

Quantification of damages

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1 Introduction

Economic damage due to infringement of antitrust laws can take various shapes and forms. Damage can be caused by different types of competition law violations, such as price-fixing or market-dividing cartel agreements, excessive pricing or exclusionary practices, such as tying and bundling or predatory pricing, by a dominant firm. Moreover, there are different parties that can suffer damage, ranging from customers (direct and indirect further down the supply chain), distributors and intermediaries, to suppliers and competitors. Even though from an economic perspective it can be clear who suffered damage and how much, in the end it is the legal framework in a jurisdiction that determines which antitrust law violations can lead to compensation for damage, which parties have standing to claim damage, and what the burden and standard of proof is for claimants and defendants.

Quantification of damages can be required in both public and private enforcement of competition laws. In public enforcement, damage may be quantified as part of the decision by a competition authority what fine to impose. Moreover, in some countries victims of cartel activity can recover damages for their monetary loss in the course of enforcement proceedings by the competition authority. In private enforcement, however, the quantification of damage seems more often a central issue. In the United States (US), where private antitrust enforcement is much more common than in Europe, plaintiffs and defendants frequently put forward damages amounts as calculated by their economic experts, whereby the standard of proof for the claimant varies depending on the type case.¹ Although in Europe private antitrust law enforcement is much less common, quantification of damages can be required on several occasions. When it happens, civil action often “lifts” on the findings of competition law infringement by the public authorities. In addition, although largely publicly invisible, in private settlements quantification of damages is an important input in the negotiations between parties. How often disputes on damages in Europe

¹ For example, under the 1890 Sherman Act, price-fixing agreements are per se illegal in the US. This per se illegality means that public prosecutors need to prove that beyond reasonable doubt an agreement was made, but neither that that agreement was effectively put in place nor that it raised prices and caused harm. The actual adverse economic effects of cartels are called injuries. Only parties that can establish that a cartel was the direct and identifiable cause of their injury are said to have standing, where standing refers to the right to stand in court of law and sue for compensation of the injury. This compensation is termed damages (Connor (2000). See also Page (1996).

result in settlements outside courts, perhaps through arbitration, is very hard to estimate.

This chapter provides an overview of the economics behind damages and of the various methods to assess damages in practical cases. We have chosen to focus on price-fixing cartels, although at the end of the chapter we briefly discuss damage due to other competition law violations as well.

The chapter is organised as follows. Section 2 develops an economic framework in which damage due to price-fixing cartels can be formally expressed. This framework decomposes the cartel damages in two components: the direct effect and the pass-on effect. The direct effect is the cartel damage to a customer as measured by the price overcharge times the number of units purchased at that price overcharge. The pass-on effect adjusts this direct effect, first, by determining on which party the burden of the price overcharge eventually falls; and, second, by taking account of an output-reducing effect of the price overcharge if it is passed on. The decomposition of cartel damages in direct and pass-on effects is important, since both components do not have the same legal treatment in all countries. Where the law dictates, for example, that damage amounts should compensate only for direct effects, decomposition of effects clarifies the impact of such a rule. After this formal framework, section 3 discusses issues related to quantifying the direct damage, whereas section 4 discusses quantification of pass-on effects. Several approaches to empirically assess direct and pass-on effects are set out in these sections. Next, section 5 discusses eligibility and points at an important difference between the US and Europe in this respect: passing-on defence is generally not allowed in the US whereas it appears to be allowed in Europe. This section ends with a policy discussion on whether or not to allow for a passing-on defence. Finally, section 6 discusses economic damage caused by other competition law violations besides price-fixing cartels.

2 Effects of price-fixing cartels in a formal framework

2.1 Counterfactual in the “but-for” world

The idea underlying most economic damage assessment is that of the “but-for” world. In the case of a price-fixing cartel the but-for world is given by what the economic outcome would have been but for the cartel. A comparison between this counterfactual world and the actual world provides the basis for damage assessment. For example, in case the cartel’s direct customer is a downstream firm, what profit would this firm have made in absence of the cartel and what was its actual profit? The difference in profits in both worlds is *ceteris paribus* the damage caused by the cartel.

2.2 Formal framework

In principle, cartel damages may be assessed by immediately considering the cartel’s impact on the profits of the downstream claimant firm. In practice, however, the more common approach has been to measure the cartel’s effect on the claimant firm’s costs of purchasing its inputs.²

The relevant question then becomes how the increased costs due to the cartel translate into reduced profits and hence damages. If the cost increase refers to fixed costs, there are no further effects and the damages may be simply computed as the price overcharge from the cartel, multiplied by the amount of inputs purchased by the claimant firm.³ In contrast, if the cost increase refers to variable costs, there may be possible additional effects. The claimant may to some extent pass-on the variable cost increase by raising its own retail prices. That price increase may in turn lead to a reduction in the output sold by the claimant firm.⁴

To understand these various effects more precisely, consider a downstream claimant firm, charging a retail price p and selling a total output q . For simplicity, assume

² It is much more common to estimate damage as the immediate effect on profits of victims in other competition law violations, such as exclusionary conduct by a dominant firm (see section 6).

³ One could argue that an increase in fixed costs may lead to additional effects, since it could reduce the incentives for innovation, product development, etc. We abstract from such effects in this chapter.

⁴ In case the claimants are final customers there are no pass-on effects and the damage equals the price overcharge times the volume of the cartelised product purchased.

that its variable cost c is constant (independent of output q), and that each unit of input purchased from the cartel corresponds to one unit of output.⁵ The claimant firm's profits \mathbf{p} are then given by the price-cost margin $p - c$, multiplied by total output sold:

$$\mathbf{p} = (p - c)q.$$

It is now possible to consider the various channels through which a variable cost increase due to the cartel affects the claimant firm's profits. Using Δ to refer to a (small) change of a variable, the change in profits $\Delta\mathbf{p}$ of the downstream claimant due to the cartel can be decomposed into the sum of three possible changes:

$$\Delta\mathbf{p} = -q\Delta c + q\Delta p + (p - c)\Delta q. \quad (1)$$

We discuss each of these three terms in turn:

- *Direct effect.* The first part ($-q\Delta c$) is the direct effect of the cartel on variable profits. It represents the increase in variable costs Δc due to the cartel, multiplied by the total output. Equivalently, it is the price overcharge multiplied by the total inputs purchased from the cartel. This effect is generally negative, and forms the basis for damages claims in both the US and in Europe.

The second and third parts refer to the indirect effects from the cartel, i.e. the effects that may be indirectly induced by the increase in costs Δc .

- *Pass-on effect.* The second part ($q\Delta p$) is the pass-on effect and represents a possible price increase Δp following the cartel, multiplied by total output. To the extent that there is indeed a price increase ($\Delta p > 0$), we say that there is pass-on of the initial cost increase Δc . The pass-on effect is typically positive or zero, thus acting to at least softening the direct damage by the direct purchaser. At the one extreme, it is possible that pass-on is complete, i.e. $\Delta p = \Delta c$. In that case, the negative direct effect from the cartel is fully compensated by a positive pass-on effect. At the other extreme, it is possible that there is no pass-on, i.e. $\Delta p = 0$. In intermediate cases, pass-on is positive

⁵ The arguments below also apply to a more general technology, but with more complicated notation.

but not necessarily complete. The pass-on effect may then form a basis for a *partial discount* to the direct cartel damage.

- *Output effect.* The third part $(p - c)\Delta q$ is the output effect. It represents a possible reduction in output (Δq), multiplied by the price-cost margin $p - c$. This effect is either zero or negative, and indirectly depends on the extent of pass-on. If there is no pass-on ($\Delta p = 0$), there will be no lost output so that the output effect is absent. In contrast, if there is passing-on ($\Delta p > 0$), at least some output is likely to be lost ($\Delta q < 0$), so that the output effect is negative.

As far as we are aware the output effect is usually not explicitly discussed in cartel damages assessment. This can be particularly disturbing when claims about the extent of pass-on are made by the defendant, since it is then that the output effect is potentially present and reduces the limitation of damage by the claimant through pass-on.⁶

Based on this general framework we now discuss empirical methods to assess damages. We focus on methods to assess the direct effect from the cartel, since this has a strong legal basis in the US and also in Europe (see section 5 for a discussion on eligibility and differences in this respect between the US and Europe). Nevertheless, we also provide a discussion on methods to assess the pass-on effect, since there are reasonable economic grounds for including them and since, at least in Europe and as we understand in a number of US District Courts, a passing-on defence may be allowed.

⁶ For a more detailed discussion of the passing-on rate and adjustments for the output effect, see Van Dijk en Verboven (2005).

3 Quantifying the direct damage

This section discusses practical empirical approaches to assess the direct damages suffered by customers who purchased products from cartel members. The direct damages ($-q\Delta c$) are given by the total amount of inputs purchased from one or more cartel members, multiplied by the price overcharge per unit of input. These damages ought to be computed over the entire period during which the cartel took place. We now discuss each of these factors.⁷

The challenge often lies in estimating of the price overcharge. This amounts to comparing the actual price charged during the cartel period with the hypothetical price that would have occurred in the absence of the cartel, i.e. the but-for price (the price but for the cartel). Since estimating the price overcharge requires the most specific economic analysis, and is usually the most central and controversial issue, we focus our discussion around that (subsections 3.1 and 3.2), and subsequently briefly discuss other aspects in the quantification of damages (subsection 3.3).

There are two general approaches towards assessing the price overcharge. The first approach quantifies the price overcharge using comparators. It measures the actual cartel prices and compares these to the pre- and post-cartel prices, or to prices in comparable sectors, or to prices in the same sector in comparable countries. Obviously, one has to be able to safely assume that no cartel existed in the periods, sectors or countries of comparison. The second approach does not draw comparisons with competitive benchmarks, but instead aims to directly construct the competitive but-for price using only information on the cartelised market itself. This can be done in various ways. Methods range from simple cost-plus analysis to a full-fledged simulation analysis, describing an economic model of competition in the market under the assumption that there would not have been a cartel.⁸

⁷ Levenstein and Suslow (2002) provide an overview of empirical studies assessing direct cartel damages; see also Connor and Bolotova (2005).

⁸ See Connor (2004) for an overview of the various methodologies considered in the context of the US investigation of the lysine cartel in the 1990s. See also Clark et al. (2004).

3.1 Assessing the price overcharge using comparators

The first approach quantifies the price overcharge by establishing the but-for price on the basis of comparators. This approach is largely empirical, and does not require making specific economic assumptions on the market. In econometric terms, this approach may also be referred to as the reduced-form approach (as opposed to the structural approach). Within this approach, the “before-and-after” and the “yardstick” methods can be distinguished.

3.1.1 The “before-and-after” method

This method simply compares pre- and post-cartel prices with the actual cartel prices to assess the price overcharge. Pre- and post-cartel prices are thus used as reasonable approximations for the prices but for the cartel. To the extent that cartel prices differ in a statistically significant way from the pre- and post-cartel prices, one may attribute a more or less reasonable degree of confidence in the price overcharge. It is instructive to reinterpret the before-and-after approach in a simple regression framework, in which one estimates the price over the entire period for which data are available on a dummy variable equal to one when the price corresponds to the period when there was a cartel. The parameter associated with this dummy variable then measures the amount of the price overcharge.

This simple regression framework lends itself easily to some extensions. One may add control variables that are believed to affect the prices regardless of whether or not there has been a cartel. For example, suppose that one has statistical information on prices during and after the cartel period, and suppose this period was characterized by an increase in imports, starting around the point when the cartel ended. These imports would likely result in reduced prices regardless of whether there has been a cartel. Hence, a failure to control for these imports would lead one to confuse normal competitive pressure with a cartel effect. More generally, the before-and-after approach can, and should if possible, be extended to include relevant economic variables that changed during the period of observation. These variables include demand factors (GDP, prices of substitutes) and cost factors (input costs, capacity usage).

Other possible extensions of the methodology consist of statistically determining the beginning and the end of the cartel period (i.e. endogenous structural break analysis), and of modelling gradual price changes around the beginning and the end of the cartel period (i.e. dynamic analysis). While such extensions may sometimes be important, there is a clear trade-off between simplicity and the implied transparency, and added realism and the implied risk of ad hoc analysis. It is therefore crucial to motivate any extensions to the simple framework on sound economic principles.

Several authors have recently also pointed out that a comparison between the actual and post-cartel prices may lead to an underestimation of the price overcharge. Connor (2004) puts forward that implicit or tacit collusion is more likely after explicit collusion, because firms may have learned ways to organise tacit collusion during the explicit cartel. Harrington (2004) shows that the likelihood of damage assessment based on post-cartel prices may in fact create an incentive for parties to price above the non-collusive price in the post-cartel period. This strategic behaviour leads to an underestimation of cartel damages if the assessment is based on post-cartel prices. Both arguments support the use of pre-cartel price information as the more appropriate benchmark.

3.1.2 The “yardstick” method

The yardstick method is similar in spirit to the before-and-after method. It compares the cartel price to prices in similar markets, which are known to be cartel-free. “Similar markets” can be either sectors in the same state or country that are similar in terms of demand, cost and market structure conditions, or they can be the same sectors in other states or countries. As in the “before-and-after” approach, it is possible to use a generalized framework, in which one tries to control for as much as possible observable differences across the yardstick sectors, states or countries (differences in income, capacity usage, etc.). Once again, such an approach is in principle desirable since it adds more realism, though extensions to simple models need to be motivated by economically sound reasoning.

3.2 Assessing the price overcharge using direct information on the cartelised market

The second approach aims to directly construct the competitive but-for price, using information of the cartelised market only (hence without drawing comparisons to competitive benchmarks). One may distinguish between several methods: the cost-based approach, which is the simplest to implement, critical-loss analysis, and simulation analysis, describing an economic model of the competition in the market under the assumption that there would not have been a cartel.

3.2.1 Cost-based method

This method involves collecting information on production costs and estimating the competitive price on the basis of some measure of costs per unit plus a mark-up allowance for “reasonable” profit. Various cost measures can in principle be used for this: for example, short-run incremental costs, long-run incremental costs or average unit production costs. Which of these is most appropriate in a particular case depends, amongst others, on the time-horizon taken in the analysis. The costs per unit of production plus the “reasonable” profit mark-up are then taken as an estimate for the competitive price.⁹

Cost data can be collected from accounting systems or management information systems of the companies involved. Attention should be paid to the fact that accounting cost data is often not the same as economic cost data. Where, for example, an accounting system amortises fixed costs and generates annual depreciation costs, from an economic cost perspective, at least in the short run, these fixed costs are bygone and should no longer play a role in price-setting in a competitive environment.

The cost-based approach has some appeal for its simplicity. The main information required for computing the competitive but-for price is accounting information to

⁹ The cost-based approach has also been used to construct a competitive price using a more “top-down” approach based on profitability. Excessive economic profits, taken to be the actual profits of cartel members during the cartel period, minus “reasonable” profits, are divided by production volumes, in order to estimate the price overcharge per unit sold. Against the relative advantage of this approach that costs need not to be analysed in detail, which allows a quicker way to use accounting data, there is the potential disadvantage of more reliance on accounting profits, which may differ substantially from economic profits.

compute cost, and assumptions on what constitutes a reasonable competitive profit margin.

These features, however, also imply a number of drawbacks, of which we highlight two here. The first, perhaps most fundamental, drawback is that this approach assumes that a competitive price equal to costs is the appropriate benchmark for the price but for the cartel. In most sectors there is no such clear relationship between prices and costs. In absence of the cartel, for example, competition may take the form of oligopolistic competition where non-collusive prices are well above unit production costs. A “competitive” price based equal to average unit costs would not occur in absence of a cartel in such a sector, and is therefore not an appropriate but-for price.

The second drawback relates to the “reasonable” profit margin (cost of capital), which is to be added to the production costs. Although it is common practice in regulated sectors that regulators estimate “reasonable” profits (on the basis of weighted costs of capital) for price-regulated firms, in non-regulated sectors this is not often done and specific issues may arise. Apart from obvious problems relating to financial data necessary estimate a reasonable profit, it is doubtful that even in highly competitive sectors “reasonable” profits are often actually observed, and even that it is desirable that they should be observed. Firms can have “Ricardian” profits for superior efficiency, or “Schumpeterian” profits for innovativeness - and without these profits as rewards, incentives for productive and dynamic efficiency are suboptimal. Moreover, competition can be regarded as a dynamic process towards the long-run equilibrium in a sector, in which firms have “reasonable” profits, but various factors act to disturb the way to that equilibrium and out-of-equilibrium profits can be temporarily higher or lower.

3.2.2 Critical loss analysis

Another way in which cost data can help to estimate the cartel price overcharge is through critical loss analysis. Critical loss analysis calculates the break-even point for lost demand given a particular price increase. By comparing the critical loss to the expected actual loss, in market definition analysis, for example, it can be assessed whether or not a 5 to 10% hypothetical price increase would be profitable under the hypothetical monopolist test to delineate markets. In damage assessment, critical loss

analysis may provide an upper bound on the price increase that would be profitable for the cartel.

To illustrate: suppose the price overcharge has been estimated as, say 15%, of the competitive price. Suppose further that, given the typical cost structure and contribution margin¹⁰ of cartel members, the critical loss (demand reduction) associated with a price increase of 15% equals 30%, i.e. if more than 30% of demand is lost, a 15% price increase is no longer profitable. If the actual loss associated with a 15% price increase has been estimated, for example, using an estimate of the price elasticity of demand, to be more than 30%, then this analysis suggests the price overcharge of 15% is not correct. But one can go further and deduce, on the basis of the estimated actual loss and the cost structure, the critical price increase to break even given the actual loss. This critical price increase can be used as an upper bound to price overcharge estimates.

3.2.3 Simulation analysis

The final approach to quantify damages using direct information on the cartelised market is to specify an economic equilibrium model that explicitly specifies the demand and cost conditions, and the nature of oligopolistic behavior in the sector under consideration. This economic model can be made operational by entering key parameters such as price and cost elasticities, and structural information such as firms' market shares. When the model is completely specified in this way, it is possible to carry out counterfactual simulations, i.e. ask how the equilibrium prices would change once the cartel no longer exists.

In principle, the simulation approach makes it possible to compute both the cartel margins and the competitive (or non-cooperative) margins without relying on any cost data. In practice, the approach can be used in combination with the cost-plus approach. This would amount to computing the competitive but-for price using accounting cost data, plus an allowance for the competitive margin based on a simulation model.

¹⁰ These data are required to calculate critical and actual losses. See Harris and Simons (1989) for a detailed description of the use of critical loss analysis in market definition.

The simulation approach has proven to be a useful tool in merger analysis, and may also be useful in other areas of antitrust, an important advantage being that it makes the economic assumptions on which decisions are based transparent. The main challenge for applying the simulation approach in the context of computing the cartel price overcharge lies in the specification of the nature of oligopolistic behavior. The simulation results may be sensitive with respect to how one models actual cartel and pre-/post-cartel behavior. Should one assume that the cartel worked perfectly (i.e. fully collusively) during the cartel period, and then unravels afterwards to obtain a completely non-cooperative outcome (such as Cournot or Bertrand)? Claimants and defendants are likely to give different answers to this question. For example, Connor (2001) mentions the lysine cartel, where "... the defendants argued that the lysine industry had an oligopoly structure and that its key characteristics (namely high concentration, high barriers to entry, the absence of product differentiation and large number of dispersed buyers) would tend to result in implicit price co-ordination that would keep price substantially above the long run competitive price." In contrast, the claimants would naturally tend to argue that the market would be intensely competitive but for the cartel and that the cartel's impact was therefore considerable. Against this drawback of possible disputes about the appropriate specification of oligopolistic behavior before and after the cartel, there is the advantage that the discussion is explicitly focussed on the most relevant factors, namely the specific circumstances in the sector that affect competition. On balance, the approach may still be useful, especially if it is used as a complement to (rather than a substitute of) the simple cost-based approach, by focusing on computing the competitive margin in a more reliable way. But the approach should be used with greater caution than in other areas of antitrust where the simulation approach has been applied, because it may be more sensitive to the assumptions about oligopoly behaviour.¹¹

3.2.4 Summary

Quantifying the price overcharge due to a cartel can be done in various ways, all with relative weaknesses and strengths. The comparator approach, such as the "before-and-after" and "yardstick" methods, have the advantage of relying on "hard evidence"

¹¹ In a later section, we discuss the simulation approach for computing the extent of pass-on. As we mention there, the results are generally less sensitive to the assumptions about oligopolistic interaction.

from competitive benchmark situations, but they require that there is indeed sufficient information to construct a reasonable competitive benchmark. This may make it necessary to control for relevant observable factors that have changed over time or differ across markets, and that cannot be attributed to the cartel. An in-depth comparator approach, which is simple in principle, may become complex in practice, so it is necessary to keep the assumptions and methods transparent and conduct a careful sensitivity analysis.

When there is no information available on a reasonable competitive benchmark, one may assess the cartel price overcharge based on direct information of the cartelised market only. Because of the more limited amount of information, such an approach will inevitably require additional assumptions. The cost-based method requires the use of accounting information, and estimates or assumptions about what constitutes a reasonable competitive margin. At the other end of the spectrum, the simulation approach in principle avoids the need for accounting cost data, and has the potential of better modelling the competitive margin, based on explicit assumptions about oligopolistic behavior, but it has the risk of ending in theoretical debates about the most appropriate model to be used.

3.3 *Specific issues*

In addition to the main issue of assessing the cartel price overcharge, there are several additional factors that need to be considered to quantify the direct damages due to the cartel. First, it is necessary to properly define the cartel period, and measure the total units purchased. In addition, there is the issue of how damages caused by an individual cartel member relate to the specific role of that member in the cartel. A final question is whether one should account for the claimant's efforts (or lack thereof) to mitigate the effects of the cartel.

3.3.1 Cartel period

The cartel period, when exactly it started and when exactly it stopped, may be subject to disagreement between defendant and claimant. Apart from direct evidence, for example, diaries or e-mails mentioning actual meeting dates or memos describing the cartel's pricing schemes, there are statistical techniques to assess the timing and

duration of the cartel. An example of such a technique is structural break analysis, as discussed in section 3.1.1. above. The exact cartel period is important in the calculation of the direct damage because it determines the total volume that was purchased by the customer at a price overcharge. In addition, in some methods in particular it is also important to know the exact cartel period from start to finish to quantify the price overcharge

3.3.2 Total units purchased

Once the cartel period has been established, the actual volumes purchased from one or more cartel members can be simply recollected from invoices and the accounting records of the purchaser.

3.3.3 Individual cartel member's role within the cartel

The identity of the individual cartel member from which damage is claimed may matter. Some cartel members may have had a leading role in establishing and maintaining the cartel, whilst other cartel members may have merely been followers. Although strictly speaking one may wish to correct for these different roles and different degrees of damage caused, here we regard each cartel member as having full responsibility for the price overcharge. If one wished to differentiate damage according to roles played within the cartel, the non-differentiated, "average" damage forms a practical starting point. The damage of a single member could be expressed as some deviation from this average damage: damage would be higher if that member had a leading role and smaller if it had a follower's role. The role an individual member played in the cartel appears especially important in the decision to find guilty or not or to set fines, but can also be taken into account when assessing damages.

3.3.4 Claimant's efforts to limit damage

An interesting issue for damage assessment is whether parties that are adversely affected by the cartel should be assumed to sit still and accept the higher cartel price, or should they be assumed to actively limit the damage by, for example, purchasing from firms outside the cartel. Strictly speaking, economic damage is given by the

money-equivalent difference between a customer's first-best choice in absence of the cartel, and his first-best choice in presence of the cartel. It is possible that the actual choice in presence of the cartel is for some reason not the customer's first-best choice. For example, it can be the case that the customer would have been better off buying an alternative product at a lower price from an outsider, rather than the most preferred alternative at an inflated price from the cartel. Quantifying the price overcharge as the difference in price when buying both with and without the cartel from the same firm is then over-estimating the true economic damage. One should of course always wonder what stopped a customer from not actually choosing its first-preferred option in presence of the cartel.¹² On the other hand, there may be specific considerations to stop a customer from doing so. For example, if the customer mitigates the cartel and purchases elsewhere, he still suffers damage but has considerable less chance of receiving compensation(because it is harder to proof that he did actually not purchase but would have done so at a lower price – see section 5 for a brief summary of the legal standing of the various groups that suffer from cartels.

¹² The framework to assess damage set out in section 2 assumes that the claimant acts optimally. For example, it is assumed that the claimant passes on the price overcharge to the degree that is optimal to the claimant. Similarly, if cartelized input prices increase, it is assumed that the claimant adjusts inputs and substitutes these, insofar possible, for other inputs, in order optimize his own profits.

4 Quantifying the pass-on effect

As discussed in section 2, the direct effect (price overcharge times amount purchased) may overestimate the amount of damages resulting from the cartel. This can be the case if the claimant firm passes part of its cost increase on to consumer prices.¹³

We now discuss empirical methods that can be used to measure the pass-on rate.¹⁴ We distinguish between two possible approaches. The first approach uses historical information on the relationship between prices and input costs to assess the extent of pass-on. The second approach does not use such information, but instead constructs a complete model of how the claimant's industry operates. Such a model reveals the structural determinants of pass-on behaviour, which can be used either qualitatively or quantitatively in the analysis.

Notice that these two approaches roughly correspond to the reduced-form comparator and modelling of competition approaches to assess direct effects, as set out in the previous section. These two approaches reflect a choice between the use of rich data in combination with fewer economic and institutional assumptions (reduced-form approach) on the one hand, and in absence of detailed data the necessity to make explicit assumptions about competitive behaviour of firms (modelling of competition or structural form approach).

4.1 *Assessing pass-on using historical information*

This approach makes use of historical information on prices, cost factors and control characteristics to estimate the degree of pass-on. A regression model specifies the claimant's prices as a function of its input costs, and supply and demand control variables that may affect prices. Econometrically speaking, this is a "reduced-form" approach: it enables one to measure the extent of pass-on, without identifying the precise economic determinants behind it. Note that this approach should not just relate the prices to inputs purchased from the cartel, but also account for other input costs

¹³ Recall, however, that the presence of a pass-on effect also implies the presence of an output effect, which may especially be important when the claimant has much market power (see Van Dijk and Verboven, 2005).

¹⁴ For an overview of empirical studies of pass-on rates, we refer to Stennek and Verboven (2001) in the context of pass-on of efficiency gains by merging parties, and Hussain et al. (2001) in the context of damages in antitrust cases.

that may have varied over the consider period. A careful economic modelling is required, so as to avoid biases in the estimated pass-on due to misspecification.

The estimated pass-on rate may then serve as a basis for computing discounts to the damages claims. The greater the extent of pass-on, the greater will be the discount off the direct damage. If the claimant's market is fairly competitive, no further adjustment of the pass-on rate has to be made for the output effect, i.e. the fact that the claimant is loosing sales when raising its own prices in response to the cartel. However, it may be necessary to adjust the pass-on rate as a basis for measuring the discount if the output effect is likely to be large.

4.2 Assessing pass-on using a model of competition

Instead of measuring the extent of pass-on using historical information about the relationship between prices and cost, one may also follow an alternative approach and specify a complete economic model of how the claimant's industry operates. Such a model would make predictions about the extent of pass-on based on the relevant structural characteristics of the industry, and the implied required discount to the direct effect of the cartel. Since the main feature of this approach is the specification of a complete economic model, it is referred to as the structural approach, as opposed to the previous reduced-form approach.

In fact, the approach requires specifying several elements that were left open in the framework outlined in section 2. That framework essentially only introduced demand and cost conditions, without being explicit about how the firms strategically compete with each other. Adding a model of how firms in the industry behave completes the economic model, and can generate predictions about the pass-on rate and the required discount to the direct effect of the cartel. The structural approach may sometimes provide simple analytic formulas to compute discounts. In other cases this is not possible, and numerical methods have to be used, in which case the approach can be referred to as the "simulation approach". In either case, the predictions about the pass-on rate will depend on the same type of structural determinants, such as the price elasticity of demand and information on market shares and the number of firms. We now discuss the pass-on rate formulas for a few well-known models of competitive interaction.

4.2.1 Perfectly competitive market

In a perfectly competitive market, the pass-on rate of a cost increase at the industry level is given by the following well-known formula:

$$t = \frac{1}{1 + ew}, \quad (2)$$

where e is the elasticity of demand, and w is the elasticity of supply (the percentage increase in marginal cost, when output raises by one percent). The pass-on rate is therefore high if one of the following conditions are met: the demand curve is steep (low e); and, the marginal cost curve is flat (low w).

In two extreme cases, pass-on will be complete: when the demand is perfectly inelastic ($e = 0$), or when the marginal cost curve is perfectly flat ($w = 0$, no capacity constraints).

4.2.2 Imperfectly competitive market

In real life, most markets are not perfectly competitive. Firms exercise at least some market power, which is reflected in positive price-cost margins. This complicates the analysis of pass-on. In imperfectly competitive markets, the rate of pass-on no longer only depends on demand preferences and technological aspects, but also on the way margins are adjusted.

One possibility is that firms with market power lower their price-cost margins in response to a cost increase. The opposite, however, is also possible (but seems unlikely). A basic insight from recent oligopoly theory is that the extent of which price-cost margins are adjusted depends on the curvature of the demand curve faced by the firms. This is usually measured by the elasticity of the price elasticity of demand h , i.e. the extent to which the price elasticity of demand e changes when the price increases. When the price elasticity of demand is constant ($h = 0$), firms find it optimal to keep their percentage margins constant regardless of the cost conditions. This implies that a cost increase would lead to a higher absolute price cost-margin, and hence a higher rate of pass-on.

In practice, however, it seems more realistic that the price elasticity of demand increases when the price increases (hence a positive elasticity of elasticity $h > 0$). As price increases, consumers may become more price sensitive and spend their budget on other products. Firms would then find it optimal to lower their percentage margins, and for sufficiently high h even their absolute margins. With a positive elasticity of elasticity, it is thus possible that firms lower their margins in response to a cost increase, so that pass-on is less complete than in the perfectly competitive model.¹⁵

To illustrate, suppose that imperfect competition in the claimant's industry can be described by the Cournot model. In its basic version, this model assumes that there are N firms producing a homogeneous product at a constant variable cost. Firms simultaneously and independently choose their output to maximize its profits, taking as given the outputs chosen by the other firms in the industry. The pass-on rate is given by the following formula

$$t = \frac{1}{1 + ew + (h - 1)/(eN)}$$

This formula looks similar to the perfect competition formula, except for the third term in the denominator. This third term would cancel out if the number of firms N is very large, approaching the situation of perfect competition. With a small number of firms, it becomes important and captures the extent to which firms may respond to a cost increase by changing their margins. As discussed above, this would depend on the elasticity of the elasticity h . Consider two cases. First, if the elasticity of elasticity is constant ($h = 0$), then the third term is negative, so that the rate of pass-on is higher than under perfect competition. This is because firms charge constant percentage margins, hence the absolute margin increases in response to a cost increase. Second, if the elasticity of elasticity is sufficiently large ($h > 1$), then the third term is positive, so that the rate of pass-on is lower than under perfect competition. Firms now find it optimal to lower their margin in response to a cost increase. This situation would occur in one well-known specific case, the linear demand model for which $h = 1 + e$.

¹⁵ A similar result is also found in the tax incidence literature, which predicts that a monopolist absorbs part of a per-unit tax in order to reduce demand-contracting effects of pass-through of the tax.

When there is imperfect competition, the pass-on rate must be adjusted downwards if it is to be used to discount the direct damages claim. The reason for this is the output effect, which limits the extent of pass-on by the claimant since this reduces his sales.¹⁶

To summarize, the structural approach provides a useful approach to assess the pass-on rate based on observed structural determinants, such as the extent of capacity constraints, the price elasticity of demand, and the curvature of demand. If such information is available, it can be used either quantitatively, or at least qualitatively to argue that the extent of pass-on is high or low.

4.3 Pass-on circumstances neglected in the private settlement of the Christie's and Sotheby's price-fixing case

To illustrate how pass-on of a cartel price overcharge depends on market-specific circumstances, we briefly discuss the price-fixing cartel case of auction houses Christie's and Sotheby's between 1993 and 2000.¹⁷ The US Department of Justice (DOJ) and the UK Office of Fair Trading had started investigations into a cartel between Christie's and Sotheby's to fix the commission rates paid by sellers and the premiums paid by buyers. As far as the sellers' commissions are concerned there was a criminal settlement between the DOJ and Christie's and Sotheby's, which we will not discuss here in further detail.

From our perspective the more interesting issues relate to the civil settlement with respect to the buyers' premiums. Following a class-action suit started by Christie's customers, eventually Christie's and Sotheby's agreed to pay in settlement each an amount of 256 ml \$ to buyers and sellers. This settlement amount was based on certain percentages of hammer prices paid by buyers and received by sellers; it was divided between buyers and sellers and – and this is the main point - the buyers ended up with the largest part of the settlement amount. According to Ashenfelter and Graddy (2004) and Ginsburgh et al. (2004), the fact that buyers ended up with most was based on a misjudgement of the incidence of the price overcharges. Economic auction theory predicts that in the auction types as used by Christie's and Sotheby's,

¹⁶ See Van Dijk and Verboven (2005) for more on adjustments to the pass-on effect for this output effect.

¹⁷ Our discussion is based on Ashenfelter and Graddy (2004) and Ginsburgh et al. (2004).

buyers are unaffected by higher premiums (and also higher sellers' commission rates) because they factor these in in their bidding behaviour. In ascending auctions as used by these auction houses, winning bids are determined by the bidder with the second-highest reservation price. In the case of a higher buyer commission, the winning bid is reduced by the amount of the higher commission. In other words, the higher buyer commission is completely passed on to the seller. This specific aspect was neglected in the settlement and led to a misguided compensation to buyers and sellers.

5 Legal framework

So far we have largely neglected the legal framework in which damages claims can be submitted. Varying over jurisdictions, parties that suffer damage from a price-fixing cartel have the right, or not, to claim damages for compensation. This section first gives an overview of all possible parties that may suffer economic damage. It next describes the situation regarding legal standing of a party (i.e. the right to claim for damages) in the US and the legal practice in Europe. In the US a defendant cannot use a passing-on defence to argue that the claimant's damage was limited as the claimant passed it on to the next layer. A related, but strictly speaking separate point is that in the US indirect customers further down the supply chain cannot claim damages if the price overcharge was (partially) passed on to them. In Europe, in sharp contrast to the US, there have only been relatively few private damage claims following EC and/or national competition law violations. There is lack of clarity regarding the passing-on defence and the right of indirect customers to bring claims, but there appears to be a theoretical possibility to do so. The last section discusses economic arguments pro and con allowing or not allowing a passing-on defence.

5.1 Groups potentially harmed by a cartel

Connor (2000) distinguishes five groups that potentially suffer from economic damage from a price cartel. The first group are the direct purchasers, downstream firms or final customers, who pay the cartel overcharge for their inputs or final products. The second group are customers who did not purchase from cartel members but from fringe firms outside the cartel, but within the same relevant market, that charge a higher price as a non-cooperative response to the cartel price. This is the so-called "umbrella effect" of a cartel. If (part of) the price overcharge is passed on by direct purchasers to the next layer of the supply chain, there is a third group of indirect purchasers who pay inflated prices for products that contain the cartelised input. The fourth group are purchasers who would have purchased the cartel product at a competitive price, but who either do not purchase at all or purchase a less-preferred alternative outside the cartel. These purchasers make up part of the deadweight loss due to the above-marginal cost pricing of the cartel. The other part of the deadweight

loss consists of suppliers to the cartel, who sell less because of the output contraction at the cartel price. This is the final group.

5.2 Legal standing in the US

The standing of these five groups potentially harmed by a cartel varies in the US. The first group of direct purchasers clearly have standing to recover the price overcharge they paid – under the treble damage standard they are entitled to three times this direct damage. Since the *Hanover Shoe* (1968) Supreme Court ruling¹⁸, a defendant cannot argue the damage of the direct purchaser was limited because the price overcharge was passed-on to the layer downstream.

Regarding the second group of purchasers, who paid an overcharge because they bought from fringe players charging higher prices without actually participating in the cartel, there seems to be no consensus whether or not this should be allowed. In these cases, it is the cartel that is liable to pay damage, not the fringe players that actually served the purchasers. Quantifying the price overcharge on direct purchasers from non-participants may be undertaken using similar techniques to those in the case of direct purchasers from cartel members.

Since the *Illinois Brick* judgement by the Supreme Court in 1977¹⁹, the third group of indirect purchasers are given no standing in federal courts, but they are in a number of District Courts.²⁰

The fourth group of potential purchasers that were discouraged buying because of the cartel price, have generally been denied standing. This is both because of practical reasons (it might be hard to establish potential buyers) and of legal reasons (deadweight losses are no gains to the cartel members and damages are supposed to deny gains to the cartel). The final group of suppliers to the cartel are usually not allowed standing.

¹⁸ *Hanover Shoe Co. v. United Shoe Machinery Corp.*, 392 U.S. 481 (1968).

¹⁹ *Illinois Brick Co. v. Illinois*, 431 U.S. 720 (1977).

²⁰ Hussain et al. (2004) for a further discussion on the consequences of the *Hanover Shoe* and *Illinois Brick* rulings.

5.3 Situation in Europe

As far as Europe is concerned, a recent study by Waelbroeck et al. (2004) for the EC Commission on damage claims based on EC competition law infringements concludes as follows: “The picture that emerges from the present study on damages actions for breach of competition law in the enlarged EU is one of astonishing diversity and total underdevelopment.”²¹

In three out of 25 EU Member States there is a specific statutory basis for bringing damage actions for EC competition law infringement and in 12 Member States there is such basis for national competition law infringement. The study reports about 60 judged cases for damages, partly on the basis of EC law and partly on national law, of which 28 at the time of the study had resulted in an award being made. Harding and Joshua (2003) report that these private actions have faced highly uncertain outcomes and numerous practical barriers, such as the absence of class actions. Moreover, only few EU nations have criminalized price fixing and the EU seems to be moving slowly in that direction.

As far as standing by the various groups potentially affected by a cartel is concerned, Waelbroeck et al. (2004) state that the main relevant limitation on standing in most EU countries was the requirement of “interest” of the claimant in bringing the action. Regarding the passing-on defence, they carefully remark that there generally is lack of case law, but that the view is that on the basis of general principles of compensation-restitution, a passing-on defence is theoretically possible, with the defendant bearing the burden of proof. In some EU countries (Denmark, Germany and Italy) the passing-on defence issue has explicitly arisen and was considered possible. Also, indirect purchasers could theoretically sue, as long as they are able to prove a causal link.

5.4 Pros and cons of allowing passing-on defence and indirect purchasers' damage awards

The legal practice has considered two main questions in cartel damages allowances. The first question is whether or not a defendant should be allowed to use a passing-on defence against a direct purchaser, in order to reduce the damage award payable to the

²¹ Waelbroeck, D. et al. (2004), p1 of the Executive Summary.

claimant. The second question is whether or not indirect purchasers should be entitled to bring damages claims. We discuss the arguments pro and contra, whereby we first provide arguments as if these two policy issues are two aspects of one and the same underlying issue, i.e. allowing passing-on defence implies the possibility of indirect purchasers' damage claims and *vice versa*. Next we discuss the extent to which both policy issues are indeed necessarily related.

5.4.1 Arguments against passing-on defence and allowing standing of indirect purchasers

The main argument against allowing a passing-on defence is that direct purchasers, for several reasons, can be better relied upon to effectively claim for damages from cartels, and that thus the deterrence effect for cartels is larger. Landes and Posner (1979) put forward the following reasons. First, direct purchasers have an informational advantage because they were closer to the cartel. Secondly, given the complexities involved in allocating damages between direct and indirect purchasers, which creates more uncertainty regarding the damage awards to be expected, the incentives to bring claims may be reduced. Thirdly, indirect purchasers have many small claims whereas direct purchasers tend to have fewer larger claims, and this implies that direct purchasers have a larger incentive to bring claims. Landes and Posner finally also argue that indirect purchasers may be indirectly compensated if direct purchasers charge their customers less on the basis that their damage compensation is not limited by passing-on defence.

5.4.2 Arguments in favour

The economic arguments in favour of allowing the defendant to use a passing-on defence and permitting indirect purchasers' damage awards include the following. First, if direct purchasers indeed passed on part or all of the cartel price overcharge (and were not stopped doing so in anticipation of receiving damage awards), then damage compensation to direct purchasers without taking this pass-on into account is too large, and that of indirect purchasers who actually paid the overcharge is too small. From an allocative efficiency point of view it may under specific circumstances

lead to distorted prices and inefficient decisions these distorted prices bring about. Notice that this is a different efficiency argument as put forward by Landes and Posner (1979) – in their argument efficiency relates to minimising the chances that cartels occur.

A second argument is that this overestimation in absence of a passing-on defence may also distort incentives to the claimants to reveal the cartel. Take the simple example where the downstream sector is perfectly competitive and has a flat marginal cost curve. It can then pass-on the entire price overcharge to its own customers. Hence, without a passing-on defence the downstream sector would have a strong incentive not to reveal cartel. They are not really hurt, since they pass it all on, and once cartel detected, they can sue anyway, and ultimately extract the entire cartel's monopoly rents when there is no passing-on defence.

A third argument that has been put forward is that direct purchasers may be less inclined to bring damage claims than indirect purchasers because of the direct and ongoing relationship they maintain with their cartel suppliers. Cartel members may also be able to more effectively retaliate towards direct purchasers, which may deter them more strongly from bringing claims (Harris and Sullivan, 1979). This would imply that not direct but indirect purchasers have stronger incentives to reveal cartels.

Finally, Schinkel et al. (2005) point out in a theoretical model that only allowing direct purchasers to bring claims may under specific circumstances have the perverse effect of facilitating cartels. They show that the *Illinois Brick* ruling permits a mechanism whereby the upstream cartel “bribes” direct purchasers not to bring damage claims, in such a way that direct purchasers are better off than receiving treble damages and cartel members make higher profits than under competition in absence of the cartel.

The economic framework set out in section 2 can contribute to the policy discussion on the passing-on defence by pointing out the difference in damage claims depending on whether or not passing-on is allowed, may be smaller than often thought. The passing-on effect is namely reduced by the presence of an output effect, limiting the discount off the direct damage.

5.4.3 Decomposing Hanover Shoe and Illinois Brick?

There appears to be, as far as we are aware, an implicit view that an answer to the first question on passing on also implies an answer to the second one, on standing of indirect purchasers. This view can be made more explicit as follows. If the passing-on defence against a direct purchaser would be allowed, then this would imply that indirect purchasers should also be entitled to make damages claims, since otherwise some of the damages caused by the cartel are not compensated for. Conversely, if the passing-on defence against a direct purchaser would not be allowed, then this would imply that the indirect purchasers should not be entitled to make damages claims, since otherwise some of the damages are compensated for twice (once to the direct, and once to the indirect purchaser). In sum, if one takes the view that the cartel should repay all parties' damages but without double counting, then a positive (negative) answer to the first question would also imply a positive (negative) answer to the second question.

In our opinion, it is not necessary to take this view, i.e. it is not necessary to consider only damages schemes that accurately reflect the overall damages (to all parties) caused by the cartel. In fact, the practice of treble damages illustrates this. It may therefore be desirable to address both questions separately. This position would leave open the possibility to allow pass-on defence, on economic grounds. At the same time, however, on more practical grounds it would be possible to deny indirect purchasers the standing to claim damages.

6 Quantifying damage in other antitrust law infringement cases

Besides price-fixing cartels, competition law infringements can take various other shapes and forms.²² This section discusses damage assessment in the case of excessive pricing by a dominant firm, where claimants are customers, and exclusionary behaviour by a dominant, where claimants are rivals of the defendant.

6.1 Damage due to excessive pricing

Analysis of damages due to excessive pricing is very similar to damages due to cartel prices. Under some conditions excessive prices are equal to cartel prices but even if not equal, the main point is that excessive prices also imply a price overcharge as with cartel prices. In both cases there are direct and indirect effects very similar to the cartel ones discussed above. As far as the legal framework is concerned, in the US the principles as set out by the *Hanover Shoe* and *Illinois Brick* rulings on passing-on defence and indirect purchasers' damage awards also apply to excessive pricing cases.

6.2 Damage due to exclusionary behaviour

As opposed to cartel damage assessment, damage of competition law infringement in exclusionary practice cases is measured more directly through the impact on profits of the claimant victim, which in these cases is not a purchaser but a rival of the defendant.²³ In cartel damage assessment it is in principle also possible to assess damage through effects on profits but, as said earlier, in practice damage is often assessed indirectly through impact on the input costs of the claimant victim.

This difference in assessing damages in price-fixing cartel cases and exclusionary conduct cases could imply an inconsistency regarding the use of passing-on defence in the US. By assessing damage on the basis of impact on profits, implicitly it is taken

²² Damage due to patent law infringement can be assessed using similar methods as described here. We will, however, not cover damage assessment in patent infringement cases here.

²³ Notice that cartels can also act to collectively exclude new entrants. An example is a downstream cartel that can credibly threaten not to purchase from upstream suppliers if those upstream suppliers provide inputs to new entrants. Like exclusionary conduct by a single firm, damage due to exclusionary cartel activity can be assessed using the methods described in this section.

into account that the claimant has passed on part of the damage. Consider the example where exclusionary conduct by the defendant has not induced exit from the market, but caused marginal costs for the claimant to be higher. It is well possible that the claimant has partially passed on these higher marginal costs to its customers; this choice to pass on will have affected the claimant's profits and the delta-profit approach thus takes passing-on into account.

In exclusionary conduct cases damages are assessed in terms of lost profits from the misconduct where the objective is to value that portion of a business that has been lost as a result of competition law infringement. The same underlying idea of constructing what would have happened "but for" the competition law infringement to assess damages is also used here. Hall and Lazear (1994) phrase this as follows: "... The essential features of a study of losses are the quantification of the reduction in earnings, the calculation of interest on past losses, and the application of financial discounting on future losses. The losses are measures as the difference between the earnings the plaintiff would have received if the harmful event had not occurred and the earnings the plaintiff has or will receive, given the harmful event. The plaintiff may be entitled to interest for losses occurring before the trial. Losses occurring after the trial will normally be discounted. The majority of damages studies fit this format."²⁴ In practice this involves using accounting, finance and economic methodologies to estimate the difference between what the claimant's profit was, and what it would have been, but for the antitrust infringement.

Clark et al. (2004) mention the following accounting methods for valuing businesses and lost profits. First, "earning-based" methods, which involve discounting sales, costs and cash flows from the income statement in order to provide an estimate of the but for scenario. Second, "market-based" methods, which uses financial indicators to value the injured business, such as stock market values or profits of comparable businesses with publicly traded shares. Finally, "assets based" valuation methods, which use information from the balance sheet to value a business. Relevant measures include the book value of tangible net worth, fair market value of tangible net worth and liquidation value.

²⁴ Hall and Lazear (1994), p280.

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