Außer-Haus-Bereich" means deliveries for restaurants, hotels, vending machines and other bulk consumers. They also discussed trade fairs, the abolition of coffee tax, certified coffee, etc. Price changes were usually announced by Kraft and Tchibo, others followed within the agreed time frame.	Beginning of 1997-Mid of 2008	8	20	0.5	3	0.075	-	2.9	31	13	62	26	B11-19/08
Coffee roaster for food retailer	Four coffee roasters agreed on price increases for typical packages (500-g package for leading company-specific brands) at retail level.	At least beginning of 2000 - Mid of 2008	3	153.5	0.5	51	0.1	-	56	647	272	1,294	544	B11-18/08
Drugstore items	Members of the working group "Personal Hygiene, Detergents and Cleaning Agents" (KWR) of the German Brands Association regularly exchanged information on planned gross price increases, negotiations with food retailers and distribution issues.	March 200 - End of November 2008	15	63		Fines are not separately reported								B11-17/06
Cable filling compounds	Standard cable filling compounds mainly contain rubber and are used to protect cable harnesses in low voltage installation cables. Both parties regularly agree on planned price increases.	Sept. 2004 -Nov. 2008	1	0.35	-	0.35	0.1	-	0.39	4	2	9	4	B11-15/09
Industrial batteries	Manufacturers of stationery and traction batteries agreed on a so-called "metal control surcharge" (MTZ), which was intended in particular to pass on price increases for lead, lead alloys and antimony.	Sept. 2012 - March 2014	2	26	0.5	13	0.07	-	14	150	57	299	113	B11-13/13
Mill industry	Milling companies that supplied wheat and rye flour to industrial customers (confectioners and bakery chains), artisan bakeries and small packaging for food retailers agreed among themselves on prices, quantities and assigned customer groups. In addition, they had coordinated their capacities by closing down mills and prevented the reopening of mills.	2001 -February 2008	23	65		Fines are not separately reported								B11-17/06

Table A6: German Cartel Cases – Administrative Fines and Potential Criminal Punishment VI

Name	Short description	Time period	Number of fined firms	Admin fines (€m) Firms f_{am}	Admin fines (€m) Individual f_{ai}	Average fine in € m	"Mark-ups" Settlements	"Mark-ups" Leniency	Profit in € m	Prison in months Loss: €6m /τ: 0.15	Prison in months Loss: €6m m/τ: 0.3	Prison in months Loss: €3m /τ: 0.15	Prison in months Loss: €3m /τ: 0.3	Reference number
Consumer goods	Regular, confidential meetings ('Hema Vertriebskreis') were used to exchange information on negotiations with food retailers, sales developments and, in some cases, planned price increases. The products addressed were chocolate, hot beverages such as instant coffee, frozen pizza, cereals, animal feed, and detergents.	At least October 2005 - January 2008	4	53	0.5	13	0.1	-	14	162	67	325	135	B11-12/08
Confectioneries	Manufacturers of chocolate products had agreed on joint price increases and smaller packages. They had also exchanged information about negotiations with various food retailers.	"Bar of chocolates" 2007/8, "Viererrunde" Spring 2006 to February 2008, "Arbeitskreis Konditionenvereinigung" End of 2003 - Beginning of 2008.	12	51	0.5	4.3	0.1	-	4.7	53	22	106	43	B11-11/08
Beer	The firms agreed to increase the price of draught beer, which was more or less universally applied in Germany, by EUR 5 to 6 per hectolitre in autumn 2006. During 2007, they discussed the possibility of increasing the price of bottled and draught beer by €1 for a reference container (24 x 0.33 l or 20 x 0.5 l). One firm had announced this price increase for early 2008 and at the same time deceived the others.	Autumn 2006 and beginning of 2008.	11	323	0.5	29	0.09	-	32	365	153	730	305	B10-105/11
Heavy fuel oil	Heavy fuel oil, a residual product of heating oil or fuels, is used for seagoing vessels in or near ports; high transport costs create loca markets. In the case of the ports of Bremen, Bremehaven, Brake and Nordenham, the market has been divided up evenly by dividing the quantities. They also agreed on a general price level.	May 2005 - January 2007	2	8	0.5	4	0.1	-	4.4	51	21	101	43	B10 -104/11

Table A7: German Cartel Cases – Administrative Fines and Potential Criminal Punishment VII

Name	Short description	Time period	Number of fined firms	Admin fines (€m) Firms f_{am}	Admin fines (€m) Individual f_{al}	Average fine in € m	"Mark-ups" Settlements	"Mark-ups" Leniency	Profit in € m	Prison in months Loss: €6m /τ: 0.15	Prison in months Loss: €6m /τ: 0.3	Prison in months Loss: €3m /τ: 0.15	Prison in months Loss: €3m /τ: 0.3	Reference number
Automatic door systems	Partially within meetings of the association, they agreed on uniform award-spans for special services. Since April 2006 they had an agreement about uniform hourly wages and travelling costs.	2000 - 2009	8	1.8	0.5	0.2	0.1	-	0.25	3	1	6	2	B10-105/11
Power trans-formers	Quota and bidding agreements for medium (from 12.5 MVA) and large (from 100 MVA) power transformers-	Spring 1999 - 2004, March	4	243	-	61	-	-	61	689	284	1,377	567	B10-101/11
Instant-Cappuccino	Participating companies determine price increases and justifications for family cappuccino products in bilateral telephone calls at the turn of the year 2007/2008	End of 2007	2	7	-	3.5	-	-	3.5	39	15	77	31	B11-20/08
Asphalt mix	Price, territory, customer and quota agreements in the formation of asphalt mix supply pools	Beginning of 2005 to End of 2013	1	1.5	-	1.5	-	-	1.5	18	8	36	15	B1-189/13; B1-11/15
Reading circle	Regionally active reading circle companies agree not to poach existing customers from medical practices, hairdressing salons, etc.	Daheim/-Brabandt 2008-2016; Daheim/Dörsch 2008-2016; Daheim/Krum-beck 2011-2016; Daheim/Medien palette 2007-2016; Daheim/Hettling 2009-2017	8	1.8	-	0.2	0.1	-	0.2	3	1	6	2	B7-50/16
Port towage service provider	Quota cartel for port towage services in northern German ports	2000-2013/2014	4	1.8	-	0.4	0.1	-	0.7	8	4	17	8	B9-44/14

Table A8: Final decisions of Federal Cartel Office

Reference number	Fines against firms/organizations
B12–14/09	*€1.2m Condor Air Service.*
B12–14/10	Roughly €0.9m in all to porcelain factory Christian Seltmann, Kahla Thuringa Porcelain, Association of Ceramic Industry (VKI). Sentences were related to the economic situation of the involved firms.
B12–15/12	€11m in all. Ten producers of finished garages, price cartel in South Germany: Classic Grundstückverwaltungsgesellschaft, in former times: Classic Garagen, Emil Steidle, Gebr. Ott Betonwerke, Grötz Bauunternehmung, GVS Garagen Vertrieb, IBK Fertigbau Villingen, IBK-Fertigbau Büchenau, Kemmler Baustoffe, Pfaff Fertiggaragen; price cartel in Northern Germany: Hanse-Beton. Sentences were related to the economic situation of the involved firms.
B12–15/08	€42m in all against four important producers and responsible individuals. Glunz (Meppen), Pfleiderer (Neumarkt in der Oberpfalz), and Rauch (Markt Bibbart) must pay together €31m for cartel offences related chipboards; Kronopoly (Heiligengrabe) and Glunz (Meppen) sentences related to osb-plates (oriented strand boards). Sentences were related to affected revenues. Due to reduced economic feasibilities, fine payments could be made within several years.
B12-15/09	More than €1m for eight firms and individuals, Berding (Steinfeld), Beton Tille (Horn-Bad Meinberg), Betonwerk Kuschmierz (Oststeinbek). BWV Betonwaren- und Verbundsteinwerk Lehnen (Lachendorf), KLEI-HUES (Embsbüren). Schröder Bauzentrum (Heide), Rolf Pöthmann Handelsgesellschaft (Vienenburg), and Wilhelm Siemsen (Eckernförde). Earlier €11m against Berding, and Bieren (Bad Oeynhausen). €11m in the first case (Berding and Bieren), €1m in the second case. Due to cooperative behavior of all firms with competition authority are further reduced.
B12–16/08	€0.66m against two producers. Low amount of included revenues let to low fines.
B12–11/11.	€124.5m against four producers and suppliers; *ThyssenKrupp €103m*, Stahlberg Roensch GmbH €13m, TSTG Schienentechnik GmbH €4.5m, and voestalpine BWG €4m. ThyssenKrupp GfT Gleistechnik Gmbh (Essen), Stahlberg Roensch GmbH (Seevetal, subsidiary of Vossloh), TSTG Schienentechnik GmbH & Co. KG, Duisburg, subsidiary of voestalpine, and BWG GmbH & Co. KG, Butzbach, subsidiary of voestalpine. Low amount of included revenues let to low fines.
B12-16/12, B12-19/12	€97.64m in all. *ThyssenKrupp €88m*, voestalpine BWG €6.4m, Schreck-Mieves €2m, Holz-Fehlings (Marl-Sinsen), Narosch (München) Künstler (Holzwickede), Heinrich Krug (Dortmund), and Betzler (Aalen) each €1.24m. Level of cartel cooperation and cartel duration were relevant for amount of fines.
B12-16/13	€9.6m against Lydall Gerhardi (Meinerzhagen), ElringKlinger (Switzerland), and Estamp (Spain); firm sentences were related on the intensity of cartel offences and market power of VW; sum of fines includes also sentences for individuals.
B12-23/15	€3.1m against Studio Berlin Adlershof and Bavaria (Munich). Fines were related to intensity of cartel participation.
B12-11/09	€20.5m against Albert Ziegler, Giengen; Schlingmann, Dissen; Rosenbauer Gruppe, Luckenwalde und Leonding (Österreich) + 1 individual.
B12-12/10	€17.5m versus Iveco Magirus Brandschutztechnik (Ulm).
B12-11/08	€115m versus five producers (Rodenstock, München; Carl Zeiss Vision, Aalen; Essilon, Freiburg; Rupp + Hubrach, Bamberg; Hoja Lens, Mülheim), 11 individuals, and Central Association of Opticians (ZVA). Fines were splited off between "HERRZ-Kreis" (€85m) and "Arbeitskreis Preisstrukturen" (€39m).
B11-26/05	€91m Alstom Power Systems, formerly Energie- and Verfahrenstechnik EVT. Fines were calculated as three times of more revenues.
B11-24/05	€10m versus 9 firms: Chanel Deutschland, Clarins, Cosmopolitan Cosmetics Prestige, Coty Prestige Lancaster Group, Estée Lauder Companies, L´Òréal Deutschland, LVHM Parfums Kosmetik Deutschland, Shiseido Deutschland, and YSL Beauté, and executive officers.
B11-21/15	€13.2m against Hans-Willi Böhmer Verpackung und Vertrieb, Mönchengladbach, and Kartoffel-Kuhn, Frankenthal. The cartel office had terminated investigations to other packing firms due to discretionary reasons.
B11-20/05	€250m versus 11 firms (Drachen-Propangas, Frankfurt; Friedrich Scharr, Stuttgart; Sano-Propan, Nürnberg; Tyczka Energie and Totalgaz, Geretsried; Primagas, Krefeld; Progas, Dortmund; Transgas. Dortmund; Thermogas, Stuttgart; Westfalen, Münster; Propan Rheingas, Brühl), and individuals. Firm fines were calculated on the base of additional revenues, according the valid legal rule until 2005.

B11-19/08	Roughly €30m versus eight coffee roasters (Kraft Foods Außer Haus Service, Bremen; Tchibo, Hamburg; J.J. Darboven (Hamburg), Melitta System Service, Minden; Luiggi Lavazza, Frankfurt; Seeberger, Ulm; Segafredo Zanetti, Munich; Gebr. Westhoff, Bremen), German Coffee Association (DKV), and responsible individuals. Fines were related to affected revenues and duration of participation.
B11-18/08	Roughly €159.5m versus 4 coffee roasters (Tchibo, Hamburg; J.J. Darboven (Hamburg), Melitta Kaffee, Bremen; Alois Dallmayr Kaffee, München) and responsible individuals. Fines were related to affected revenues and duration of participation.
B11-17/06	€63m versus 15 firms: Colgate Palmolive, Beiersdorf, GlaxoSmithKline, Schwarzkopf Henkel, Henkel Wasch- und Reinigungsmittel, Johnson & Johnson, SC Johnson, Erdal, Recklitt Benkiser, Coty, Sara Lee, Lever Fabergé, since 2005 Unilever, Procter & Gamble, Gilette Group, delta pronatura, L´Oréal Haarkosmetik und Parfümerien, and responsible sales managers.
B11-15/09	€0.4m versus Condor Compunds, Braunschweig and individuals; fines are very low due to small volume of revenues.
B11-13/13	Roughly €28m versus Hawker GmbH, Hagen and Hoppecke Batterien, Brilon, and responsible individuals. Three other suppliers had not been investigated further due to minor relevance; the corresponding association had also been excluded because of non-participating in decisive meetings.
B11-13/06	Roughly €65m versus 23 firms (VK Mühlen, Werhahn Mühlen, Gorg Plange, Mphle Rüningen, Pfälzische Mühlenwerke, Grain Millers, Saalemühle Alsleben, Flechtorfer Mühle Walter Thönebe, Gebr. Engelke Große Mühle Hasede-Hildesheim, Magdeburger Mühlenwerke, Oderland Mühlenwerke Müllrose, Hedwigsburger Okermühle, Thüringer Mühlenwerke, Albert Mühlschlegel, Friedrich Wilhelm Borgstedt Milser Mühle. Südhannoversche Mühlenwerke Engelke, Frießinger Mühle, Bliesmühle, Karl Bindewald Kupfermühle, Cramer Mühle, Heinrich Thylmann Kilianstädtermühler, Rheintal Mühlen, and Heiss Mühle), German Association of Mills, and individuals. Other roughly 37 participating firms were not prosecuted due to irregular participating in meetings. Possible fines were reduced to be able keeping in mind different degrees of participation, fines in other countries, and avoiding insolvencies of firms.
B11-12/08	Roughly €57m versus 4 firms (Dr. August Oetker Nahrungsmittel; Kraft Foods Deutschland, Unilever Deutschland, and Nestlé Deutschland), and individuals.
B11-11/08	Roughly €63m versus 12 firms and responsible sales managers; subcase "bar of chocolate" roughly €21.7m versus Kraft Foods Deutschland and Alfred Ritter GmbH; "Viererrunde" roughly €21.9m versus Mars GmbH, Nestlé Kaffee und Schokolade. GmbH, Alfred Ritter GmbH & Co. KG, and Haribo GmbH & Co. KG; "Arbeitskreis der Konditionenvereinigung" roughly € 19.6 m versus Mars, Ritter, and Bahlsen, Griesson de Beukelaer, Storck, Katjes Fassin, CFP Brands Süßwarenhandels, Feodora Chocolade, Piasten, Zentis, allways GmbH & Co. KG, and individuals.
B10-105/11	Roughly €338 versus 11 firms Bitburger Braugruppe, Carlsberg Deutschland, Krombacher Brauerei Schadeberg, Radeberger Gruppe, C. + A. Veltins, Warsteiner Brauerei Haus Cramer, Privat-Brauerei Ernst Barre, Privat-Brauerei Bolten, Erzquell Brauerei Bielstein Haas, Cölner Hofbräu P. Josef Früh, Privat-Brauerei Gaffel Becker & Co., and Verband Rheinisch-Westfälischer Brauereien (Association of rhin-westfalia Breweries), and individuals. Fines were related to revenues and degree of cartel participation, also economic situation.
B10-104/11	Roughly €11m versus Bremer Mineralöltransportgesellschaft and BOMINFLOT, Hamburg + individuals.
B10-105/11	Roughly €2.5m versus 8 firms (Assa Abloy, Drieburg; Blassi, Mahlberg Dorma, Ennepetal; Geze, Leonberg; Kaba, Bühl; Landert, Bülach/Schweiz, record, Wuppertal) and economic association industry - and construction system (WIB, Hagen), and one individual. Fines are related to the short duration of agreement and relative unimportance of agreement.
B10-101/11	€24.3m against ABB Mannheim, Alstom Frankfurt am Main, Siemens München, and Starkstrom Gerätebau Regensburg.
B11-20/08	Roughly €9m versus 2 firms (Krüger GmbH & Co, Bergisch-Galdbach and Kraft Foods Bremen) and 2 individuals.
B1-189/13; B1-11/15	€1.43m against Gaul GmbH, Sprendlingen.
B7-50/16	€3.5m against Daheim Liefer-Service, Hamburg, Lesezirkel Brabandt, Aalen, Lesezirkel Dörsch, Nürnberg, Lesezirkel Detlef Krumbeck, Pinneberg, Lesezirkel Die Medien-Palette, Hamm, Lesezirkel „Hettling."
B9-44/14	€17.5m against 4 firms (Fairplay Hamburg, Bugsier Hamburg, Petersen Alpers Hamburg, Schleppreederei Kotug, Hamburg).

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