

Friederiszick, Hans W.; Röller, Lars-Hendrik

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## Quantification of Harm in Damages Actions for Antitrust Infringements: Insights from German Cartel Cases

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## Quantification of Harm in Damages Actions for Antitrust Infringements: Insights from German Cartel Cases

Hans W. Friederiszick, ESMT CA  
Lars-Hendrik Röller, ESMT

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# Abstract

## Quantification of Harm in Damages Actions for Antitrust Infringements: Insights from German Cartel Cases

Author(s): Hans W. Friederiszick, ESMT CA  
Lars-Hendrik Röller, ESMT

This paper argues that empirical economic analysis in court proceedings is subject to important economic and legal restrictions, cumulating in a fundamental trade-off between accuracy and practicality. We draw lessons from two influential German court cases—the paper wholesaler cartel decision of 2007 and the cement cartel decision of 2009. We characterise the trade-offs arguing that they need to be well understood, made transparent, and that decisions on how to proceed in light of these trade-offs have to be taken upfront by the court. In this respect, we believe that the three-step procedure (design, application, and robustness checks) followed by the German court in the cement case is well suited to meet the appropriate legal standard and requirements, both with respect to accuracy and practicality.

**Keywords:** antitrust law, horizontal anticompetitive practices, quantification of damages

**JEL Classification:** L12, L41, K21, K41, C10

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Contact: Hans W. Friederiszick ESMT, Schlossplatz 1, 10178 Berlin, Germany; Email: [hans.friederiszick@esmt.org](mailto:hans.friederiszick@esmt.org).

## 1. Introduction

In Europe, private damages lawsuits in cartel cases have only recently become more prominent. Accordingly, case precedents set in European courts on the quantification of cartel damages are scarce. Given the differences in the legal environments of the US and Europe, the wide-ranging US experiences cannot be transferred directly to Europe.<sup>1</sup> Administrative proceedings do not provide much guidance as in most jurisdictions cartel effects are not needed to determine the level of fines.

By contrast, until recently under German competition law the national competition authority was required to base the level of fines on an estimate of additional earnings, a concept closely related to damages. While these estimates were built on weak empirical and methodological grounds in the past, a stricter review by the courts has forced estimates to be based on a more comprehensive empirical assessment. Notably, two influential court cases emerged that provide insights into quantification of damages claims in court proceedings.

The first court case of interest is a 2007 judgment by the German Federal Court of Justice (“the Federal Court”),<sup>2</sup> which overruled the decision by a Higher Regional Court on how to calculate additional earnings for a regional cartel of German paper wholesalers. In this decision the Federal Court lays out some general principles on how to measure damages in cartel cases.

The second court case is a 2009 judgment of the Higher Regional Court (“the Higher Court”) on additional earnings related to a cartel in the cement industry.<sup>3</sup> In this case the court quantified the additional earnings based on an econometric assessment submitted by court appointed economic experts (the authors).

This paper argues that empirical economic analysis in court proceedings is subject to important economic and legal restrictions, cumulating in a fundamental trade-off between accuracy and practicality. We characterise the trade-offs arguing that they need to be well understood, made transparent, and that decisions on how to proceed in light of these trade-offs have to be taken upfront by the court. In this respect, we believe that the three-step procedure (design, application,

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<sup>1</sup> A prominent example of an expert report submitted in the US context is Bernheim’s testimony on behalf of plaintiffs in the vitamins cartel case (Bernheim 2002). The acceptance of class action and the need for class certification, wide disclosure rules and jury trials are important features of the US legal system which are not common in European proceedings. For their implications on empirical economic analysis see ABA 2005, in particular the chapters on “The Use of Econometric in Class Certification”, on “Data and Disclosure Issues” and on “Econometric Evidence in Jury Trial”.

<sup>2</sup> Judgment of the German Federal Court of Justice (BGH) of June 19, 2007, KRB 12/07. For a comprehensive description of the case see Friederiszick and Röller (2008).

<sup>3</sup> Judgment of the Higher Regional Court (OLG) Düsseldorf of October 8, 2009, VI-2a Kart 2 – 6/08.

and robustness checks) followed by the German court in the cement case is well suited to meet the appropriate legal standard and requirements, both with respect to accuracy and practicality.

The paper is structured as follows: Section 2 reviews the two German court cases. Section 3 presents the potential damages of cartel behaviour and section 4 empirical methods for their measurement. Section 5 reviews the overcharge estimation carried out in the German cement cartel case. Section 6 draws lessons on this experience, and section 7 gives the main conclusions.

## 2. Two German Court Cases

We describe the general principles on how to measure damages in cartel cases as laid down by the Federal Court in the 2007 judgment on the paper wholesaler cartel case. We then describe the 2009 judgment of the Higher Regional Court on the additional earnings related to a cartel in the cement industry.

### **General principles confirmed by the Federal Court**

The 2007 decision by the Federal Court starts by providing a definition of additional earnings (illicit gains) under the applicable German law, which was in force until mid-2005.<sup>4</sup> According to the Federal Court, additional earnings are the difference between actual earnings, earned because of the infringement, and the earnings that would have been earned by a cartel member without the infringement.<sup>5</sup> The Federal Court confirms the legal presumption of positive additional earnings for cartels lasting a long period and being of broad scope. This presumption holds as long as no evidence to the contrary exists.

Regarding the quantification of the additional earnings, the ruling by the Federal Court gives the judge relatively broad discretion.<sup>6</sup> In general, the amount of additional earnings can be estimated by the court. More specifically, the judge is free to choose which methodology is best suited to

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<sup>4</sup> The German notion is “*Mehrerlös*”, which was relevant to calculate the fine. From an economic point of view ‘additional earnings’ or ‘illicit gains’ are roughly the same as the price and quantity effect caused by a cartel, that is, the cartel damage. It is for this reason that the judgment is also of relevance for private damages proceedings. For the relationship between the administrative and the civil procedure see Kammergericht 2009a.

<sup>5</sup> The original paragraph of the decision reads in German as follows: “*Unter Mehrerlös ist nach der Rechtsprechung des Bundesgerichtshofs der Differenzbetrag zwischen den tatsächlichen Einnahmen, die aufgrund des Wettbewerbsverstoßes erzielt werden, und den Einnahmen zu verstehen, die das durch die Kartellabsprachen bevorzugte Unternehmen ohne den Wettbewerbsverstoß erzielt hätte*”, BGH (2007, paragraph 10).

<sup>6</sup> The original paragraph of the decision reads in German as follows: “*Die nach §81 Abs. 2 Satz 2 GWB 1999 eröffnete Schätzungsbefugnis räumt dem Tatrichter einen erheblichen Ermessensspielraum ein*“, BGH (2007, paragraph 12).

approximate *reality in a probabilistic sense*.<sup>7</sup> The estimation has to be conclusive; the results have to be economically reasonable and feasible.<sup>8</sup>

With respect to empirical methods for quantification, the Federal Court holds the view that an approach that compares affected prices with other, non-affected markets or time periods is considered superior to other approaches. Only if a comparison with other markets or non-affected time periods is not feasible is an *overall economic analysis* considered appropriate.<sup>9</sup>

According to the Federal Court, the overall economic analysis consists of an estimation of costs where – again by comparisons to other markets – an average margin<sup>10</sup> is added. To derive an estimate of a competitive price, adjustments are made according to the market structure, buyer power or other relevant factors. This allows an initial cost- and margin-based estimate of the counterfactual price.

This initial estimate can further be adjusted or optimised by cross-checking the results with non-affected submarkets or only partially affected markets. Pricing behaviour in the affected market after cartel inspection could also be used as an additional countercheck of the initial price estimate derived *more abstractly* based on cost and margin calculations.<sup>11</sup>

### **The cement cartel case**

In spring 2002 the national competition authority uncovered a cartel in the German cement sector lasting from 1997 to 2001. In 2003 the competition authority fined the six largest companies a total of €660 million, the largest fine ever for such an infringement in Germany. Several parties appealed against the decision at the Higher Regional Court (“the Higher Court”). In a recent decision, the Higher Court confirmed the cartel infringements, extending the length of the cartel period from 1997 through 2001 to 1991 through 2001. The same decision also extended the geographic scope of the cartel to all German regions. In comparison to the original decision by the national competition authority, the fines were significantly reduced due to the incompleteness of the data on which the fines were based. Several parties appealed against the ruling. The final

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<sup>7</sup> The original paragraph of the decision reads in German as follows: “*Er hat selbst zu entscheiden, welche Schätzungsmethode dem vorgegebenen Ziel, der Wirklichkeit durch Wahrscheinlichkeitsüberlegungen möglichst nahe zu kommen, am besten gerecht wird.*“ BGH (2007, paragraph 12).

<sup>8</sup> The original paragraph of the decision reads in German as follows: “*Sie muss schlüssig sein, und ihre Ergebnisse müssen darüber hinaus wirtschaftlich vernünftig und möglich sein.*“ BGH (2007, paragraph 12).

<sup>9</sup> BGH (2007, paragraph 19).

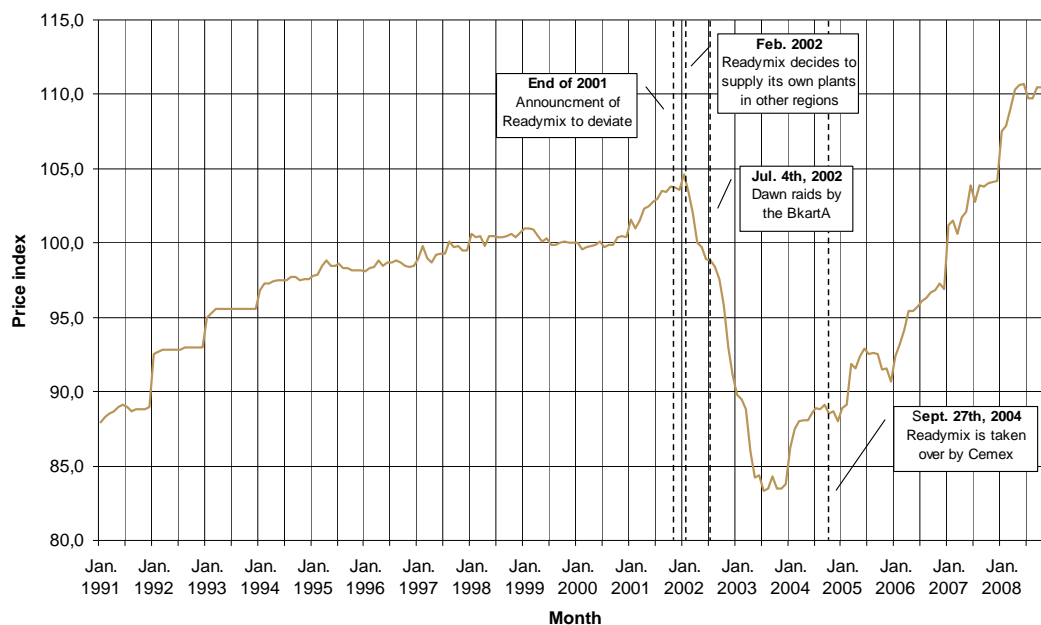
<sup>10</sup> It is debatable whether the concept of average margins is an appropriate shortcut. This seems to us to not be the case in industries with strongly fluctuating margins across individual projects, firms and time.

<sup>11</sup> BGH (2007, paragraph 19 and 20).

decision by the Federal Court on these appeals is still pending. Private litigation is also still ongoing.<sup>12</sup>

The following graph shows the evolution of cement prices in Germany during the alleged cartel period and thereafter.

**Figure 1:** Evolution of cement prices from 1991 to 2009, main events



Source: German Statistical Office; own research.

The main events can be briefly summarised as follows. In 2001, one of the alleged cartel participants announced that it would replace third-party cement used in its vertically integrated concrete plants with cement produced by its own subsidiaries, thereby increasing its market share above the cooperatively agreed shares. At the same time, and supported by two leniency applications (one was filed by the deviating firm mentioned above), the national competition authority carried out dawn raids in mid-2002. In response to these events, competitors reacted with sharp price decreases (price war) in order to re-establish the original market segmentation.

<sup>12</sup> In August 2005 an action for damages was brought before the Regional Court of Düsseldorf (2005). The claimant enforced the claims of 29 injured companies against the six leading members of the German cement cartel. The total damages claim amounts to approximately €152 million (without interest), according to the claimant. Related to private litigation on the German cement cartel, downstream concrete producers in Berlin have also been sued by their customers, i.e. construction firms. Two recent judgments (Kammergericht Berlin 2009a und b) are of interest as they highlight the differences between the administrative proceedings and private litigation proceedings (Kammergericht Berlin 2009a, p.21) and exclude a pass-on defence (Kammergericht Berlin 2009a, p.24). The court awarded around €45,000 to the plaintiff. The decisions are under appeal. This is the second time that a private damages cartel claim has successfully been enforced in a German court. The first successful enforcement was related to the vitamins cartel

Due to cross-regional retaliation strategies prices dropped not only in Eastern Germany – where deviation first happened – but spread across all German regions.<sup>13</sup> Only after 2004, after the deviating firm had been taken over did prices increase again. According to public price figures, it took until 2008 for pre-cartel-breakdown price levels to be reached. Hence, a crucial element for the quantification of the additional earnings was to assess when prices in the post-cartel breakdown period could be considered non-collusive.

Before we discuss the damages calculation carried out in the cement case in more detail we introduce in brief the potential negative effects of a cartel and describe the methods to empirically estimate these.

### 3. Potential Damages of Cartel Behaviour

From an economic point of view, collusion describes a situation where prices of a specific antitrust market (or markets) are raised or attempted to be raised through direct or indirect communication between competitors above a level that would have emerged without communication. Note that the economic definition of collusive behaviour comprises both explicit collusion (based on direct communication and often referred to as a cartel), and implicit (or tacit) collusion. The legal consequences are significantly different of whether a particular behaviour falls into on or the other category, the underlying economic analysis does not differ very much – partially due to shortcomings of economic theory, partially because of similarity in its effects.<sup>14</sup>

The definition highlights the fact that the focus of most damages calculations rest on estimating the **price increase** encountered by customers, rather than quantity or quality effects, for instance.<sup>15</sup> It also highlights the need to first define antitrust markets – to some extent – when carrying out a damages calculation in order to assess the affected volume.<sup>16</sup> Finally, it stresses the

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(LG Dortmund 2004), after a series of settlements in related cases. See BkartA (2005, p.5) for an overview of private damage claims related to exclusionary conduct in Germany.

<sup>13</sup> An internal strategy paper circulated in the press outlines a plan (“operation skunk”) by the other large cement firms to punish the deviator through regionally targeted low price offers, take-over and subsequent asset stripping. See [http://www.welt.de/print-welt/article264894/Operation\\_Stinktief.html](http://www.welt.de/print-welt/article264894/Operation_Stinktief.html), extracted on February 8, 2010.

<sup>14</sup> In fact economists tend to define collusion as related to an outcome (higher prices) more than to a particular behaviour, like explicit communication of prices or market shares. For instance, Motta (2004, p.138) defines collusion as follows: “*In economics, collusion is a situation where firms’ prices are higher than some competitive benchmark. A slightly different definition would label collusion as a situation where firms set prices which are close enough to monopoly prices. In any case, in economics collusion coincides with an outcome (high-enough price), and not with the specific form through which that outcome is attained.*” See also Harrington (2008, p.216).

<sup>15</sup> It is not our position that those effects are irrelevant; they can constitute important elements of damage calculations in cartel cases as well. In comparison to damage calculation of exclusionary conduct cartel cases exhibit a focus on price effects though.

<sup>16</sup> The relevance of market definition in cartel cases is often underemphasised. While market definition is of lesser relevance if a proper assessment of the effects of the cartel is carried out, it becomes highly relevant if the effects of



importance of coming-up with a robust estimate of the price levels without cartel agreement, the counterfactual or **but-for price**.

Before describing the main empirical methods for the measurement of damages in cartel cases, we would like to recall some basic economic principles of cartels.

Most prominently, explicit and implicit collusion rests on the dynamic interaction between firms.<sup>17</sup> Firms condition their future behaviour in the market on the current behaviour of competitors. For instance, firms may threaten to revert to ‘cut-throat competition’ for some period in the future in reaction to a competitor’s deviation from collusive price levels. This type of dynamic interaction allows firms – if implemented effectively – to maintain prices at levels close to monopoly prices and significantly above what unilateral conduct alone would allow.<sup>18</sup> Dynamic price stabilisation can be reached either through direct communication – which is the legal prerequisite for a cartel infringement – or through coordination via observing and following other firms’ behaviour in the market.<sup>19</sup> The latter is referred to as tacit coordination or coordinated effects, and is assessed within dominance assessments or merger proceedings, but is not considered a cartel agreement.

Cartels can breakdown, or not emerge, due to several factors. Most importantly, cartels need to avoid internal and external destabilisation. Internal destabilisation describes a situation in which one of the cartel members deviates from the price agreement. External destabilisation can happen when a non-cartel member (a foreign firm or a firm active in a neighbouring product market) competes with or enters the affected market. A cartel can also be externally destabilised by customers with buyer power.<sup>20</sup> Finally, the incentives for firms to engage in cartel activity are affected by competition policy law and its anticipated enforcement.

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the cartel are only presumed – as for example in European administrative proceedings. In our view more effort is required in those cases in order to come up with a sound understanding as to which customer groups are affected and which not. For instance larger customers might have additional supply channels available outside the sphere of influence of the cartel, and might, hence, be unaffected by collusion.

<sup>17</sup> Ivaldi et al. (2006). Equally, (repeated) interaction across markets or products might allow collusive outcomes to emerge. See Bernheim and Whinston (1990) for an analysis of multi-market contact games and Milgrom and Roberts (1982) for a seminal work on entry deterrence in markets with interaction across regional markets.

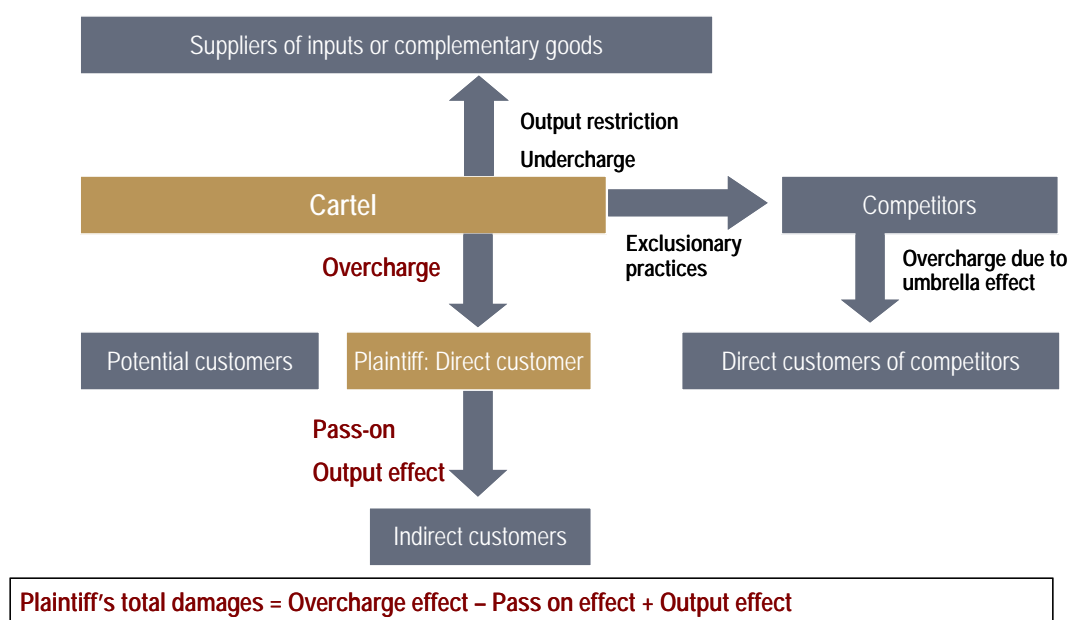
<sup>18</sup> A simple test to distinguish price increases due to unilateral conduct from price increases due to collusive behaviour is whether a single firm has an incentive to lower prices given the prices of its competitors. If the firm has an incentive to lower prices collusive behaviour is the cause. It is not possible however to distinguish between explicit collusion (i.e. a cartel) and implicit or tacit collusion based on economic effects only. For an overview of the economics of collusion, see Motta (2004), Ivaldi et al. (2006) or Davis and Garcés (2010).

<sup>19</sup> There is a rather fine delineation line between direct communication of market shares or prices sufficient to prove a cartel and indirect communication (via the marketplace). Motta (2004, p.189), for instance, considers communication between firms which is based on unilateral behaviour of the firms not sufficient to form part of a hardcore violation. A careful discussion of different forms of collusion and their grading from a competition policy perspective is given in Kühn (2001). See also Davis and Garcés (2010, p.315).

## Potential damages

The economic literature identifies a broad set of potential damages due to collusive behaviour by firms.<sup>21</sup> Figure 2 provides an overview of the main effects. From the perspective of a direct customer there are three main effects: higher prices<sup>22</sup> on observed sales (normally labelled overcharge or in legal terms actual loss or *damnum emergens*), an opposing pass-on effect (that is the fraction of the overcharge which is passed on through higher prices to indirect customers) and the quantity effect, which is the forgone benefit (in the form of utility in consumption or profit when resold to the final customer) that customers would have realised in additional sales at the counterfactual price level.

**Figure 2:** Potential damages caused by a cartel



Source: author's calculation.

As illustrated in Figure 2, there are several other parties affected by a collusive agreement.

<sup>20</sup> Harrington and Chen (2006).

<sup>21</sup> Cartels may also result in positive effects to customers (so-called efficiencies), like, for instance, lower transportation costs or higher supply reliability. These effects – if significant in a particular case – have to be balanced against the potential negative effects to customers to calculate the factual damages.

<sup>22</sup> We abstract here from effects related to product quality. Cartels may also lower or – for some customers – increase the quality of the products delivered. For the purpose of this paper prices should be considered 'quality adjusted prices', that is, prices at a constant quality level. We also abstract from the dynamic affects of collusion, like lower levels of innovation or the occurrence of x-inefficiencies in the long run.

First, there are potential customers who would have purchased at the lower competitive price but did not purchase at the cartel price (this is a further dimension of the output effect). Potential customers forgo the benefit of additional sales in the form of utility in consumption or profit when resold to the final customer in a competitive environment. In legal terms both variants of the output effect – the lower consumption by existing customers and the non-consumption by potential customers – are labelled loss of profit or *lucrum cessans*.

Second, an equivalent effect occurs for upstream suppliers.<sup>23</sup> By exercising buyer power a cartel may enforce lower input prices upstream. Depending on the specific market conditions, input price reduction may be enforced by the cartel through output contraction affecting both existing and potential suppliers.<sup>24</sup> Moreover, upstream suppliers may (partially) pass-on the worsened sales conditions to their own upstream suppliers.<sup>25</sup>

Finally, exclusionary practices may affect (potential) competitors outside the cartel. Competitors in the same relevant market that are not participating in the cartel agreement, or potential competitors in related product or neighbouring regional markets, are potentially affected by exclusionary practices. The opposite can also happen: competitors outside the cartel could benefit by softened competition, enjoying higher prices due to the cartel (the so-called umbrella effect).<sup>26</sup>

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<sup>23</sup> Suppliers of complementary products can be considered input suppliers in some instances (and hence have been depicted jointly in Figure 2). Yet some differences might exist. For instance, suppliers of complementary products who have direct access to end customers and where customers do not consume the complementary products in fixed proportions might be less affected by collusion in the neighbouring markets (or might even benefit).

<sup>24</sup> Buyer power can be exercised in a number of ways. In markets with an institutionalised, liquid market place, like a commodity exchange, the cartel can enforce lower prices simply by output contraction: a reduction of overall demand results in oversupply, which requires price reductions for market clearance. In contrast, in a bilateral bargaining situation an overall output reduction is not needed to enforce lower prices. In these situations the supplier and the buyer negotiate prices individually. The increased bargaining power of the cartel is given by a reduction (or a less profitable) alternative for suppliers in case negotiations with the cartel breakdown (see Blair and Harrison, 1993), Dobson et al., 1998, and Inderst and Mazzarotto, 2008).

<sup>25</sup> For a detailed discussion on how cartel damages propagate across the supply chain, see Han, Schinkel, and Tuinstra (2008).

<sup>26</sup> In this paper we focus on the exploitative effects of a cartel and the methods for quantification. In general, analogous methods exist for exclusionary practices. Three main differences may be worth pointing out. First, effects on customers may vary across phases of conduct (or across different customer groups). For example, in predation, prices are low initially and then high during the recoupment phase. Second, different exclusionary strategies exist (e.g. tying or bundling strategies, conditional rebates, or refusal to supply strategies), resulting in more case specific empirical approaches for estimating the damages. See, for instance, the EC Guidance and staff discussion paper on Art. 82 (EC 2005 and 2009). Third, market structure, which in cartel cases is often assumed to be unaffected by the conduct, is by definition affected by exclusionary practices. This results in additional challenges for the empirical methodology.

## 4. Empirical Methods for Quantification of Damages

There are a large number of empirical approaches to quantifying damages caused by a cartel.<sup>27</sup> We follow the categorisation put forward by the Ashurst report (2004), primarily because it is in line with the terminology used by most stakeholders.<sup>28</sup>

- **Before and after approaches** compare prices during the alleged cartel period with prices before a cartel agreement was reached and/or after a cartel breakdown (we refer to the ‘during and after approach’ if no cartel-free period before the infringement took place is available). Before and after approaches can be carried out by a simple comparison of average prices between the periods or by more sophisticated econometric tests in order to control for changes in other market conditions.<sup>29</sup> The main difficulty for these approaches is to establish the exact cartel period. Moreover, one needs to determine when the post-cartel breakdown data can be used as well (see the discussion on price wars in the cement cartel case).
- **Yardstick approaches (in the narrower sense)** compare the price in the cartelised region with prices in other geographic regions which are not affected by the cartel (regional benchmark). Specific challenges are to control for differences in the various regions and to exclude indirect effects of the cartel, e.g. the umbrella effect, if neighbouring regions are used as benchmarks. Alternatively, when product markets exist with comparable market characteristics, they may be used as a yardstick (product market benchmark). Note that empirical applications can cover the spectrum from simple average price comparisons to complex econometric estimations. Also note that both before and after methods and yardstick approaches can be considered in a unified empirical framework.<sup>30</sup> As a result, we refer to the combination of the two approaches as **yardstick approach (in the broader sense)**.

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<sup>27</sup> An overview of the various methods can be found in Ashurst (2004) or van Dijk and Verboven (2007). Applications of these methods to cartel cases can be found in Connor (2007). See also Baker and Rubinfeld (1999) for a discussion within the US legal context.

<sup>28</sup> Nevertheless, we did adopt the terminology slightly for the purpose of this paper. We excluded price predictions/econometric methods, since in our view econometric methods can play a role in all approaches depending on data availability, resources and time frame. We also combine “before and after approaches” with “yardstick competition” under ‘yardstick competition in the broader sense’.

<sup>29</sup> Two frequently applied methods are the so-called dummy variable model and the out-of-sample prediction approach. The dummy variable approach introduces an indicator variable for collusion. The out-of-sample prediction predicts prices during the alleged cartel period based on prices from the periods before and after the cartel period (or from other regional or product markets). In this way it does not rely on data from the infringement period, and is thereby immune to criticism that the cartel affects other parameters (such as costs). By contrast, the dummy variable method uses more information. See for instance Davis et al. (2010, p.356).

<sup>30</sup> For instance, one might have relevant data on various regions (some affected by the cartel, others not) over a long time period (longer than the cartel lasted). In this case, these data can be explored in a single empirical approach,

- **A cost-based approach** constructs the but-for price ‘bottom up’ by measuring the relevant costs of the affected product and adding a reasonable profit margin (which would emerge under normal market conditions). The main difficulty of this approach is in finding robust cost estimates, since accounting costs do not generally reflect economic costs. Competition authorities, courts and customers often lack a proper understanding of such robust cost measures. A further difficulty is the assessment of a reasonable profit margin, which requires a proper understanding of competition absent the cartel and may require the empirical assessment of firm- or product-specific margins.
- **Simulations (theoretical modelling)** is closely related to cost-based approaches as it often requires some cost information. However, this methodology uses an explicit model of competition, which is used to ‘simulate’ the profit margins. In addition to data on costs, simulations thus require information on market structure and demand (such as demand elasticities). As before, various empirical techniques exist to implement this: individual parameters of the theoretical model can be adjusted to replicate the known facts of the industry.<sup>31</sup> Alternatively, one may estimate the parameters econometrically, which is more demanding with respect to data.<sup>32</sup>

An alternative categorisation of methods is provided by the recent study commissioned by DG COMP<sup>33</sup>. The authors differentiate between three main approaches: comparator-based approaches (roughly mapping into the yardstick approaches defined above), financial-analysis-based (related to cost-based approaches, but extended to the various evaluation methods used by financial analysts) and market-structure-based approaches (mainly referring to theoretical modelling as defined above).

## 5. Overcharge Estimation: the German Cement Cartel

We summarise in brief the main facts and the methodology used to estimate the additional earnings in the German cement cartel case.

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called panel data analysis or difference-in-difference estimation. See, for instance, Simpson and Taylor (2008) for the application of a difference-in-difference method on a merger in the US gasoline market.

<sup>31</sup> Setting parameters in such a way that the model replicates the real world is called calibration. Parameters can also be taken from other studies of the same industry, so-called extraneous estimates.

<sup>32</sup> This is referred to as structural empirical modelling. See Reiss et al. (2007) and our brief discussion below. A variation of this technique is to test which theoretical model best fits the data, or like Harrington (2008, p.227) to put “*collusive and competitive models into a horse race to determine which better fits the data.*”

<sup>33</sup> Oxera and Komninos (2009).

In November 2008, the authors were commissioned as court experts to propose a methodology and subsequently to quantify the additional earnings. Determining whether or not collusion occurred was not part of the assignment. The final assessment was presented during an oral hearing in June 2009.

Procedurally, the court's approach can be characterised by a three-step process: *design*, *application* and *robustness checks*.

The *design* step consisted of proposing an empirical method for an overcharge estimation, such as before and after, yardstick (regional benchmark), cost-based approaches or simulation. In the end, yardstick approaches (regional benchmark) were discarded, due to the high likelihood of cartels in all of the neighbouring countries. Moreover, most other European countries have had very different exposure to low-price imports from Eastern Europe and considerable differences exist in market structure and population density. Yardstick approaches based on data from other product markets were also discarded, because of limited comparability.

As a result, a “**during and after approach**” was ultimately chosen, comparing the prices during the cartel period with prices after cartel breakdown. Important details such as how to take into account the price war period post-cartel breakdown, whether to take into account quantity effects and whether to collect regional price data from the parties in order to refine the methodology were discussed both in written format and during oral hearings. The design methodology of a “during and after approach” was chosen by the court at the end of February 2009.

In the following weeks, the *application* step was carried out. A first version of our testimony was put forward in writing on May 7, 2009, and presented orally on May 15, 2009. Smaller changes were communicated in memos and the underlying data sources (raw data and statistical codes) were submitted to the court and the parties.

The third step – *robustness checks* – allowed the various parties (the defendants and their economic and legal experts, the public prosecutor and the national competition authority) to put forward additional questions and comments. On the basis of the first version of our testimony and the underlying raw data this was done both in writing and orally. During two subsequent oral hearings those questions were discussed and – where appropriate – adjustments and checks to our assessment were made.

A final version of the testimony and a CD ROM with all data and programmes used for the final assessment were submitted to the court and the parties. The final testimony also contained a detailed description of the data and variables used (for example, the demand and supply factors which influence German cement prices). Controversial issues – such as an assessment of the price

war period – were discussed, together with numerous robustness checks and sensitivity analysis. An overall assessment of the robustness of our findings was presented, taking into account the plausibility of the estimated results, the robustness of the estimated effects and the quality of the underlying data. In order to keep the number of alternative estimates manageable some scenarios were withdrawn to the benefit of the defendants. Finally, the plausibility of the empirical results was cross-checked with the court’s understanding of the cartel’s effectiveness as well as with overcharges in historical cartel cases in Germany. In the final decision, the court applied a 25% discount margin to our estimate to account for any remaining uncertainties within the estimations.

## 6. Lessons from the German Cement Case

In this section we put forward some key points learned from the German cement case. We argue that empirical economic analysis in court proceedings is subject to some important trade-offs. Those trade-offs have to be well understood, made transparent, and decisions on how to proceed in light of those trade-offs have to be taken upfront by the court. In this regard, we welcome the three-step procedure (design, application, and robustness checks) followed by the court in the German cement case.

Below, we structure our discussion of the trade-offs into general trade-offs, followed by trade-offs of an economic nature and finally trade-offs of a legal nature. While some of the trade-offs can be linked more to economic methodology and others to legal aspects, it is important to keep in mind that it is the legal constraints (burden and standard of proof, etc.) that define the economic approach (scope of data collection, methodology, level of sophistication, etc).

### **General trade-offs**

A central theme when discussing the relative benefits of different empirical methods is the trade-off between accuracy and practicality. For clarity we define these two notions:

There are two dimensions to being accurate in a probabilistic world. The first is to be correct *on average*, which in statistics is referred to as **unbiased**<sup>34</sup>. In other words, the methodology is unbiased if it delivers on average the correct estimate. Note that being right on average does not necessarily imply that your estimate is necessarily close to the truth: you could be over or underestimating the correct damages by a lot, while still being on average correct. This second

dimension of accuracy – being close to the truth – is called **precision** in statistics (or efficiency of the estimator).<sup>35</sup>

***Definition of accuracy:** accuracy describes the potential of a methodology (an estimator) to deliver unbiased and precise estimates of ‘true’ damages.*

Note that in the above definition, we abstract away from the trade-off between bias and precision. In principle an estimator with a small bias but high precision might be superior to an estimator which is unbiased but very imprecise.<sup>36</sup> This is related to the debate surrounding structural economic models. The more economic assumptions from economic theory are imposed on the estimation, the more precise the estimates obtained. Albeit, the result will be biased if the assumptions are incorrect.<sup>37</sup>

Let us also state that this definition assumes a state-of-the-art execution of the methodology under discussion. Hence, we abstract from questions related to the quality of the expert and his capabilities to execute the methodology.<sup>38</sup>

***Definition of practicality:** a methodology is practical when it yields a verifiable and transparent estimate within a reasonable timeframe and with proportional resources.*

In empirical work, the property of verifiability and transparency depends a great deal on data submission and presentational style. The provision of raw data, documentation of any

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<sup>34</sup> In econometrics an unbiased estimator describes an estimator with an expectation value, or mean, that is the true population parameter one is trying to estimate. In other words, that if the empirical experiment is repeated sufficiently often on average the unbiased estimator yields the true population mean. Griffiths et al. (1993, p.81)

<sup>35</sup> Precision of an estimator tells us, in a probabilistic sense, how much the estimates from that estimator can vary from sample to sample. The lower the variance of an estimator the greater the (sampling) precision of that estimator. Griffiths et al. (1993, p.213)

<sup>36</sup> Statistical measures do exist which provide guidance for empirical economists on how to resolve this trade-off. For instance, the mean square error is the sum of the (squared) bias and the variance of the estimator. An estimator which minimises the mean square error may achieve that by allowing some bias to the benefit of precision. Griffiths et al. (1993, p.312). This trade-off is most visible in the debate between so-called parametric versus semi- or nonparametric estimations methods. Semi- or nonparametric estimations do not – in contrast to parametric approaches – presume (or at least to a lesser extent) the functional relationship between the variables of interest. The higher flexibility comes at a price though. First, estimation precision decreases rapidly as the number of explanatory variables increases. As a result, impracticably large data sets are required. Second, nonparametric estimations do not permit extrapolation thereby excluding predictions from the cartel-free into the cartel-affected period. Finally, it is difficult to impose restrictions on the estimates. While partial solutions to these shortcomings do exist, these also come with more assumptions imposed on the statistical methodology. See Horowitz (2009) for an introduction on this topic.

<sup>37</sup> This is the debate on structural vs. non-structural empirical estimations. According to Reiss et al. (2007) “economists refer to models that combine explicit economic theories with statistical models as structural econometric models”. There exists all type of intermediate types through blending some form of economic theory with statistical models. Reiss et al. (2007) also provide a careful discussion on the pros and cons of structural empirical models and how and when to apply them. The opposite extreme to structural empirical estimation is an approach focussing predominantly on the predictive power of the estimated benchmark model. Within such an approach predictors are selected “based on their ability to improve the forecast accuracy of the econometric model during the benchmark period” (White et al. 2006), that is, the choice of the included variables is driven predominantly by their statistical properties.

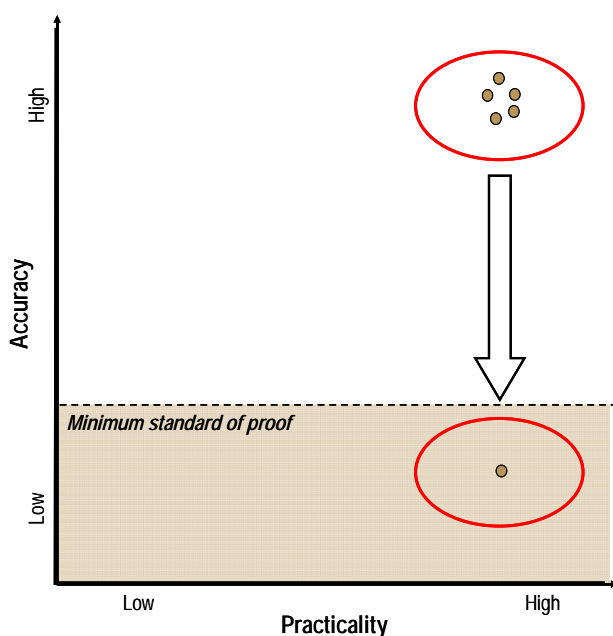


adjustments made to the data, and the statistical routine used to derive the results allow a direct replication of the results by a second expert and enable sensitivity checks and the estimation of alternative empirical models. Even complex methods can be communicated so that the underlying empirical test idea and assumptions become verifiable for non-experts; best practice rules exist on how to present empirical results in such a way that they can be verified by an expert.<sup>39</sup>

Regarding timeframe and proportionality of resources it has to be noted that huge differences exist; the key determinants of which are data collection and data cleaning. We will come back to that point.

As mentioned, we argue that there is a fundamental trade-off between accuracy and practicality that may emerge in empirical work. The following graph depicts this trade-off between accuracy and practicality. The shaded area indicates the minimum standard of proof to be met by a specific methodology.<sup>40</sup>

**Figure 3:** The trade-off between accuracy and practicality (each dot refers to a methodology)



Source: author's calculation.

With an appropriate methodology and sophistication, many empirical methods do gain accuracy. In other words, the above trade-off exists as a matter of fact in many situations. This may also

<sup>38</sup> See the US debates on the Daubert procedure.

<sup>39</sup> European Commission (2010), Davis and Garcés (2010, p.13) or Reiss et al. (2007).

<sup>40</sup> The level of the standard of proof depicted in this graph and in the following graphs is for descriptive purposes only. It does not intend to reflect the factual standard or ranking of standards in a particular case or country.

imply that judges and lawyers may find it difficult to fully comprehend the proposed methods. This is not uncommon in other areas – a testimony assessing, say, the causes and damages caused by a car accident (typically carried out by a specialised engineer) also contains elements that are not understandable without profound expert knowledge. The key is that the expert must be in a position to explain the logic and plausibility of the approach taken. Nevertheless, there is a conflict between the objective of practicality (in particular, verifiability) and accuracy. In our view, this implies that judges should demand significant accuracy, while making sure that the procedural aspects of empirical economic analysis are strengthened.

It may also be that there are cases where no accurate empirical estimate is possible within a reasonable timeframe or with proportional resources. The legal system requires a careful discussion of how to proceed in such cases. For instance, under German law applicable to the cement case, only a very low overcharge relative to average cartel overcharges can be imposed on firms if an estimation is not possible.

On the other hand, there are situations where a specific method is both practicable **and** results in highly accurate results (in Figure 3 this is symbolised by the upper-right circle). The so-called difference-in-difference method used in the context of a sound benchmark might be one example of such a methodology.<sup>41</sup>

More generally, both accuracy and practicality depend on specificities of the case and on data availability. For instance, the difference-in-difference approach will not meet any plausible legal standard if no sound benchmark is available (this is indicated by the lower-right circle in Figure 3). Nevertheless, economists should provide some *prima facie* guidance on the pros and cons of different methods. For instance, yardstick approaches (labelled comparator-based in the nomenclature of the DG COMP study) are in our view – and in line with the judgment of the Higher German Court in the paper wholesaler cartel case – usually more robust than cost-based approaches: cost measures are often less transparent than measures of prices, and ergo more difficult to verify.<sup>42</sup>

Plausible niche applications do exist for some methods, however. For example, cartel simulations may play an important role for a first risk assessment (from the perspective of a defendant) or a

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<sup>41</sup> A sound benchmark is one that is affected by changes in demand, costs or market structure to the same extent as the affected market but for the conduct under assessment. For an application of the difference-in-difference approach in the field of merger control see, for example, Simpson and Tayler (2008). Indeed, this is related to a broader empirical principle that changes in variables (i.e. differences) can often measure effects more accurately than absolute values.

<sup>42</sup> Specific problems arise when assessing cost data. First, customers typically do not have access to their suppliers' cost data. They do, however, have information on prices from their invoice files. Second, the assignment of fixed costs to various product categories offered by a firm is not trivial in most instances.

first damages model (from the perspective of a plaintiff). In addition, cartel simulation might play a particular role for local markets with different market structures.<sup>43</sup>

### **Trade-offs from an economist's perspective**

The general trade-off between accuracy and practicality translates into several specific but important trade-offs on how to tailor the empirical economic analysis.

Often, the most cumbersome work in empirical economics is data collection and cleaning. Hence, an important decision is whether one can work with **publicly available data or with data provided by the parties**. Working with data provide by the parties often allows for the collection of much more disaggregated data (transaction data vs. annual data; price data on specific products vs. average prices across all product categories; regional data vs. national data). More disaggregated data result in a higher accuracy of the estimates.

On the other hand, beyond easy accessibility, publicly available information does have some advantages over data provided by the parties. First, public data offer a consistent data source that allows cross-firm comparisons and includes information on firms not participating in the proceedings. Second, they are not prone to ex post strategic data manipulation. Third, the period of data collection is significantly shortened.

A further important design question is **on the number of variables included and – related to this – the number of methods applied in parallel**. Consider the question of the number of variables, which is subject to a number of trade-offs. Prices are determined by many factors, including cost and demand shifters as well as market structure. Collecting information on all of these factors would result in significant data collection. Moreover, the introduction of many variables relative to the number of data observations will reduce the accuracy of the estimates. On the other hand, the omission of important variables could result in biased estimates (less accuracy).

Hence, a careful selection is important as included variables need to be based on an assessment of the economics of the industry and tailored to the specific needs of the methodology. For instance, in the cement case, several explanatory factors followed a simple linear time trend or were highly correlated. As the individual impact of those variables was not of interest for our assessment, the inclusion of representative variables controlling for the combined effect was sufficient and

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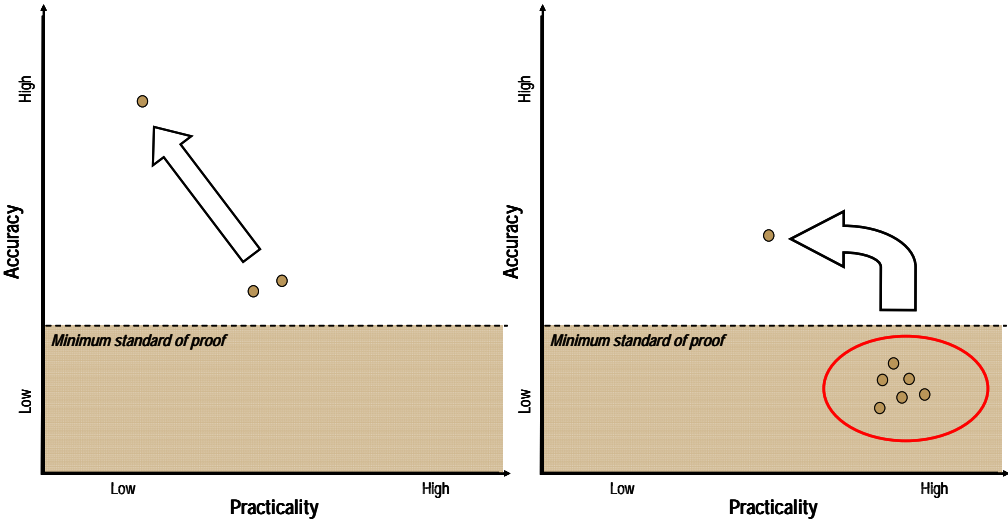
<sup>43</sup> The reason for this is that cartel simulations do allow the calculation of firm specific margins depending on local market structure. In industries where markets are regional and local concentration varies, cartel simulation might

allowed us to pursue the assessment with a relatively small data set based on publicly available data.

Questions of time and effort (i.e. practicality) versus accuracy will determine whether several different methods in parallel are applied. From an accuracy perspective, applying as many parallel methods as possible is desirable. From a practicality viewpoint, this is not so.

Consider, for instance, a situation depicted in the graph on the left in Figure 4, where two methods are available, both of which are sufficient to meet the minimum required legal standard at a significant tolerance. By executing both methods one can still achieve a higher level of accuracy but at the cost of lower practicality, as indicated in the graph by the arrow. In this situation a sequential approach seems plausible: starting with the most promising method – in the cement case this was the during and after approach – and only if this method does not result in an outcome which is sufficiently accurate to meet legal standards is an alternative method carried out. Such a sequential approach seems to us superior to a “try all” approach, at least in those instances where each method requires a significant effort when executed.

**Figure 4:** Potential effects of parallel application of methods (each dot represents a method)



Source: author’s calculation.

Consider another situation where several simple (high practicality) methods are available. In this case, it makes sense to pursue several methods in parallel, jointly reaching the required legal

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provide helpful guidance on average margins. This relates to the earlier point that working with ‘changes’ may be

standard at a sufficient margin as indicated in the right-hand side graph of Figure 4. A word of caution is in order as to whether various “weak” methods are so much more informative than each method separately. In general, this depends on the amount of independent information on the underlying facts of the case. However, torturing the same low quality data with various alternative methods may not result in a more informed assessment of the damages.

In the cement cartel case, the second most plausible method – a cross-region price comparison controlling for differences in cost and demand factors between countries – would, in our view, have resulted in significant additional costs (in the form of time and effort) and potentially would not have added additional insights given the ambiguity of cartel conduct in the comparator countries.

In sum, whether a sequential or parallel approach is taken depends on the particular circumstances of the case. It is important though to decide early in the process which approach to follow, otherwise a dispute on the method may arise. A veil of uncertainty on the outcome of each methodology allows a consensus between parties with conflicting interests on what is considered the superior methodology.<sup>44</sup>

A third important design element is **the right counterfactual**; that is, what would have been the price during the alleged cartel period absent the cartel. There are three variations of this issue, which we address in turn.

An initial legal question is whether to take market concentration into account when assessing the counterfactual price. While this seems obvious from an economic perspective, it has significant implications for the empirical analysis. While unilateral price effects would have to be accounted for, it may also be an issue as to whether coordinated effects apply when assessing illicit gains: from a welfare perspective coordinated effects can be as damaging as explicit coordination. A further issue in this context is whether an alternative market structure would have emerged in the counterfactual without cartel.

One further variation of the right counterfactual is related to the inter-temporal (as well as cross-sectional) relationship between prices during and after the cartel period. For instance, Harrington<sup>45</sup> has argued that prices post-cartel are set higher than a scenario without the cartel, since firms know that damages will be calculated based on the price difference before and after

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better than absolute levels.

<sup>44</sup> A further argument in favour of the application of multiple methods is that the application of a single predictable methodology may result in an attempt by firms to influence the outcome of estimated overcharges, see Harrington (2004). However, this argument supports the position to not always use the same method across all cases. It does not support the view to always go for multiple methods in each individual case.

<sup>45</sup> See Harrington (2004).

cartel breakdown. This argument may be more prone to the US environment since in Europe fines are not based on a before and after methodology<sup>46</sup>, nor does private enforcement currently apply such an approach consistently. For the cement cartel case, the argument of inter-temporal dependence becomes more important with respect to the price war period post-cartel breakdown: most likely, without cartel conduct no price war would have happened. Hence, the low prices during a price war are not a proper competitive comparator. This was taken into account by partially excluding the price effects of the price war through a set of specific variables.<sup>47</sup>

A final variation on the right counterfactual design is whether other market distortions have to be taken into account. In the cement case the parties argued that prices in East Germany would have been below normal competitive price level for some time due to dumping from Eastern Europe. The parties argued that the cartel only pushed back the prices to normal price levels and hence – despite having a positive impact on prices – did not result in positive overcharges. This argument was rejected by the court.

### **Legal aspects and trade-offs**

Leaving the question of the right counterfactual behind, another important trade-off arises with respect to cartel-affected comparator markets. For long-lasting cartels it is often difficult to find clean comparable prices. For instance, in the cement cartel case the court extended the cartel period backwards from 1997 to 1991. As a result, previous overcharge estimations which were based on a comparison of prices from 1991 to 1997 to prices from 1998 to 2001 were invalidated by the extension of the cartel period by the court. Neighbouring countries or comparable products were either prone to cartelisation or were too different.

Focussing on accuracy, markets where there is an indication of cartelisation are likely to be excluded as comparator markets. However, markets with proven effective cartel periods are still informative, as they can be used to benchmark an alleged cartel price against a (proven) monopoly price. A significant difference would indicate a less effective cartel in the affected market. If alternative methods are not available it might be appropriate to use this information.

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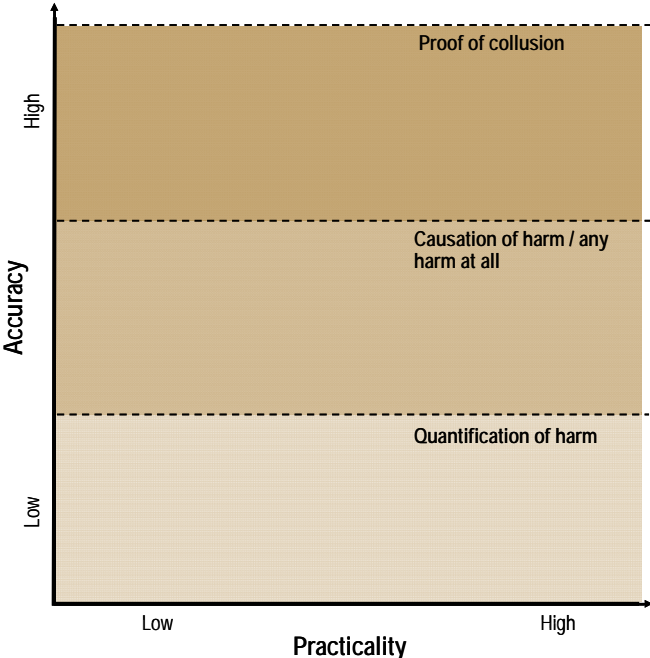
<sup>46</sup> In Europe the effects of a cartel are only indirectly taken into account when assessing the level of fines. For instance, the gravity of the infringement (which determines the basic amount of fines) is decided by factors like the nature of infringement, market shares, regional scope or implementation. See the Guidelines on the method of setting fines, European Commission (2006).

<sup>47</sup> A price war situation can describe the end of a cartel or, alternatively, can be part of its ‘normal’ functioning. Green and Porter (1984) for instance argued that in industries with high demand uncertainty price war situations may arise during an ongoing cartel agreement. Cartelists can not distinguish in those industries between low demand situations caused by cheating behaviour of other cartelists and low demand situations caused by the business cycle.

More generally, the trade-off is whether the potential bias that is introduced by wrongly including a cartel-affected market into the group of cartel-free comparators or a cartel-free market into the group of cartel-affected markets is too large, offsetting the advantage of additional observations.

While the question of whether to include cartel-affected comparator markets in the analysis is more a detailed methodological question, the legal **standard of proof** as well as the distribution of the **burden of proof** are core issues that determine the legal environment in which an overcharge estimate is to be used.

**Figure 5:** Different standards of proof



Source: author’s calculation.

As depicted in Figure 5, significant differences exist in standards across different legal aspects (as well as across various countries). Recall the widespread belief in economics that empirical findings are not sufficient to prove cartels.<sup>48</sup> Evidence of explicit communication is required to meet any meaningful standard.<sup>49</sup> The legal requirement to have a proof of communication to find

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In order to keep the collusive agreement intact, prices are drastically reduced in low demand situations to make cheating unattractive.

<sup>48</sup> See for instance Motta (2004, p.189) or Kühn (2001). It remains to be seen whether under the more effects-based approach under Art.82 and competition policy in general this wide-shared belief in economics is overruled. See Davis and Garcés (2010, p.316) for a discussion leaning – it seems – towards a more interventionist approach and Röller (2008) for a more sceptical view on exploitative abuses.

<sup>49</sup> Economics may play a much more important role for guiding the competition authorities’ priorities in carrying out dawn raids. While broad “fishing expeditions” are considered extensive, the legal standard to be met to justify dawn raids is relatively low. See Friederiszick and Maier-Rigaud (2008).

a cartel may make sense from a practical perspective. If such an approach is pursued, the role of economics is limited to the steps following the finding of a cartel (which may still have been ineffective). In the cement cartel case we were assigned to quantify the overcharges, certainly not to prove collusion. The judge was free to estimate the illicit gain as long as the result was conclusive and economically reasonable and feasible. Similarly, in private actions for damages, high standards of proof exist for an infringement and whether any harm was inflicted at all, while the standard of proof for quantifying the harm is lower. Once harm has been shown, judges can estimate the quantity of harm at a lower standard.<sup>50</sup>

The legal standard has important implications for the economic analysis and its trade-offs: a higher legal standard may require more accurate economic analysis, for example by collecting transaction level data and, eventually, pursuing several methods in parallel. This results in significant additional effort and cost. To this end courts need to be upfront and transparent as to the objectives of economic assessment and the relevant legal standards.

Turning to the burden of proof, one element that is important for economic analysis is who has access to data. For instance, the question of whether the parties have earned an overcharge at all can under German law be presumed by the judge (elements of this are whether the cartel lasted for a long time, exhibited a comprehensive internal organisation and was applied across all relevant regions, etc.; see earlier discussion of the paper wholesaler cartel). It is up to the parties to rebut this presumption.

Another aspect crucial for the proper functioning for economic analysis in court proceedings is the guidance that the economic expert gets from the court. For instance, in the cement cartel case the court decided – after a comprehensive debate with the expert and the parties – to pursue a during and after approach (i.e. to exclude cross-region and cross-product comparisons). Other important decisions were taken by the judge in light of the economic trade-offs discussed above, such as to exclude the price war period, to collect regional data, etc. In this regard, the three-step procedure can be instrumental in maximising the effectiveness of the economic analysis.

Guidance by the court could also be provided with regard to the effectiveness of the cartel. Providing the economic experts with an assessment of the effectiveness of the alleged cartel across various regions would enable the experts to cross-check their empirical findings.

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<sup>50</sup> See e.g. § 287 of the German Code of Civil Procedure.



Finally, discounting the estimates of the damages by the court are helpful instruments to balance the trade-off between accuracy and practicability. However, this should be applied carefully so that the estimate does not become superfluous.<sup>51</sup>

## 7. Conclusions

This paper argues that empirical economic analysis in court proceedings is subject to some important trade-offs, in particular the trade-off between accuracy and practicality. Those trade-offs have to be well understood, made transparent, and decisions on how to proceed in light of those trade-offs have to be taken upfront by the court. In this respect, we believe that the three-step procedure (design, application, and robustness checks) followed by the court in the German cement case is well suited.

Overall, we argue that within the right legal environment both conceptual and empirical economic work can meet the requirements of sufficient accuracy and practicality. Its implementation throughout a diverse European landscape requires certain efforts from both economists and lawyers. Lawyers (and judges) have to be at ease with empirical economic analysis, even if parts remain within the economic black box. Economists need to be aware of, and able to work within, legal and institutional trade-offs.

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<sup>51</sup> A word of caution is also required for simple presumptions on overcharges in cartel cases. The empirical evidence of existing overcharge estimations suggests a high variation of overcharges across various cases, highlighting the need for case specific estimates (see Bolotova et al. 2009).

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ESMT  
European School of Management  
and Technology GmbH

Schlossplatz 1  
10178 Berlin  
Germany

Phone: +49 (0)30 212 31-1279

[www.esmt.org](http://www.esmt.org)