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# ROUNDTABLE ON THE QUANTIFICATION OF HARM TO COMPETITION BY NATIONAL COURTS AND COMPETITION AGENCIES

-- Background Note by the Secretariat --

This Background Note by the Secretariat is submitted to the Competition Committee FOR DISCUSSION under Item V at its forthcoming meeting to be held on 16 February 2011.

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## QUANTIFICATION OF HARM TO COMPETITION BY NATIONAL COURTS AND COMPETITION AGENCIES

## -- Background note<sup>1</sup> --

## 1. Introduction

1. Competition agencies try to limit harm to competition caused by anti-competitive conduct. In some jurisdictions and for specific types of conduct they are required to quantify the potential or actual harm in order to prove the conduct, to calculate administrative fines, or for advocacy reasons. National courts – besides their role in administrative proceedings – are in charge, often with the help of external experts, of quantifying private damages due to anti-competitive conduct. Given that administrative proceedings and private damages actions are pursued in parallel both proceedings steer the incentive of firms not to behave anti-competitively, resulting in interrelations between the two types of proceedings – some of them wanted by the competition authority, others not.

2. The concept of harm to competition resulting from anti-competitive conduct is related but distinct from the concept of damages suffered by particular victims as a result of that conduct. Harm to competition captures the general harm done to the economy and takes a welfare perspective; it is at the centre of any assessment by a competition agency. On the opposite side, the concept of damages takes a strong individualised perspective which might or might not coincide with the damages to society; it is central in any private damages case brought in front of a national court.

3. While the two theoretical concepts differ to some extent the methods for quantification are more or less the same and face comparable challenges: When quantifying harm to competition or private damages analytical approaches vary due to industry and infringement characteristics and the information available on the infringement. Indeed, quantifying harm (or damages) caused by an infringement can be complex: reconstructing the situation that would have occurred "but for" the infringement often requires elaborate analysis – an analysis that requires economic experts to work within a legal context. That, in turn, presents a challenge in terms of preparing judges to understand complicated models and techniques. The *tragedy of information asymmetry*, i.e. that the defendant holds the information that the plaintiff needs to prove damages empirically and that the plaintiff holds the information that the defendant needs to prove pass-on, requires well-defined procedural rules to allow a robust empirical estimation.

4. This note explores the economic challenges in quantifying adverse effects to competition (comprising both harm to competition and private damages). In section two, we describe the likely (theoretical) economic effects of anti-competitive conduct. Section three describes empirical methods to quantify adverse effects and section four describes important trade-offs to be considered when applying those empirical methods in a legal setting.

5. The main points of this note are:

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This paper was prepared for the OECD Secretariat by Hans W. Friederiszick and Elisabeth Fugger. It partially builds upon some joint earlier work with Lars-Hendrik Röller.

- There are differences between harm to competition and individual damages, which needs to be taken into account when measuring the effects of anti-competitive behaviour and limits the exchangeability of quantification results between administrative and private litigation proceedings. In cartel cases, for instance, the focus in private damages cases is on the overcharge effect (and potentially on the pass-on defence) while in an administrative proceeding the output effects which measure the negative welfare implications of a cartel- must play a prominent role.
- While for cartel cases (as an example of exploitative abuses) the theoretical effects are relatively well defined, in exclusionary conduct cases in particular if they comprise a vertical dimension they are not. The most important complicating factors for exclusionary conduct cases are that competitors, beside the consumers, are directly affected; potential effects vary with the particular exclusionary strategy chosen (e.g. tying or bundling strategies, conditional rebates, or refusal to supply strategies); conduct specific efficiencies are common; the market structure is affected by exclusionary practices; and that the effects vary across the different phases of conduct (and/or across different customer groups) and may not be limited to the market or region where the price effects are felt.
- The pros and cons of empirical methods vary according to the underlying assumptions and data requirements; simple, "automatised" routines are, hence, not applicable. The most often used methods, the indicator variable approach and the forecasting approach, typically require relatively large data sets, but work with only a few structural assumptions.
- The trade-off between practicality and applicability is central for a proper judgement on the appropriate methodology to be applied in the court room. Well defined procedural steps, legal standards and disclosure rules are required to make econometric testimony effective in legal proceedings.

# 2. Economic effects of anti-competitive behaviour

6. Anti-competitive behaviour can come in many forms. In general one can distinguish anticompetitive conduct along two main dimensions: horizontal vs. vertical and exploitative vs. exclusionary conduct. Horizontal conduct comprises anti-competitive agreements or unilateral behaviour between direct (i.e. horizontal) competitors like in cartel cases or foreclosure strategies targeted to direct competitors (like predation strategies). Vertical conduct explores the strategic opportunities available in an upstream/downstream constellation, where misbehaviour upstream may lower competitive pressure downstream, and vice versa.

7. Exploitative conduct describes behaviour where the anti-competitive conduct focuses on earning a supernormal profit from customers or customer groups as is the case in cartel or discrimination infringements, while exclusionary conduct focuses on the foreclosure or marginalisation of a competitor (which in turn may allow higher profits after successful foreclosure). One example of exclusionary conduct is predatory strategies, where once the prey is excluded the predator can earn supernormal profits. Bundling or tying strategies may also be misused to foreclose competitors (but they can also form part of exploitative conduct to extract supernormal profits from particular customer groups through price discrimination).

8. The richness of the underlying conduct, the fact that various types of conduct often come in parallel or have multiple effects, translates into a rather complex investigation if one wants to measure the empirical effects of a particular behaviour. This complexity rules out any simple, "automatized" estimation approach but requires a careful investigation of the economic parameters of the industry (such as, type of

product, number of firms, cost and demand factors and forms of rivalry), the particular theory of harm and the availability of data. It is a combined assessment of all three elements that will define the best set of empirical methods to be applied for measuring the effect of an anti-competitive behaviour.

9. In the following section we describe the potential harm to competition and likely damages and how to measure it from a theoretical perspective. We begin with cartels as an example of an anticompetitive horizontal agreement. Here the theoretical effects can be relatively robustly defined. Thereafter we discuss exploitative/ vertical abuses, where – even from a theoretical perspective – the effects of anticompetitive behaviour on the different stakeholders are often ambiguous.

# 2.1 Cartels

# 2.1.1 The economic concept of collusion

10. From an economic point of view, collusion describes a situation where a group of competitors raises, or attempts to raise, through direct or indirect communication with each other, the prices in a specific antitrust market (or markets) 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 of whether a particular behaviour falls into one or the other category are significantly different. The underlying economic analysis does not differ very much – partially due to the shortcomings of economic theory, partially because of similarity in the effects of both infringements.<sup>2</sup>

11. The motivation of forming a cartel is that market participants can raise collective and consequently individual profit relative to the profit achieved in a competitive market. The challenge of managing a cartel is that once prices are raised, cartel participants have a motivation to individually lower prices and raise their individual profit even higher while harming the other cartel participants.

12. Most prominently, explicit and implicit collusion rests on the dynamic interaction between firms.<sup>3</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>4</sup>

<sup>&</sup>lt;sup>2</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>&</sup>lt;sup>3</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>&</sup>lt;sup>4</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

13. 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>5</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.

14. Cartels can break down, 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 the cartel members or enters the affected market. A cartel can also be externally destabilised by customers with buyer power.<sup>6</sup> Finally, the incentives for firms to engage in cartel activity are affected by competition policy law and its anticipated enforcement.

# 2.1.2 Potential effects of collusive conduct

15. From the perspective of a direct customer there are three main effects: First, higher prices on observed sales (so called overcharge or in legal terms actual loss or damnum emergens; in Figure 1 labelled "A"). Second, an opposing pass-on effect that is the fraction of the overcharge which is passed on through higher prices to indirect customers (labelled "B" in Figure 1) and the output effect, which is the forgone profit margin of the direct purchaser that he would have realised from additional sales at the counterfactual price level (labelled "C" in Figure 1 and called loss of profit or lucrum cessans in legal terms). The later effect can affect both actual customers who have purchased some products during the infringement period, but less than what they would have purchased at a lower price and potential customers who did not purchase at all at the collusive price level but would have purchased some products at the competitive price level.

effects only. For an overview of the economics of collusion, see Motta (2004), Ivaldi et al. (2006) or Davis and Garcés (2010).

<sup>&</sup>lt;sup>5</sup> There is a rather fine 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 that 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).

<sup>&</sup>lt;sup>6</sup> Harrington and Chen (2006).



### Figure 1: Potential damages caused by a cartel

Source: Based on Friederiszick and Röller (2010)

16. As illustrated in Figure 1, besides the direct customers there are several other parties affected by a collusive agreement. First, there are indirect customers who are negatively affected by the pass-on effect (B). Indirect customers also forgo the benefit of additional consumption at the collusive price level in the form of lost consumer utility (labelled D in Figure 1).

17. Second, an equivalent effect occurs for upstream suppliers.<sup>7</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

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Suppliers of complementary products can be considered input suppliers in some instances (and hence have been depicted jointly in Figure 1). 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).

suppliers.<sup>8</sup> Moreover, upstream suppliers may (partially) pass-on the worsened sales conditions to their own upstream suppliers.<sup>9</sup>

18. Finally, exclusionary practices may affect (potential) competitors outside the cartel and their (potential) customers. 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).

## 2.1.3 Relationship between harm to competition and private damages

19. The different adverse effects of a collusive agreement affect various parties differently. Figure 2 shows the example of an upstream cartel and the distribution of the adverse effects between the direct purchasers and the indirect purchasers. Assume a (partially) competitive market in which upstream firms sell goods to retailers at a wholesale price ( $w_{comp}$ ). From the perspective of retailers the wholesale price represents input costs. The retailers process the product and re-sell it to end consumers. For simplicity we assume that the wholesale price is the only cost the retailer faces. In the competitive counterfactual retailers can sell the product at a retail price ( $r_{comp}$ ) which includes a normal profit margin ( $r_{comp}$ -w<sub>comp</sub>).

20. In a second scene the upstream firms agree to raise the price of their input good to a higher price level ( $w_{cartel}$ ) in order to maximise profits. Rectangle A represents the overcharge earned by the upstream cartel. Consequently, the costs of the retailers rise and they will try to increase prices as well to minimise their loss suffered from the cost increase (pass-on effect). Rectangle B shows the fraction of the overcharge that is passed on to the indirect purchaser (that is, the end-consumers in our example).

21. Whether retailers can or cannot pass-on a significant fraction depends on various factors. The most important factors are the degree of competition in the downstream industry, whether or not all downstream firms are equally affected by the cost increase due to cartelisation and the demand elasticity of the end consumer. A more competitive industry will – in a standard setting – pass-on a higher fraction then a non-competitive industry. In a perfectly competitive industry the market price equals marginal costs. Hence, any change of the marginal cost will be passed on 1:1. A cartel, however, will pass on only a fraction and partially absorb the cost increase. This intuition of pass-on reverses however if outside competition exists, i.e. if some retailers (for instance foreign importers) are not affected by the cost shock. In this setting outside competition will – in a perfectly competitive industry – not allow a pass on of the overcharge to end consumers. Finally, when consumers are more price sensitive the pass on will be – all else equal – smaller.

22. Increased end consumer prices will result in decreased demand (quantity effect).<sup>10</sup> The quantity effect follows from the presumption that not all customers value the good equally high. Customers that

<sup>&</sup>lt;sup>8</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), Inderst and Mazzarotto (2008) and OECD (2008).

<sup>&</sup>lt;sup>9</sup> For a detailed discussion on how cartel damages propagate across the supply chain, see Han, Schinkel, and Tuinstra (2008).

<sup>&</sup>lt;sup>10</sup> Note that we will not distinguish between quantity foregone by the active or potential retailers or end consumer. Economically the effect is the same for both groups. A difference might lie in the burden of

value the product higher than reflected in the competitive price but lower than reflected in the collusive price will refrain from purchasing it, if the price of a product increases to the collusive price level. This output effect damages both retailers and end customers. The retailers lose the additional profit they would have earned selling additional quantity. Rectangle C describes the output effect felt by the direct purchaser (lost sales), that is, the additional profit he could have made if he could have bought the input at the competitive wholesale price level ( $w_{comp}$ ). Triangle D describes the output effect of the end-consumer (lost utility). It represents the additional end-consumer welfare achieved without a collusive agreement at the upstream level and without subsequent pass-on thereof to the end-consumer; it accounts for the value of the extra utility he would have realised at the higher consumption level.

#### Figure 2: Damages with two layers of downstream purchasers



Source: Based on van Dijk and Verboven (2010)

23. Table 1 allows us to derive the adverse effects for the two purchaser groups (direct and indirect) and shows the total harm to competition from a consumer welfare perspective (total consumer harm) and from a total welfare perspective (total welfare harm). We will briefly discuss the various sub-segments focussing on the different objectives of an assessment by a competition authority and a court.

proof as it often may be easier to document that one would have purchased more quantity at a lower price than that one would have initiated a new supply channel at the lower price level.

	overcharge	pass-on	lost sales	lost utility
Direct purchaser	А	-B	С	
Indirect purchaser/ end-consumer		В		D
Total consumer harm	А		С	D
Total welfare harm			С	D

#### Table 1: Adverse effects of a cartel on various parties

Source: Based on van Dijk and Verboven (2010)

24. In a private damages case the focus typically stays on the damages felt by the direct purchaser. His damages are the sum of overcharge A minus the pass-on effect B plus the output effect C (lost sales). In contrast to that, the damage of the indirect purchaser (in our example the end-consumer) is the sum of the pass-on effect B plus the output effect D (lost utility).

25. From a competition policy perspective either the total consumer harm or total welfare harm is of relevance (depending on the welfare standard applied; in most jurisdictions this is the consumer welfare standard). The total consumer harm is the sum of the overcharge effect A and the two components of the output effect, C (lost sales of the direct purchaser) and D (lost utility of the end-consumer).

26. The pass-on effect washes out under such an assessment, highlighting the different focus of the assessment of effect in an administrative proceeding and such an assessment in a damages case (i.e. no assessment of the pass-on effect). It also highlights the similarities of the two different foci under a consumer welfare standard, namely the central focus on the overcharge effect A and the output effects.

27. Interestingly under a total welfare standard only the output effects should stay in the focus of the assessment by a competition authority.

### 2.2 Exclusionary conduct

## 2.2.1 The economic concept of exclusionary abuses

28. Exclusionary conduct can come in various forms ranging from price related practices like predatory pricing, conditional rebates and margin squeeze strategies to non-price related abuses, like tying, refusal to deal or exclusive dealing. Exclusionary practices may target direct horizontal competitors (like under predation strategies or through conditional rebates) or focus on firms active downstream or upstream. The two most common vertical abuses are customer foreclosure or input foreclosure.

29. What all exclusionary strategies have in common is that they aim to weaken rivals. Typically, a firm sacrifices short-term profits to force its competitors out of the market or to limit their capabilities to compete (i.e. to marginalise them). Due to (re-)entry barriers, the foreclosed competitor may not re-enter, allowing the incumbent to recoup his losses in the long run.

30. Consider the example of a predation strategy. Here the predator reduces – in the aggressive form of predation - his price below average avoidable cost. In its less aggressive variant the incumbent decreases prices below average total costs but remains with its prices above average variable costs. In a homogeneous product industry this forces its competitor to follow this price move. Depending on the

particularities of the industry the prey may depend to a larger extent on (limited) external finances, forcing it to exit the market or to accept being a niche supplier. Predatory strategies may also allow the incumbent to pre-empt entry in neighbouring markets by building up a reputation of entry deterrence. Predation strategies are particular profitable for incumbents if the low pricing policy can be targeted to specific regions or customer segments, thereby limiting the negative effects on the incumbent's profits.

31. A complicating feature of these kinds of conduct is that they often come together with (or are hidden behind) efficiencies. Low price strategies are common for promoting new products, in particular in industries with strong network effects; bundling or tying strategies are often implemented in response to consumer preferences for a unified product environment.

# 2.2.2 Potential effects of exclusionary conduct

32. The identification of the adverse effects of an exclusionary conduct is – in comparison to exploitative abuses previously discussed – complicated by four main differences:

33. First, the group of affected parties, the potential effects, and the welfare implications thereof are much more diverse and case related: competitors are, beside the consumers, directly affected; potential effects vary with the particular exclusionary strategy chosen; and positive welfare effects, i.e. efficiencies, must be expected. Overall, this results in a much more case-specific empirical approach for estimating the damages.<sup>11</sup>

34. Second, the 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.

35. Third, the effects on customers may vary across the different phases of conduct (and/or across different customer groups). For example, in predation, prices are low initially and then high during the recoupment phase.

36. Fourth, the effects of the anti-competitive behaviour may not be limited to the market or region where the price effects are felt. Exclusionary strategies can be used to try to deter entry into neighbouring markets or can be pursued by an incumbent in order to build a reputation of aggressive response to entry. For instance, a predation strategy in a local bus market may prevent entry in this particular submarket, but it also potentially deters entry at a national scale.

37. Figure 3 describes the typical timeline of exclusionary conduct. In the first step the firm with market power implements its exclusionary strategy, either forcing a competitor to exit the market or to prevent entry of a potential competitor. In the recoupment phase prices will go up, allowing the incumbent to recover potential losses he might have felt during the attrition phase. Finally – and potentially in response to the intervention by the competition authority – re-entry may occur, which typically involves some entry costs and a phase of gradual recovery.

<sup>11</sup> 

See, for instance, the EC Guidance and staff discussion paper on Art. 82 (EC 2005 and 2009).



### Figure 3: Phases of exclusionary conduct

Source: Fumagalli/ Padilla/ Polo 2010

38. Table 2 summarises the main theoretical effects over the different time periods and for the excluded or marginalised competitor and the end consumer. If the exclusionary strategy takes place in an upstream industry pass-on effects may be relevant as discussed before for exploitative abuses.

39. While it seems a relatively robust conjecture to presume increase in prices during the recoupment phase (that is after foreclosure and relative to a competitive price level), effects during the attrition phase – and eventually also during the growth phase – strongly depend on industry characteristics and the anticompetitive strategy chosen.

40. In predatory pricing cases, for example, prices will be set below the costs of both the predator and its competitor (in its most radical form, below average avoidable cost of an as-efficient competitor) until the competitor exits the market. Applying those strategies will often mean short term social welfare gains for all affected customers during this period. Positive side effects of a predation strategy can, however, be focused on few customers or offset by negative effects in neighbouring markets. For instance in transport cost intensive industries foreclosure strategies can be limited to one, specific region. The positive effects might be also limited due to some waterbed effects, i.e. predation strategies vis-à-vis foreign firms may be cross-financed through collusion in the home market.

41. Furthermore, some strategies can come with no or very limited positive price effects. Margin squeeze constellations can arise for instance through an anticompetitive increase in the wholesale price (and not - like under a predation strategy – through an anticompetitive reduction of the end consumer price) thereby effectively undermining the potential to earn a normal margin at the retail level without driving end consumer prices down. Equally, conditional rebate systems may effectively keep small competitors out of the market through the so called suction effect without reducing average market price substantially. Thus the effect of exclusionary strategies during the attrition phase on consumer welfare is ambiguous.

42. The following table summarises the likely effects of exclusionary conduct (assuming effective foreclosure of competition).

	Attrition	Recoupment	Growth	Overall effect
Excluded Competitor	Reduced operating profit and/ or factual losses; exit costs	Foregone operating profit	Reduced profit and re-entry costs	Harmed
End consumer	Ambigious, Potential gains due to price cuts	Losses due to higher prices (price and output effects)	Gains or losses depending on entry strategy chosen	Harmed (if no significant efficiencies exists)
Total consumer harm	Negative	Positive (if no significant efficiency exists)	Depends on entry strategy and efficiencies	Harmed (if no significant efficiencies exists)
Total welfare harm	Ambiguous	Positive (if no significant efficiency exists)	Ambiguous	Harmed (if no significant efficiencies exists)

Table 2: Adverse effects of effective exclusionary conduct

### 3. Empirical methods for auantification

43. The quantification of harm to competition is typically a backward-looking exercise that applies sophisticated econometric techniques.

44. As outlined in the theoretical sections, the following main effects need to be measured: (1) butfor price during the infringement period (and potentially some spillover effects after the end of the infringement) in order to measure the overcharge; (2) the degree of cost pass-on (3) the reaction of demand to price changes to measure the quantity effect (price elasticity of industry demand).

45. In exclusionary effects cases – in particular if they include a vertical dimension – in addition to the above-mentioned effects one may be required to measure/put more emphasis on: (1) the changes in price during the various phases of the infringement as the infringement affects market outcomes differently over time (e.g. predatory pricing leads to prices being lower than the competitive prices in the attrition phase and higher during the recoupment phase. Applying a model that measures an average price effect over both periods is not adequate, averaging out the two effects. Furthermore, quantity of the affected competitor will strongly fluctuate across the different phases, necessitating accurate price measures over the time horizon); (2) the loss in sales of an affected competitor (cross-firm price elasticity) (3) direct profit measures, cost assessments (both to measure exit and re-entry costs and efficiencies).

46. Once the period-specific effects are calculated they need to be discounted to come to a current money value of damages incurred over a long period. Whether or not (and from which point in time) interest rates are taken into account strongly depends on the legal environment and on the purpose of the quantification exercise. Some jurisdictions (like the US) do not consider any interest rates (or only from the point of the legal action and not from the point of the infringement on); some jurisdictions apply simple interest rates, others compound interest rates. In some jurisdictions simple shortcuts are available to derive the appropriate discount factor, e.g. an interbank interest rate like the EURIBO plus some fixed add-ons. From an economic, compensation perspective a compound interest rate based on the opportunity cost of capital of the victim and applied to the damages in the period of occurrence seems to be the most appropriate one.

47. There are a large number of empirical approaches to quantify damages caused by a cartel.<sup>12</sup> In the following we discuss the various methods, focussing on the price effects of a cartel.

## 3.1 Simple presumptions

48. A starting point for calculating harm to competition is some simple presumptions about the average price effects of a particular infringement on the revenue figures of the affected parties. For instance, in cartel cases an increasing number of overcharge estimations of cartels exists, allowing us to derive average overcharges. Figure 4 shows the average overcharge (relative to the competitive price level) as calculated by Connor and Lande, 2008, and re-assessed by Oxera and Komninos, 2009, and based on 114 individual overcharge estimations.



Figure 4: Historical overcharge estimations

Source: Connor and Lande (2008) as reported in Oxera and Komninos (2009)

49. One can see from Figure 4 that for most of the (detected) cartels an overcharge of between 10% and 20% was calculated and that less than 10% of the cartels reached overcharges of 40% or more. Segmentation between international and national cartels indicates higher overcharges for international cartel cases than for national ones.

50. This kind of average overcharge estimates might justify legal, rebuttable presumptions. Indeed, the European Commission guidelines apply a 30% presumption for cartel cases (with various aggravating and attenuating factors applied thereafter); the Hungarian law foresees a 10% presumption in cartel cases.

51. This approach, however, has severe shortcomings: the strong fluctuation of overcharges indicates important industry, country and cartel-specific factors influencing the level of overcharges, rendering an average approach inaccurate. Appropriate databases that allow a cartel candidate market to be benchmarked with some comparable historical cartel cases do not exist so far.

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An overview of the various methods can be found in Ashurst (2004), van Dijk and Verboven (2007) and most recently in Oxera and Komninos (2009) and Davis et al. (2010, pp.351). See also Baker and Rubinfeld (1999) for a discussion within the US legal context.

52. One interesting alternative to an across-the-board presumption for overcharges is bilateral negotiated fines. On some markets, where prices are set in standardised, formalistic tender procedures – in economic terms labelled bidding markets – parties agree in the tendering documents (or the final contract in the event of success) to a, say, 15% overcharge presumption in the case of proven cartel conduct. Such an approach allows the presumption to be situation and industry specific. It requires sufficient buyer power ex ante to establish such a practice, though (because an effective cartel might fight off any attempts to introduce contractual fines).

53. In addition, simple presumptions are helpful for cross-checking the results of estimates based on more complex methods or for a first risk/opportunities assessment for plaintiff or defendant.

## 3.2. Before, during and after approaches

54. Before, during and after approaches compare prices during the alleged anti-competitive period with prices before and/or after. Before, during 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.

55. The straight-line method assumes that the prices absent the anti-competitive conduct would have grown or declined on a constant rate (Figure 5; the shaded area represents the conduct period). A line is drawn from the price before the anti-competitive period to the price after the anti-competitive period to estimate the but-for price. The difference between the actual price and the estimated but-for price is considered to be the price effect due to anti-competitive behaviour. This method requires knowledge of the prices before and after the conduct.

56. Unfortunately, data on prices before the conduct are often unavailable. This situation occurs especially in Europe, where many markets have only recently been liberalised. In these cases an alternative and even more simplistic approach can be applied assuming that prices have been constant and that the price within the anti-competitive period equals prices after the conduct.



#### Figure 5: Straight-line approach

57. One major shortcoming of these simple approaches is that price changes due to other external factors (e.g. increased demand or costs, or structural changes in the competitive environment, like increased import penetration) are disregarded. Consequently if, for instance, costs increased significantly during the anti-competitive period, and thus prices as well, the price effect of the cartel will be overestimated. In the same manner, the cartel effect might be underestimated if cost were higher outside the cartel period.

58. Figure 6 shows a hypothetical time series of marginal costs (blue line) together with the price line (black line). The simple straight-line approach would have resulted in an counterfactual price between 40 to 50 index points. Compared to the average cartel price of around 80 index points this would hint to a significant overcharge of around 60% to 100%. However, the marginal cost line reveals a severe increase in costs over the cartel period, which would have pushed prices up also during the cartel period. As this is not taken into account, the straight-line-approach results in this example in a drastic overestimation of the price effect of the infringement.



#### Figure 6: Straight line method – overestimating the price effect

59. To address those concerns, statistical, econometric methods allow multiple changes of those factors to be controlled for, thereby deriving an overcharge estimate which is unaffected by such concerns (so-called multivariate regression analysis). Carrying out such an analysis requires expert know-how and can typically only be carried out by specialised units within competition authorities (like the Chief Economist Team in the EU) or external experts.

60. While the range of alternative approaches is broad (depending on the specificities of the case and data availability) two main methods are commonly used: the indicator variable model and the forecasting approach.

61. The indicator variable approach introduces an indicator variable for the anti-competitive period. Depending on the specification of the model, the estimator for the indicator reflects the absolute or relative increase of prices due to anti-competitive behaviour.<sup>13</sup> The estimation sample includes both a period

<sup>13</sup> There is some ambiguity as to whether the estimate coefficient of the indicator variable is the right measure of the cartel effect or the difference between the factual price and the predicted price under the presumption of no infringement (i.e. setting the indicator variable to zero). In the latter case the overcharge varies to

unaffected by the cartel and the period affected by it and thereby assumes that the relationship between the cost/demand factors and prices is the same in periods of anti-competitive conduct and effective competition. The main advantages of this model are its relatively simple application (and thereby higher verifiability) and the more limited data requirements. In particular, for cases for which data outside the infringement period is limited, the indicator variable approach is superior to the forecasting approach. The introduction of different indicator variables for different infringement phases allows the calculation of different periods of the infringement (as required for exclusionary conduct cases).

62. The forecasting approach uses estimates from the regression analysis only in the periods free of anti-competitive behaviour. The estimated cost-price and demand-price relationships are applied to the cost and demand data during the infringement period allowing the but-for price during the infringement period to be forecast. It thereby results in overcharge estimations that vary over time (Figure 7).

63. In comparison to the indicator model, the forecasting model puts fewer assumptions on the data – it only assumes that the relationship between cost/demand factors and prices *would have been* the same during the entire sample period if a cartel had not existed, but allows for different cost/demand/price relationship in a competitive environment vs. a collusive one. Accordingly, the forecasting approach is superior to the indicator model in an environment with rich data outside the infringement period and indications that the infringement affected the cost/demand/price relationship.

64. For both models the indicator variable approach and the forecasting approach can be implemented in a so-called dynamic framework. Here, price changes of period t-1 influence price in period t, allowing some form of price rigidity. Such a dynamic approach might allow superior predictions if it can be estimated robustly. Indeed, 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. In a low-quality data environment this may not be feasible; it also comes with the disadvantage that the influence and economic plausibility of the cost/demand factors cannot be easily assessed.

#### Figure 7: Forecasting approach



some extent over the infringement period, assigning effects which cannot be explained by the model to the infringement. The differences, in most cases, should be limited though.

65. The main difficulty for the before and after approaches is to establish the exact cartel period. Decisions from the administrative proceedings often leave open the starting point of the collusive conduct. In a rich data environment one may want to exclude ambiguous time periods for the estimation and "let the data decide" whether a positive overcharge is identified or not over this period. It is then mostly a legal question of whether the overcharges of these periods can be taken into account or not.

66. The post cartel/infringement period is in most cases more clearly identified through the date of the dawn raid by the competition authority or the leniency application. However, problems may also arise here if the cartel has lasting effects into the post-cartel period. Reasons for this can be long-term contracts or a price war situation post-cartel breakdown that lasts until an industry moves back to a long-term competitive equilibrium. Another concern – mostly plausible in a US environment where private damages are much more relevant than administrative fines and have for a long time been based on empirical approaches – is that cartel participants may act strategically by holding the prices higher than the competitive level to forgo higher damage claims.<sup>14</sup>

# 3.3 Regional or product price comparisons

67. An alternative approach to the before, during and after price analysis is based on regional or product comparisons (also sometimes labelled yardstick approaches). Here the price in the region affected by anti-competitive behaviour is compared to prices in other geographic regions or product markets that are not affected by the conduct. Just as with the before, during and after approach, empirical applications can cover the spectrum from simple average price comparisons to complex econometric estimations comparable to the empirical methods described above.

68. The main challenge for such comparisons across different regions and/or products is to find a sound benchmark. 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. Indeed, structural factors vary between markets (e.g. number of firms or regulatory rules) or products and have to be "controlled" for if a comparison is to be valid. If, however, the structural parameters of a particular region or a specific product are highly comparable then this region is also prone to collusion (and accordingly an invalid competitive benchmark). Along the same lines, the cartel can have effects on related markets, e.g. the umbrella effect, if close markets are used as benchmarks. Thus, estimators of the price effects may be biased.

69. Note that both before and after methods and regional and product comparisons can be considered in a unified empirical framework. For instance, one might have relevant data on various regions (some affected by the anti-competitive conduct, others not) over a long time period (longer than the anti-competitive conduct lasted). In this case, these data can be explored in a single empirical approach, called difference-in-difference method or – when more sophisticated statistical methods are applied - panel data analysis. The benefit of such an approach is that if a proper comparator market does exist, that is a market which is affected by the same cost and demand factors but not affected by collusion, the difference-in-difference approach offers an easily applicable but robust methodology. If the comparator market does exhibit some differences, statistical methods allow us "to make the markets comparable". Here it is the usage of all available information which makes the methodology superior to more simple before and after approaches – requiring however more data and depending on the assumption that the price/ cost/ demand relationship in the comparator markets is the same as in the affected market. See, for instance, Simpson and Taylor (2008) for the application of a difference-in-difference method to a merger in the US gasoline market.

<sup>&</sup>lt;sup>14</sup> Harrington (2004).

# 3.4 Cost-based, profit-oriented or simulation approaches

70. 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). One major difficulty of this approach is in finding robust cost estimates, since accounting costs do not generally reflect economic costs. Furthermore, the assignment of fixed costs to various product categories offered by a firm is not trivial in most instances. Finally, competition authorities, courts and customers often lack a proper understanding or simply do not have access to such robust cost measures.

71. 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. Some industries might have a structure that allows positive margins exceeding a reasonable margin even when competition is active (e.g. low number of firms, high barriers to entry, product differentiation and capacity constraints). Another reason for higher than reasonable margins can be an outcome of the dynamics of a market. Companies investing in innovation must have a perspective on being able to amortise the investments through higher prices.<sup>15</sup> These specific structural characteristics are to some extent accounted for in simulation models.

72. The simulation approach (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 (like HHIs) and demand (such as demand elasticities).

73. Several crucial decisions have to be made that can drastically influence the results. Depending on the type of rivalry, an industry-specific theoretical model must be chosen (or even tailor-made). Do firms compete on prices or quantities? Do capacity constraints matter? Are prices bilaterally negotiated? etc. Another crucial assumption is the choice of the particular demand system and the cost function. This includes, for example, deciding whether prices are likely to rise proportionally or not when demand or cost is increasing.

74. Once a model environment is chosen the model parameters need to be set according to the facts of the industry (so-called "calibration"). Parameter values might be available from earlier studies of this or a comparable industry. Crucial parameters may also be set according to own estimates for this particular industry or market intelligence. In any case, a sensitivity analysis should support the robustness of the results over plausible ranges of the core parameters of the model.

75. Once the parameters are set a simulation approach allows one to derive a theoretical price at the competitive level and under collusion (see Figure 8). Comparing the simulated collusive price with the factual price during the infringement period allows the verification of the plausibility of the model (and/ or the effectiveness of the cartel).

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Van Dijk and Verboven (2005)



#### **Figure 8: Simulation models**

76. The advantage of such simulation models is the relatively limited data requirements; its main shortcoming is the high sensitivity to changes in the model setting and the parameter values. Estimated damages often vary strongly within plausible parameter ranges. Simulation models can however play an important role in estimating margins across various regional markets, and calculating the implications of market exit and entry on prices. Hence, in particular for exclusionary conduct cases, simulation techniques may provide complementary estimates of price effects.

77. Alternatively, the theoretical framework may translate into an empirically testable hypothesis, an approach typically referred to as structural empirical modelling. According to Reiss et al. (2007) "economists refer to models that combine explicit economic theories with statistical models as structural econometric models". All types of intermediate types exist 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 the dynamic forecasting approach previously discussed that focuses predominantly on the predictive power of the estimated benchmark model.

78. Table 3 summarises the main methods, their key assumptions and data requirements.

	Requires understanding of			
Estimation method	the form of rivalry prevalent in the market (economic model)	Required data quality	Data needed	
Presumptions	No	Low	Volume data	
Straight-line Method	No	Low	Prices in cartel period and to some extent data from after (and or before) cartel period	
Regional or product price comparisons	(Yes)	Low to moderate	Prices of comparable products in a different product or regional market without anti-competitive conduct	
Simulation methods	No	Moderate	Average prices, demand elasticity and marginal costs within anti- or competitive period	
Regression: (Dynamic) indicator variable approach	No	High	Prices, costs and demand factors from anti-competitive and before or after periods	
Regression: (Dynamic) forecasting approach	No	High	Prices, costs and demand factors from anticompetitive and before or after periods	
Regression: Structural estimation	Yes	High	Depends on specific model, typically prices, costs and demand factors from anti-competitive and before or after periods	

#### Table 3: Estimation methods and data requirements

From a practical perspective an empirical assessment typically comprises six steps. First, 79. interviews will be carried out to understand the economics of the industry, the alleged conduct and the available information. Second, a methodology (or several in parallel) will be chosen. The empirical strategy depends not only on the economics and data availability, but also on the objective and legal environment of the empirical assessment (see the discussion of trade-offs in the following section). Third, an information request will be filed. The broadness thereof will again strongly depend on the legal disclosure rules in private damages cases or the power of the competition authority to file information requests within the administrative proceeding. Fourth, a data cleaning process is initiated. Here data is made consistent between various data sources, outliers are identified and open data questions resolved. This phase is often the most intensive and long lasting phase of an empirical investigation. Fifth, the analysis is carried out and a preferred (that is the most robust and economically convincing) model is chosen. Sixth, robustness checks and sensitivity analysis are carried out around the preferred model. This step often is carried out in dialogue with the various stakeholders of a case, e.g. economic and industry experts of the opposing side. All these steps are influenced both from economic and legal aspects of the case – the main trade-offs will be identified in the following section.

#### 4. Important trade-offs exist between legal concepts and empirical methods

80. In this section some important trade-offs that arise when applying empirical economic analysis in a legal environment are discussed. 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.

81. Below, we structure our discussion of the trade-offs into general trade-offs, followed by tradeoffs 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.).

## 4.1 General trade-offs

82. A central theme when discussing the relative benefits of different empirical methods is the tradeoff between accuracy and practicality. This trade-off becomes clear when it is taken into account that quantifying the effect of a practice requires the creation of a scene (the counterfactual). The more realistic the scene that is created, the more complex is the creation. At the same time increases in complexity lead to decreases in practicality. For clarity we define the two notions of accuracy and practicality:

83. 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>16</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 close to the truth: you could be over or underestimating the correct damages by a great deal, 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>17</sup>

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

84. 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>18</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>19</sup>

<sup>&</sup>lt;sup>16</sup> In econometrics an unbiased estimator describes an estimator with an expectation value, or mean, which is the true population parameter 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. Griffiths et al. (1993, p.81).

<sup>&</sup>lt;sup>17</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>&</sup>lt;sup>18</sup> Statistical measures do exist which provide guidance for empirical economists on how to resolve this tradeoff. For instance, the mean square error is the sum of the (squared) bias and the variance of the estimator. An estimator that 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 non-parametric estimations methods. Semi- or non-parametric 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, non-parametric 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>&</sup>lt;sup>19</sup> This is the debate on structural vs. non-structural empirical estimations. See section on different empirical methods.

85. 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>20</sup>

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

86. In empirical work, the properties of verifiability and transparency depend 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 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>21</sup>

87. 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.

88. 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. With an appropriate methodology and sophistication, many empirical methods do gain accuracy. The shaded area indicates the minimum standard of proof to be met by a specific methodology.<sup>22</sup>

<sup>&</sup>lt;sup>20</sup> In the US - based on a judgment in the case Daubert v. Merrell Dow Pharmaceuticals, Inc - detailed rules are derived for admissibility of an econometric expert testimony. These rules address issues like the qualification of the expert, and reliability and relevance of the methods applied. See ABA (2005, Chapter II).

<sup>&</sup>lt;sup>21</sup> European Commission (2010), Davis and Garcés (2010, p.13) or Reiss et al. (2007).

<sup>&</sup>lt;sup>22</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.



Figure 9: The trade-off between accuracy and practicality (each dot refers to a methodology)

89. In other words, the above trade-off 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 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.

90. 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 needs a careful discussion of how to proceed in such cases.

91. On the other hand, there are situations where a specific method is both practicable **and** results in highly accurate results. The so-called difference-in-difference method used in the context of a sound benchmark might be one example of such a methodology.<sup>23</sup>

92. More generally, both accuracy and practicality depend on the 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. Nevertheless, economists should provide some *prima facie* guidance on the pros and cons of different methods. For instance, price-based approaches are in our view usually more robust than cost-based approaches: cost measures are often less transparent than measures of prices, and are therefore more difficult to verify.

93. Plausible niche applications do exist for some methods, however. For example, 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, simulation might play a particular role for local

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For an application of the difference-in-difference approach in the field of merger control, see for example Simpson and Taylor (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.

markets with different market structures<sup>24</sup> or in exclusionary conduct cases, where market structure is affected by the conduct.

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

94. The general trade-off between accuracy and practicality translates into several specific but important trade-offs on how to tailor the empirical economic analysis. These trade-offs can be structured in data choice, number of variables included and methods applied and the choice of the counterfactual.

95. 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.

96. 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.

97. A further important design issue is **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 several 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.

98. In some instances, several explanatory factors follow a simple linear time trend or are highly correlated. If the individual impact of those variables is not of interest for the assessment, the inclusion of representative variables controlling for the combined effect is sufficient and may allow to pursue the assessment with a relatively small data set based on publicly available data. 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.

99. 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.

100. Consider, for instance, a situation depicted in the graph on the left in Figure 10, 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 and only if this method does not result in an

<sup>&</sup>lt;sup>24</sup> The reason for this is that cartel simulations 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.

outcome which is sufficiently accurate to meet legal standards an alternative method is 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 10: Potential effects of parallel application of methods (each dot represents a method)

101. 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 10. 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.

102. 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 over 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>25</sup>

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

104. 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

Source: Friederiszick and Röller (2010)

<sup>&</sup>lt;sup>25</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 that it is always appropriate to use multiple methods in each individual case.

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 infringement. Cartel cases sometimes are an attempt of the industry to avoid industrial restructuring; in exclusionary conduct cases by definition the changes of market structure have to be taken into account,

105. One further variation of the right counterfactual is related to the inter-temporal (as well as crosssectional) relationship between prices during and after the infringement period. For instance, Harrington<sup>26</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 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>27</sup> nor does private enforcement currently apply such an approach consistently.

106. A final variation on the right counterfactual design is whether other market distortions have to be taken into account. In some cases it was argued that prices would have been below the normal competitive price level, for instance, due to dumping from foreign regions or in response to abusive buyer power. The parties argued that the abusive behaviour (here collusion) only pushed back the prices to normal price levels and hence – despite having a positive impact on prices – did not result in positive overcharges. Equally, predatory pricing strategies might be initiated in response to such events. These kinds of arguments are typically rejected by courts.

## 4.3 Legal aspects and trade-offs

107. Leaving the question of the right counterfactual behind, another important trade-off arises with respect to infringement-affected comparator markets. For long-lasting infringements it is often difficult to find clean comparable prices. Neighbouring countries or comparable products are often either prone to the infringement or are too different.

108. Focussing on accuracy, markets where there is an indication of similar infringements are likely to be excluded as comparator markets. However, markets with proven effective cartel periods or monopolies are still informative, as they can be used to benchmark the observed price against a (proven) monopoly price. A significant difference – that is the price in the region with a proven monopoly is significantly higher than the price in the affected period – would indicate a less effective infringement in the affected market.<sup>28</sup> If alternative methods are not available it might be appropriate to use this information. More generally, the trade-off is whether the potential bias that is introduced by wrongly including an affected market into the group of infringement-free comparators or an infringement-free market into a group of infringement-affected markets is too large, offsetting the advantage of additional observations.

109. While the question of whether to include infringement-affected comparator markets in the analysis is more a detailed methodological question, the legal **standard of proof** as well as the distribution

<sup>&</sup>lt;sup>26</sup> Harrington (2004).

<sup>&</sup>lt;sup>27</sup> In Europe the effects of a cartel are taken into account only indirectly 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>&</sup>lt;sup>28</sup> If the reverse is true, i.e. a higher price in the affected region than in the proven monopoly region – this indicates the inappropriateness of the region for comparison due to significant differences in demand or cost factors.

of the **burden of proof** are core issues that determine the legal environment in which an overcharge estimate is to be used.



Figure 11: Different standards of proof

Source: Friederiszick and Röller (2010)

110. As depicted in Figure 11, significant differences exist in legal standards across different aspects of a case (which in turn may differ between countries and across exclusionary practices). In cartel cases for instance the widespread belief in economics prevails that empirical findings are not sufficient to prove cartels.<sup>29</sup> Indeed evidence of explicit communication is required to meet the legal standard to prove collusive conduct in administrative proceedings of most jurisdictions.<sup>30</sup> 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). 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>31</sup> Other forms of

<sup>&</sup>lt;sup>29</sup> 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 skeptical view on exploitative abuses.

<sup>&</sup>lt;sup>30</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).

<sup>&</sup>lt;sup>31</sup> E.g. § 287 of the German Code of Civil Procedure.

exclusionary conduct like predatory pricing often rely much more on economic evidence and do not require "smoking gun" type of evidence to proof the infringement.

111. 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.

112. Turning to the burden of proof, one element that is important for economic analysis is who has access to data. Here a particular issue is the "tragedy of information asymmetry" in private litigation cases. On the one hand the plaintiff, who has to make his case, does not have the information to show damages robustly. The defendant, on the other hand, who carries the burden to prove pass-on, does not hold the right information for this in his hands. Thus, a difficult trade-off arises with tight disclosure rules, which assure timely data disclosure but also might result in excessive transparency. Indeed, examples exist where an investigation by a competition authority increased the transparency to a degree allowing tacit collusion to arise. The intervention of the competition authority thus might even result in higher prices post-intervention. Tight disclosure rules can also be misused within a strategy of raising rivals costs where a complainant pushes its competitor into a costly litigation process.

113. Another aspect crucial for the proper functioning of 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.

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

115. Finally, the possibility for courts to reduce the expert's estimates derived by econometric techniques (through so called 'safety discounts') can be a helpful way to balance the trade-off between accuracy and practicability. For instance, predicted damages might be of lower accuracy for historical periods (due to missing data or empirical predictions over a long prediction horizon). However, application of such safety discounts needs to be justified well and applied carefully so that the estimate does not become superfluous.

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