Journal of Competition Law & Economics, 6(3), 595–618
doi:10.1093/joclec/nhq008
Advance Access publication 30 July 2010

QUANTIFICATION OF HARM IN DAMAGES ACTIONS FOR ANTITRUST INFRINGEMENTS: INSIGHTS FROM GERMAN CARTEL CASES

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ABSTRACT

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 characterize the trade-offs arguing that they need to be well understood and made transparent, and that decisions on how to proceed in light of these trade-offs need 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.

JEL: L12; L41; K21; K41; C10

I. 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 United States and Europe, the wide-ranging U.S. experiences cannot be transferred directly to

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Europe.[1] Administrative proceedings do not provide much guidance, as in most jurisdictions cartel effects are not needed to determine the magnitude of fines.

In contrast, until recently, under German competition law, the national competition authority was required to base the magnitude 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"),[2] 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 laid 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.[3] 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, culminating in a fundamental trade-off between accuracy and practicality. We characterize the trade-offs arguing that they need to be well understood and made transparent, and that decisions on how to proceed in light of these trade-offs need 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

[1] A prominent example of an export report submitted in the U.S. context is Bernheim's testimony on behalf of plaintiffs in the vitamins cartel case. B.D. Bernheim, *Expert Report of B. Douglas Bernheim* (filed May 24, 2002), *In re* Vitamins Antitrust Litigation, 94 F. Supp. 2d 26 (D.D.C. 2002). The acceptance of class action and the need for class certification, wide disclosure rules, and jury trials are important features of the U.S. legal system that are not common in European proceedings. For their implications on empirical economic analysis, see A.B.A. SEC. ANTITRUST L., ECONOMETRICS: LEGAL, PRACTICAL AND TECHNICAL ISSUES (American Bar Association Publishing 2005). In particular, see the chapters *Econometric Evidence in Jury Trial* and *The Use of Econometric in Class Certification, Data and Disclosure Issues*. A.B.A. SEC. ANTITRUST L., ECONOMETRICS: LEGAL, PRACTICAL AND TECHNICAL ISSUES, *supra* note 1, ch. 4 & 8.

[2] Judgment of Bundesgerichtshof [BGH] [Federal Court of Justice] June 19, 2007, KRB 12/07 (F.R.G). For a comprehensive description of the case, see Hans W. Friederiszick & Lars-Hendrik Röller, *Overcharge Estimations in Cartel Cases – Lessons Learned from a Recent Judgment on the German Paper Wholesaler Cartel*, 1 GLOBAL CARTEL & LITIG. REV. 1 (2008).

[3] Judgment of the Oberlandesgericht [OLG] [Higher Regional Court] Düsseldorf Oct. 8, 2009, VI-2a Kart 2–6/08 (F.R.G.).

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

The paper is structured as follows: Part II reviews the two German court cases. Part III presents the potential damages of cartel behavior, and Part IV presents empirical methods for the measurement of damages. Part V reviews the overcharge estimation generated in the German cement cartel case. Part VI draws lessons from this experience, and Part VII gives the main conclusions.

II. TWO GERMAN COURT CASES

We describe the general principles on how to measure damages in cartel cases as laid out by the Federal Court in the 2007 judgment in 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.

A. 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.[4] 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.[5] 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.[6] 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

[4] 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 Berlin, Oct. 1, 2009, Case 2U 10/03 Kart (F.R.G.).

[5] The original paragaph 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." KRB 12/07, ¶ 10.

[6] The original paragaph 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." *Id.* ¶ 12.

approximate *reality in a probabilistic sense*.[7] The estimation must be conclusive; the results must be economically reasonable and feasible.[8]

With respect to empirical methods for quantification, the Federal Court holds the view that an approach which compares affected prices with prices in other, unaffected markets or time periods is considered superior to other approaches. Only if a comparison with other unaffected markets or time periods is not feasible is an *overall economic analysis* considered appropriate.[9]

According to the Federal Court, an overall economic analysis consists of an estimation of costs where—again by comparisons with other markets—an average margin[10] 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 method allows an initial cost- and margin-based estimate of the counterfactual price.

This initial estimate can further be adjusted or optimized by cross-checking the results with unaffected submarkets or only partially affected markets. Pricing behavior in the affected market after cartel inspection can also be used as an additional countercheck of the initial price estimate derived *more abstractly* based on cost and margin calculations.[11]

B. The Cement Cartel Case

In spring 2002, the national competition authority uncovered a cartel in the German cement sector and estimated that it lasted from 1997 to 2001. In 2003 the competition authority fined the six largest companies a total of €660 million, the largest fine in Germany's history for such an infringement. 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 with 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.

[7] The original paragaph 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." *Id.* ¶12.

[8] The original paragaph of the decision reads in German as follows: "Sie muss schlüssig sein, und ihre Ergebnisse müssen darüber hinaus wirtschaftlich vernünftig und möglich sein." *Id.* ¶12.

[9] *Id.* ¶19.

[10] 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.

[11] *Id.* ¶¶ 19–20.

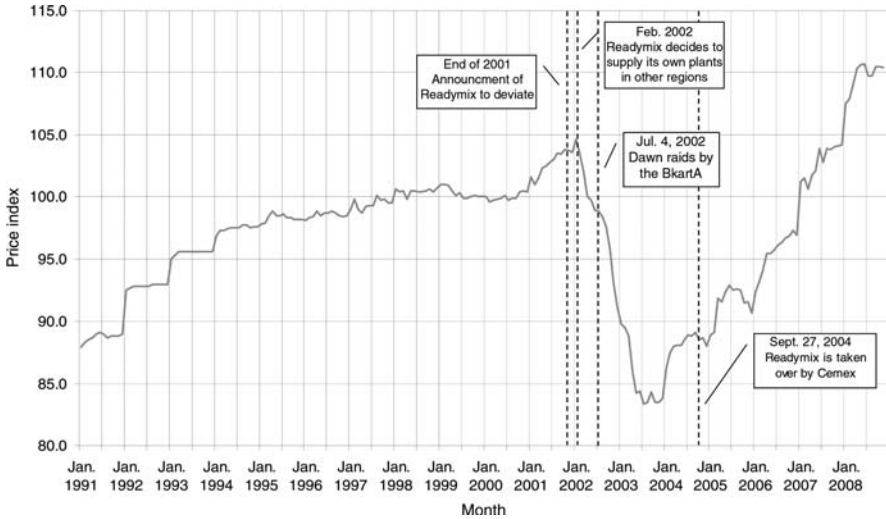

Figure 1. Evolution of cement prices from 1991 to 2009 and main events.
Source: Destatis (2009) – producer price index, Portland cement (61241BM017), year 2000 = 100; author's research.

The final decision by the Federal Court on these appeals is still pending. Private litigation is also still ongoing.[12]

Figure 1 shows the evolution of cement prices in Germany during the alleged cartel period and thereafter.

The main events can be briefly summarized 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, in mid-2002, the national

[12] In August 2005, an action for damages was brought before the Regional Court of Düsseldorf. Regional Court of Düsseldorf, Case 34 O (Kart) 147/05 (2005) (F.R.G.). 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 (construction firms). Two recent judgments (Case 2U 10/03 Kart; Kammergericht Berlin, Oct. 1, 2009, Case 2U 17/03 Kart (F.R.G.)) are of interest as they highlight the differences between the administrative proceedings and private litigation proceedings (Case 2U 10/03 Kart, 21) and exclude a pass-on defense (Case 2U 10/03 Kart, 24). The court awarded around €645,000 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 (judgment from LG Dortmund, Vitaminpreise Dortmund, Apr. 1, 2004, WuW/E DE-R 1352 (F.R.G.)), after a series of settlements in related cases. *See* BkartA, *Private Kartellrechtsdurchsetzung: Stand, Probleme, Perspektiven* 5 (Discussion Paper for the Meeting of the Working Group Kartellrecht, Sept. 26, 2005) for an overview of private damage claims related to exclusionary conduct in Germany.

competition authority carried out dawn raids, which two leniency applications (one of which was filed by the deviating firm mentioned above) supported. In response to those events, competitors reacted with sharp price decreases (a price war) to reestablish the original market segmentation. Due to cross-regional retaliation strategies, price drops occurred not only in Eastern Germany—where deviation first happened—but also spread across all German regions.[13] 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 assessing when prices in the post-cartel breakdown period could be considered noncollusive.

Before we discuss the damages calculation conducted 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 those effects.

III. POTENTIAL DAMAGES FROM CARTEL BEHAVIOR

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 behavior comprises both explicit collusion (based on direct communication and often referred to as a cartel) and implicit (or tacit) collusion. The legal consequences differ significantly based on whether a particular behavior falls into one category or the other, but the underlying economic analysis does not differ very much—partially due to shortcomings of economic theory, partially because of the similarity in the effects of the different types of collusive behavior.[14]

The definition of collusive behavior highlights the fact that the focus of most damages calculations rests on estimating the *price increase* encountered

[13] 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* von Frank Seidlitz, *Operation Stinktier*, WELT ONLINE, Oct. 9, 2003, http://www.welt.de/print-welt/article264894/Operation_Stinktier.html (extracted Feb. 8, 2010).

[14] In fact, economists tend to define collusion as related to an outcome (higher prices) more than to a particular behavior, like explicit communication of prices or market shares. For instance, Motta 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." M.MOTTA, COMPETITION POLICY: THEORY AND PRACTICE 138 (Cambridge Univ. Press 2004). *See also* J.E. Harrington, *Detecting Cartels*, *in* HANDBOOK OF ANTITRUST ECONOMICS 216 (The MIT Press 2008).

by customers, rather than quantity or quality effects, for instance.[15] It also highlights the need to first define antitrust markets—to some extent—when carrying out a damages calculation to assess the affected volume.[16] Finally, the definition stresses the importance of determining a robust estimate of the price levels that would have obtained in the absence of a cartel agreement—the counterfactual or *but-for price*.

Before describing the main empirical methods for the measurement of damages in cartel cases, we recall some basic economic principles on cartels. Most prominently, explicit and implicit collusion rest on the dynamic interaction between firms.[17] Firms condition their future behavior in the market on the current behavior 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 or prices significantly above what unilateral conduct alone would allow.[18] Dynamic price stabilization can be reached either through direct communication—which is the legal prerequisite for a cartel infringement—or through coordination through observing and following other firms' behavior in the market.[19] The latter is referred to as

[15] 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 with damage calculation of exclusionary conduct, though, cartel cases exhibit a focus on price effects.

[16] The relevance of market definition in cartel cases is often underemphasized. Although 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 the cartel are only presumed—as, for example, in European administrative proceedings. In our view, more effort is required in those cases to come up with a sound understanding as to which customer groups are affected and which are 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.

[17] Marc Ivaldi, Bruno Jullien, Patrick Rey, Paul Seabright & Jean Tirole, *The Economics of Horizontal Mergers: Unilateral and Coordinated Effects*, D.G. COMPETITION, EUR. COMM'N (2006). Equally, (repeated) interaction across markets or products might allow collusive outcomes to emerge. *See* B.D. Bernheim & M.D. Whinston, *Multimarket Contact and Collusive Behavior*, 21 RAND J. ECON. 1 (1990) for an analysis of multimarket contact games, and see P. Milgrom & J. Roberts, *Predation, Reputation and Entry Deterrence*, 27 J. ECON. THEORY 280 (1982) for a seminal work on entry deterrence in markets with interaction across regional markets.

[18] A simple test to distinguish price increases due to unilateral conduct from price increases due to collusive behavior 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 behavior is the cause. It is not possible, however, to distinguish between explicit collusion (a cartel) and implicit or tacit collusion based on economic effects only. For an overview of the economics of collusion, see MOTTA, *supra* note 14; Ivaldi, Jullien, Rey, Seabright & Tirole, *supra* note 17; and PETER DAVIS & ELIANA GARCÉS, QUANTITATIVE TECHNIQUES FOR COMPETITION AND ANTITRUST ANALYSIS (Princeton Univ. Press 2010).

[19] 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). For

tacit coordination or coordinated effects, and is assessed within dominance assessments or merger proceedings, but is not considered a cartel agreement.

Cartels can break down or fail to emerge due to several factors. Most importantly, cartels need to avoid internal and external destabilization. Internal destabilization describes a situation in which one of the cartel members deviates from the price agreement. External destabilization can happen when a noncartel member (a foreign firm or a firm active in a neighboring product market) competes within or enters the affected market. A cartel can also be externally destabilized by customers with buyer power.[20] Finally, the incentives for firms to engage in cartel activity are affected by competition policy law and its anticipated enforcement.

The economic literature identifies a broad set of potential damages due to collusive behavior by firms.[21] Figure 2 provides an overview of the main effects. From the perspective of a direct customer, there are three main effects: higher prices[22] on observed sales (normally labeled overcharge or, in legal terms, actual loss or *damnum emergens*), an opposing pass-on effect (that is, the fraction of the overcharge that 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 realized in additional sales at the counterfactual price level.

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

instance, Motta considers communication between firms that is based on unilateral behavior of the firms not sufficient to form part of a hardcore violation. MOTTA, *supra* note 14, at 189. A careful discussion of different forms of collusion and their grading from a competition-policy perspective is given in K.U. Kühn, *Fighting Collusion by Regulating Communication between Firms*, 16 ECON. POL'Y 116 (2001). *See also* DAVIS & GARCÉS, *supra* note 18, at 315.

[20] J.E. Harrington & J. Chen, *Cartel Pricing Dynamics with Cost Variability and Endogenous Buyer Detection*, 24 INT'L J. INDUS. ORG. 1185 (2006).

[21] 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—need to be balanced against the potential negative effects to customers to calculate the factual damages.

[22] 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 effects of collusion, such as lower levels of innovation or the occurrence of *x*-inefficiencies in the long run.

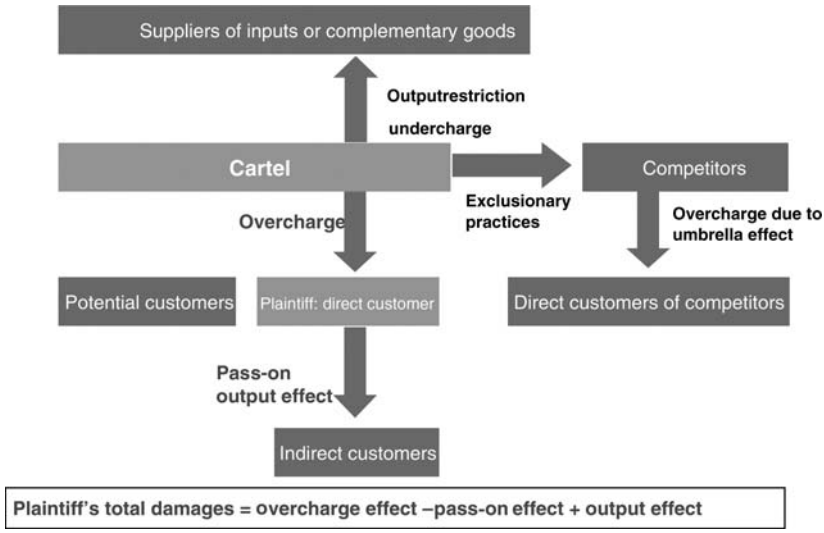

Figure 2. Potential damages caused by a cartel.
Source: Author's calculation.

existing customers and the nonconsumption by potential customers—are labeled as loss of profit or *lucrum cessans*.

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

[23] 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 neighboring markets (or might even benefit).

[24] Buyer power can be exercised in a number of ways. In markets with an institutionalized, liquid market place, such as 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* ROGER D. BLAIR & JEFFREY HARRISON, MONOPSONY: ANTITRUST LAW AND ECONOMICS (Princeton Univ. Press 1993); P. Dobson, M. Waterson & A. Chu, *The Welfare Consequences of the Exercise of Buyer Power* (OFT Research Paper No. 16, 1998); R. Inderst & N. Mazzarotto, *Buyer Power in Distribution*, *in* A.B.A. SEC. ANTITRUST L., 3 ISSUES IN COMPETITION LAW AND POLICY 1953 (W.D. Collins ed., 2008).

[25] For a detailed discussion on how cartel damages propagate across the supply chain, see M.A. Han, M.P. Schinkel & J. Tuinstra, *The Overcharge as a Measure for Antitrust Damages* (Univ. of Amsterdam, Working Paper, 2008).

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 neighboring 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 (this scenario is the so-called umbrella effect).[26]

IV. EMPIRICAL METHODS FOR QUANTIFICATION OF DAMAGES

There are a large number of empirical approaches to quantifying damages caused by a cartel.[27] We follow the categorization put forward by the 2004 Ashurst report, primarily because it is in line with the terminology used by most stakeholders.[28]

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 information on the cartel-free period before the infringement occurred 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 to control

[26] 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 (for example, tying or bundling strategies, conditional rebates, or refusal to supply strategies), resulting in more case-specific empirical approaches for estimating the damages. *See, e.g.*, Eur. Comm'n, *DG Competition Discussion Paper on the Application of Article 82 of the Treaty to Exclusionary Abuses* (Staff Discussion Paper, 2005); Eur. Comm'n, D.G. Competition, *Guidance on Its Enforcement Priorities in Applying Article 82 (EC) to Abusive Exclusionary Conduct by Dominant Undertakings* (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.

[27] An overview of the various methods can be found in Emily Clark, Mat Hughes & David Wirth, Ashurst, *Analysis of Economic Models for the Calculation of Damages*, D.G. COMPETITION, EUR. COMM'N (2004), and Theon van Dijk & Frank Verboven, *Quantification of Damages*, *in* A.B.A. SEC. ANTITRUST L., 3 ISSUES IN COMPETITION LAW AND POLICY, *supra* note 24, at 2349. Applications of these methods to cartel cases can be found in J.M. CONNOR, GLOBAL PRICE FIXING: STUDIES IN INDUSTRIAL ORGANIZATION (2d ed., Springer 2007). *See also* J.B. Baker & Daniel Rubinfeld, *Empirical Methods in Antitrust Litigation: Review and Critique*, 1 AM. L. & ECON. REV. 386 (1999) for a discussion within the U.S. legal context.

[28] Nevertheless, we did adapt the terminology slightly for the purpose of this paper. We excluded price predictions/econometric methods, because 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."

for changes in other market conditions.[29] The main difficulty in these approaches is establishing 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 cartelized region with prices in other geographic regions that are not affected by the cartel (regional benchmarks). Specific challenges are controlling for differences in the various regions and excluding indirect effects of the cartel—for example, the umbrella effect—if neighboring regions are used as benchmarks. Alternatively, when product markets exist with comparable market characteristics, they may be used as a yardstick (a 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.[30] As a result, we refer to the combination of the two approaches as the *yardstick approach* (*in the broader sense*).

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 market conditions absent collusion). 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 modeling*) 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"

[29] 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). In contrast, the dummy variable method uses more information. *See, e.g.*, DAVIS & GARCÉS, *supra* note 18, at 356.

[30] 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, called panel data analysis or difference-in-difference estimation. *See, e.g.*, John Simpson & Chrisopher Taylor, *Do Gasoline Mergers Affect Consumer Prices? The Marathon Ashland Petroleum and Ultramar Diamond Shamrock Transaction*, 51 J.L. & ECON. 135 (2008) for the application of a difference-in-difference method on a merger in the U.S. gasoline market.

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.[31] Alternatively, one may estimate the parameters econometrically, which is more demanding with respect to data required.[32]

An alternative categorization of methods is provided in the recent study commissioned by the Directorate General for Competition.[33] The authors differentiate between three main approaches: comparator-based approaches (roughly mapping into the yardstick approaches defined above), financial-analysis-based approaches (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 modeling as defined above).

V. OVERCHARGE ESTIMATION: THE GERMAN CEMENT CARTEL

In this section, we summarize in brief the main facts and the methodology used to estimate the additional earnings in the German cement cartel case. 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 characterized 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), or 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 neighboring 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.

[31] 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.

[32] This is referred to as structural empirical modeling. *See* Peter C. Reiss & Frank A. Wolak, *Structural Econometric Modeling: Rationales and Examples from Industrial Organization*, *in* 6A HANDBOOK OF ECONOMETRICS 4277 (James Heckman & Edward Leamer eds., Elsevier 2007) and our brief discussion below. A variation of this technique is to test which theoretical model best fits the data, or like Harrington, to put "*collusive and competitive models into a horse race to determine which better fits the data*." J.E. Harrington, *Detecting Cartels*, *in* HANDBOOK OF ANTITRUST ECONOMICS 227 (The MIT Press 2008) (emphasis added).

[33] Oxera & A. Komninos, *Quantifying Antitrust Damages: Towards Non-Binding Guidance for Courts*, D.G. COMPETITION, EUR. COMM'N (2009).

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 the cartel breakdown. Important details, such as how to take into account the price war period after the cartel breakdown, whether to take into account quantity effects, and whether to collect regional price data from the parties 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 procedure 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 programs 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 analyses. 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. 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 percent discount margin to our estimate to account for any remaining uncertainties within the estimations.

VI. 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 need to be well understood and made transparent, and decisions on how to proceed in

light of those trade-offs need 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 (the burden and standard of proof, for example) that define the economic approach (the scope of data collection, methodology, level of sophistication, and so forth).

A. General Trade-offs

A central theme in discussing the relative benefits of different empirical methods is the trade-off between accuracy and practicality. For clarity we define these two notions. First, 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 being "unbiased."[34] 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: one could be overestimating or underestimating the correct damages by a large magnitude, while still being correct on average. This second dimension of accuracy—being close to the truth—is called "precision" in statistics (or efficiency of the estimator).[35]

> ***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.[36] This trade-off is related to the debate surrounding structural

[34] In econometrics, an unbiased estimator describes an estimator with an expectation value, or mean, that is the true population parameter that one is trying to estimate. In other words, if the empirical experiment is repeated sufficiently often, on average, the unbiased estimator yields the true population mean. WILLIAM E. GRIFFITHS, R. CARTER HILL & GEORGE G. JUDGE, LEARNING AND PRACTICING ECONOMETRICS 81 (John Wiley & Sons 1993).

[35] 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. *Id.* at 213.

[36] Statistical measures do exist that 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 that minimizes the mean square error may achieve that by allowing some bias to the benefit of precision. *Id.* at 312. This trade-off is most visible in the debate between so-called parametric versus semi- or nonparametric

economic models. The more economic assumptions from economic theory are imposed on the estimation, the more precise the estimates obtained. If the assumptions are incorrect, though, the results will be biased.[37]

Second, 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.[38]

> ***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 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

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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. Although partial solutions to these shortcomings do exist, they also come with more assumptions imposed on the statistical methodology. *See* JOEL L. HOROWITZ, SEMIPARAMETRIC AND NONPARAMETRIC METHODS IN ECONOMETRICS (Springer Series in Statistics 2009) for an introduction on this topic.

[37] This is the debate on structural versus nonstructural empirical estimations. According to Reiss & Wolak, "*economists refer to models that combine explicit economic theories with statistical models as structural econometric models*." Reiss & Wolak, *supra* note 32 (emphasis added). There exist all types of intermediate types through blending some form of economic theory with statistical models. Reiss & Wolak also provide a careful discussion on the pros and cons of structural empirical models and how and when to apply them. *Id.* The opposite extreme to structural empirical estimation is an approach focusing 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," that is, the choice of the included variables is driven predominantly by their statistical properties. Halbert White, Robert Marshall & Pauline Kennedy, *The Measurement of Economic Damages in Antitrust Civil Litigation*, 6 A.B.A. SEC. ANTITRUST L. ECON. COMM. NEWSL. 17 (2006).

[38] *See* the U.S. debates on the Daubert procedure. Daubert v. Merrill Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993).

nonexperts; best practice rules exist on how to present empirical results in such a way that they can be verified by an expert.[39]

With respect to the timeframe and proportionality of resources, it bears noting that substantial differences exist, the key determinants of which are data collection and data cleaning. We will return to this 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.[40]

With an appropriate methodology and sophistication, many empirical methods do gain accuracy. In other words, the trade-off between accuracy and practicality exists as a matter of fact in many situations. This may also 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 specialized engineer) also contains elements that are not understood 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.

There may also be 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 outcome is represented 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.[41]

[39] Eur. Comm'n, *Best Practices for the Submission of Economic Evidence and Data Collection in Cases Concerning the Application of Articles 101 and 102 TFEU and in Merger Cases*, D.G. Competition (2010); Davis & Garcés, *supra* note 18, at 13; Reiss & Wolak, *supra* note 32.

[40] 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.

[41] 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, e.g., Simpson & Tayler, *supra* note 30. Indeed, this is related to a broader empirical principle that

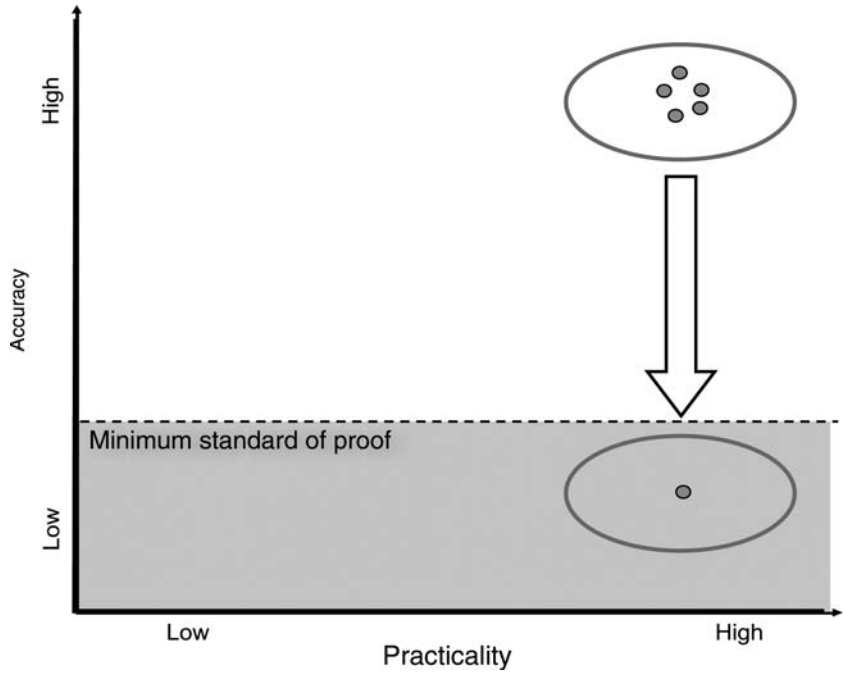

Figure 3. The trade-off between accuracy and practicality.
Note: Each dot refers to a methodology.
Source: Author's calculation.

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 scenario 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 (labeled 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 issued in the paper wholesaler cartel case—usually more robust than cost-based approaches, which are often less transparent than measures of prices, and ergo more difficult to verify.[42]

changes in variables (differences) can often measure effects more accurately than absolute values.

[42] 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.

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 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.[43]

B. 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 provided by the parties often allows for the collection of much more disaggregated data (transaction data versus annual data; price data on specific products versus average prices across all product categories; regional data versus 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, public data are not prone to *ex post* strategic data manipulation. Third, the period of data collection is significantly shortened when using publicly available data.

A further important design question involves *the number of variables included* and, related to this component, *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 those factors would result in significant data collection. Moreover, the introduction of many variables relative to the number of data observations would reduce the accuracy of the estimates. On the other hand, the omission of important variables could result in biased estimates (less accuracy).

Hence, careful selection is important, as variables included 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

[43] 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 provide helpful guidance on average margins. This relates to the earlier point that working with "changes" may be better than absolute levels.

assessment, the inclusion of representative variables controlling for the combined effect was sufficient and allowed us to pursue the assessment with a relatively small data set based on publicly available data.

Questions with respect to time and effort (that is, 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, that approach is not so desirable. Consider, for instance, a situation depicted in the graph on the left in Figure 4, in which 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, the most promising method was the during and after approach. Only if the most promising 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 significant effort when executed.

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 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, the answer to this question depends

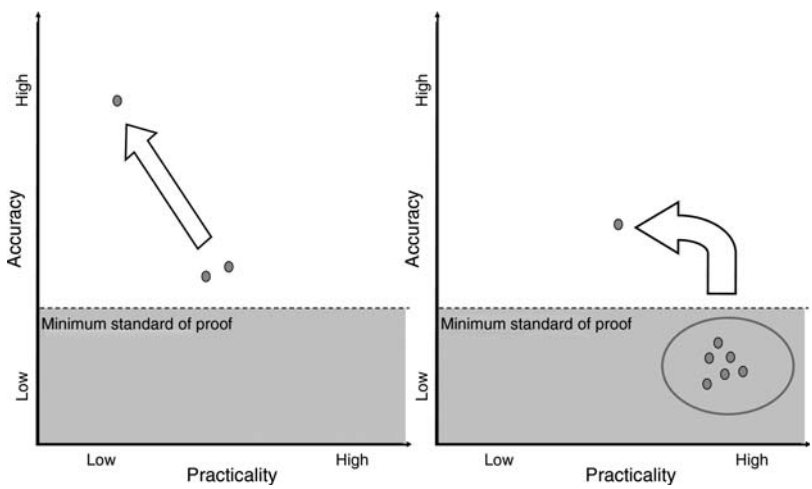

Figure 4. Potential effects of parallel application of methods.
Note: Each dot represents a method.
Source: Author's calculation.

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 use, otherwise a dispute on the method may arise. A veil of uncertainty in the outcome of each methodology allows parties with conflicting interests to reach a consensus on what is considered the superior methodology.[44]

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. Although the approach to addressing this issue seems obvious from an economic perspective, it has significant implications for empirical analysis. While unilateral price effects would need 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 intertemporal (as well as cross-sectional) relationship between prices during and after the cartel period. For instance, Harrington[45] has argued that prices post-cartel are set higher than a scenario without the cartel, because firms know that damages will be calculated based on the price difference before and after cartel breakdown. This argument may be more prone to the U.S. environment, for in Europe, fines are not based on a before and after methodology,[46] nor does private enforcement currently apply such an approach

[44] A further argument in favor 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* Joseph E. Harrington, Jr., *Post-Cartel Pricing During Litigation*, 52 J. INDUS. ECON. 517 (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.

[45] *See id.*

[46] 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

consistently. For the cement cartel case, the argument of inter-temporal dependence becomes more important with respect to the price war period after the 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 accounted for by partially excluding the price effects of the price war through a set of specific variables.[47]

A final variation on the right counterfactual design is whether other market distortions need to be taken into account. In the cement case, the parties argued that prices in East Germany would have been below normal competitive price levels 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. The court rejected this argument.

C. 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 back from 1997 to 1991. As a result, previous overcharge estimations that were based on a comparison of prices from 1991 to 1997 to prices from 1998 to 2001 were invalidated by the court's extension of the cartel period. Neighboring countries or comparable products were either prone to cartelization or were too different.

Focussing on accuracy, markets in which there is an indication of cartelization 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

amount of fines) is decided by factors such as the nature of infringement, market shares, regional scope, or implementation. *See* Eur. Comm'n, *Guidelines on the Method of Setting Fines Imposed Pursuant to Article 23(2)(a) of Regulation No. 1/2003*, C 210 OFFICIAL J. EUR. UNION 2 (Sept. 1, 2006).

[47] A price war situation can describe the end of a cartel or, alternatively, can be part of its "normal" functioning. Green and Porter for instance argued that in industries with high demand uncertainty, price war situations may arise during an ongoing cartel agreement. Cartelists cannot distinguish in those industries between low demand situations caused by cheating behavior of other cartelists and those caused by the business cycle. To keep the collusive agreement intact, prices are drastically reduced in low demand situations to make cheating unattractive. E.J. Green & R.H. Porter, *Non-cooperative Collusion Under Imperfect Price Information*, 52 ECONOMETRICA 87 (1984).

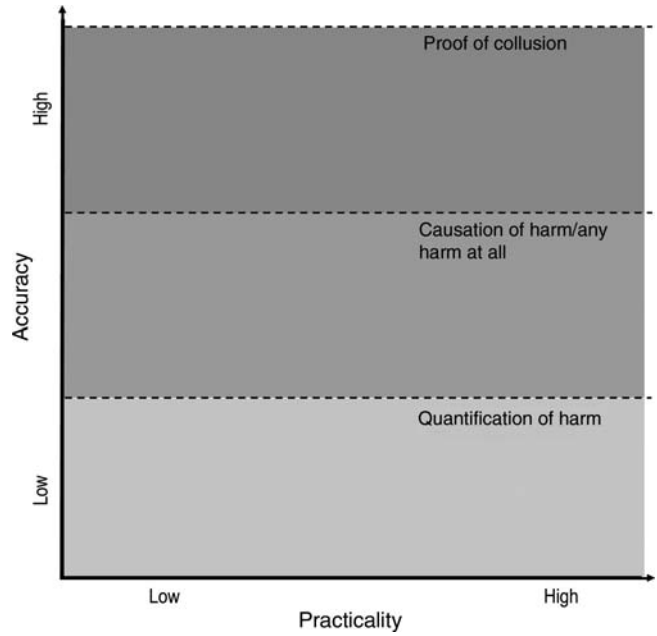

Figure 5. Different standards of proof.
Source: Author's calculation.

use this information. 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.

Although 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* is core issues that determine the legal environment in which an overcharge estimate is to be used.

As depicted in Figure 5, significant differences exist in standards of proof across different legal components (as well as across various countries). Recall the widespread belief in economics that empirical findings are not sufficient to prove cartels.[48] Evidence of explicit communication is required to

[48] *See, e.g.*, MOTTA, *supra* note 14, at 189; Kühn, *supra* note 19. It remains to be seen whether under the more effects-based approach under Article 82 and competition policy in general this wide-shared belief in economics is overruled. *See* DAVIS & GARCÉS, *supra* note 18, at 316, for a discussion leaning—it seems—towards a more interventionist approach, and Lars-Hendrik Röller, *Exploitative Abuses*, *in* EUROPEAN COMPETITION LAW ANNUAL 2007: A REFORMED APPROACH TO ARTICLE 82 EC 525 (Claus-Dieter Ehlermann & Mel Marquis eds., Hart Publishing 2008) for a more skeptical view on exploitative abuses.

meet any meaningful standard.[49] The legal requirement to provide proof of communication to find 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 quantifying the overcharges, certainly not to proving 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.[50]

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 scenario 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 the 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. (As explained above in the discussion on the paper wholesaler cartel, determinants of this decision include, among other factors, whether the cartel lasted for a long time, exhibited a comprehensive internal organization, and was applied across all relevant regions.) It is up to the parties to rebut this presumption.

Another aspect crucial for the proper functioning for the economic analysis in court proceedings is the guidance with which the court provides the economic expert. 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 (that is, to exclude cross-region and cross-product comparisons). Other important decisions were adopted by the judge in light of the economic trade-offs discussed above, such as to exclude the price war period, to collect regional data, and so forth. In this regard, the three-step procedure can be instrumental in maximizing the effectiveness of the economic analysis.

[49] Economics may play a much more important role for guiding the competition authorities' priorities in carrying out dawn raids. Although broad "fishing expeditions" are considered extensive, the legal standard to be met to justify dawn raids is relatively low. *See* Hans W. Friederiszick & F.P. Maier-Rigaud, *Triggering Inspections* Ex Officio*: Moving Beyond a Passive EU Cartel Policy*, 4 J. COMPETITION L. & ECON. 89 (2008).

[50] *See, e.g.*, Zivilprozessordnung [ZPO] [Code of Civil Procedure], § 287, 05.12.2005, BGBl. I S. 3202, ber. 2006 I S. 431, 2007 I S. 1781.

Guidance from the court could also be provided in the form of analysis of the effectiveness of the cartel. Providing 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.

Finally, discounting the estimates of damages by the court is a helpful instrument to balance the trade-off between accuracy and practicability. However, this practice should be applied carefully so that damage estimates do not become superfluous.[51]

VII. 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. These trade-offs need to be well understood and made transparent, and decisions on how to proceed in light of those trade-offs need to be taken upfront by the court. In this respect, we believe that the three-step procedure—design, application, and robustness checks—that the court followed in the German cement case is well suited for addressing the trade-offs of accuracy and practicality.

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) need 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.

[51] 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* Y. Bolotova, J.M. Connor & D. Miller, *Factors Influencing the Magnitude of Cartel Overcharges: An Empirical Analysis of the U.S. Market*, 5 J. COMPETITION L. & ECON. 361 (2009).