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I. INTRODUCTION

When assessing the damage incurred by customers of a cartel, it may (depending on the applicable legal framework) be relevant to consider the extent to which these downstream firms have passed on some or all of any price increase caused by the cartel to their own customers. Since passing on a price increase will always reduce the overall damage,² reference is often made to the “passing-on defense.” However, it is important to note that any attempt by downstream firms to pass on cartel overcharges will lower their sales, implying that downstream firms will suffer a damage even when the entire price overcharge has been passed on. In view of this, the analysis of pass-on should, at least from an economic point of view, also consider the value of lost sales caused by any price increase.

In this short article, we discuss the economic analysis of pass-on. Section 2 reviews a number of useful insights from the economic literature into the incentive of firms to pass-on cost increases under different circumstances. Section 3 discusses the estimation of pass-on in practice. Section 4 offers some concluding remarks.

II. PASS-ON IN THEORY

A firm that is faced with an increase in its variable input costs as a result of a cartel among its suppliers will typically be inclined to increase its own prices. The reason for this is that the firm’s profit-maximizing price levels prior to the cost increase will be different from profit-maximizing price levels after the cost increase. When setting their prices, firms take into account the margins associated with the volume loss that a price increase would entail. Importantly, since an input cost increase reduces margins, the negative effects of any volume loss become less severe. As a result the firm is, to a greater extent than previously, prepared to accept a volume loss as a result of higher input prices, providing it with an incentive to increase prices. However, as we will discuss below, firms will not necessarily choose to pass on the cost increase in full.

The trade-off between higher margins on existing customers and foregone margins on lost customers is a fundamental principle guiding the pricing decisions of firms. It follows that from an economic point of view, the analysis of pass-on is closely related to the analysis of the lost sales that a price increase would entail. The sales that a firm would lose when passing on some fraction of a cartel price increase to its customers are usually referred to as the “output effect” or “lost sales effect.” We discuss pass-on and the output effect in turn.

A. Factors Impacting on Pass-on

Economic theory provides several useful insights into how firms in different situations may choose to react to an input cost increase. The most widely known results from economic

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² As downstream firms always have the option of not passing on the price increase, this implies that the decision to pass-on is profitable and, therefore, it reduces the damage suffered by the downstream firms.

theory into the pass-on behavior of firms relate to the textbook models of monopoly and perfect competition. In their basic form, these models provide the two following insights:

- In a market characterized by perfect competition, a marginal cost increase affecting all firms in the market can be expected to be passed on in full.
- A monopolist will, given a number of assumptions, pass on 50 percent of a marginal cost increase to its customers.³

These results make it clear that the degree of industry-wide cost changes passed on is determined by, among other things, the nature of competition in the market. Interestingly, the *more* competitive the market, the *higher* the degree of pass-on that can generally be expected. This result is somewhat surprising and deserves an explanation.

The reason why a monopolist may choose not to pass on input cost increases in full is closely related to the trade-off between higher prices on existing customers and foregone margins on lost customers discussed above. Monopolists earn a margin over the cost of goods they sell. When attempting to increase its prices, the monopolist will suffer a loss in volumes and will therefore forego the margins that it would have earned on the lost volumes. When considering whether or not to pass on the input cost increase, the monopolist will thus balance the additional profits resulting from the price increase with the lost margins on the volumes that it will lose as a result of this price increase. To limit the volume loss, the monopolist will choose not to pass on the cost increase in full.

By contrast, in the theoretical (and, in practice, unrealistic) model of a market characterized by perfect competition, firms set prices at marginal costs and thus do not earn a margin over their costs. In such a market, price increases will need to be passed on in full if losses on any unit sold are to be avoided.

Results for oligopoly models, which may be more relevant for most markets in practice, are in between the results for the perfect competition and monopoly cases. For example, in the textbook Cournot duopoly model, which assumes that two firms compete by choosing the output that maximizes their individual profits, the predicted pass-on rate of an industry-wide input cost increase would, again on the basis of certain assumptions, be two-thirds.⁴

However, markets in practice are far more complex than the textbook models described above and, as a result, the predictions of these simple models do not shed much light on the likely extent of pass-on. Far more accurate estimates of the degree of pass-on can nevertheless be obtained by undertaking the detailed empirical analysis that we discuss below.

Finally, it is worth noting that pass-on is more likely to occur to the extent that most, if not all, competitors in the downstream market have been affected by the overcharge. If only some downstream firms incurred higher input costs, their ability to pass-on these higher costs must have been somewhat constrained by the fact that other competitors will have left their price unchanged. In this case, the pass-on rate would likely be relatively small. Such a scenario could

³ In particular, this textbook result is based on the assumption that the monopolist faces a constant marginal cost and a linear demand function. See J.I. Bulow & P. Pfleiderer, *A note on the effect of cost changes on prices*, (91) J. POL. ECON., 182-185 (1983).

⁴ This result is based on the assumption that the two firms face the same constant marginal cost of production and linear demand function. See A. Ten Kate & G. Niels, *To what extent are cost savings passed on to consumers? An oligopoly approach*, (20) EUR. J. LAW & ECON., 323-337 (2005).

occur, for example, when some of the cartelists are vertically integrated and do not apply higher prices to their own subsidiaries.

B. The Output Effect

As discussed above, passing on an input cost increase in the form of higher retail prices will most likely result in a reduction in volumes. Therefore, when considering the effects of pass-on on the overall damage, it will—at least from an economic point of view—also be necessary to consider the consequent output effect.

Again, economic theory offers some useful insights into the likely magnitude of the output effect under different scenarios. For example, in the textbook model of perfect competition, the output effect does not exist. Since firms do not earn any margin over their sales in such markets, lost sales do not imply any reduction in profit. Consequently, in markets characterized by perfect competition, the (complete) pass-through of input cost increases does not need to be adjusted for any output effect. By contrast, in a downstream market characterized by imperfect competition, the output effect can be very significant. This is because firms in such markets typically earn a positive margin such that losing sales may entail a significant reduction in profitability. The output effect is also likely to be very significant if only a subset of all firms in a market is affected by the cartel, since these firms will, when trying to pass-on some of the input cost increase to their customers, likely lose market share to rivals that are unaffected by the cartel.⁵

In some cases, it will on *a priori* grounds be clear that the output effect is likely to be insignificant. In particular, if the cartelized input accounts for only a small percentage of the total costs of the downstream product, the cartel is unlikely to trigger a significant retail price increase. If the retail price increase is tiny, the corresponding reduction in consumer sales would likely be small as well.

III. ESTIMATING PASS-ON IN PRACTICE

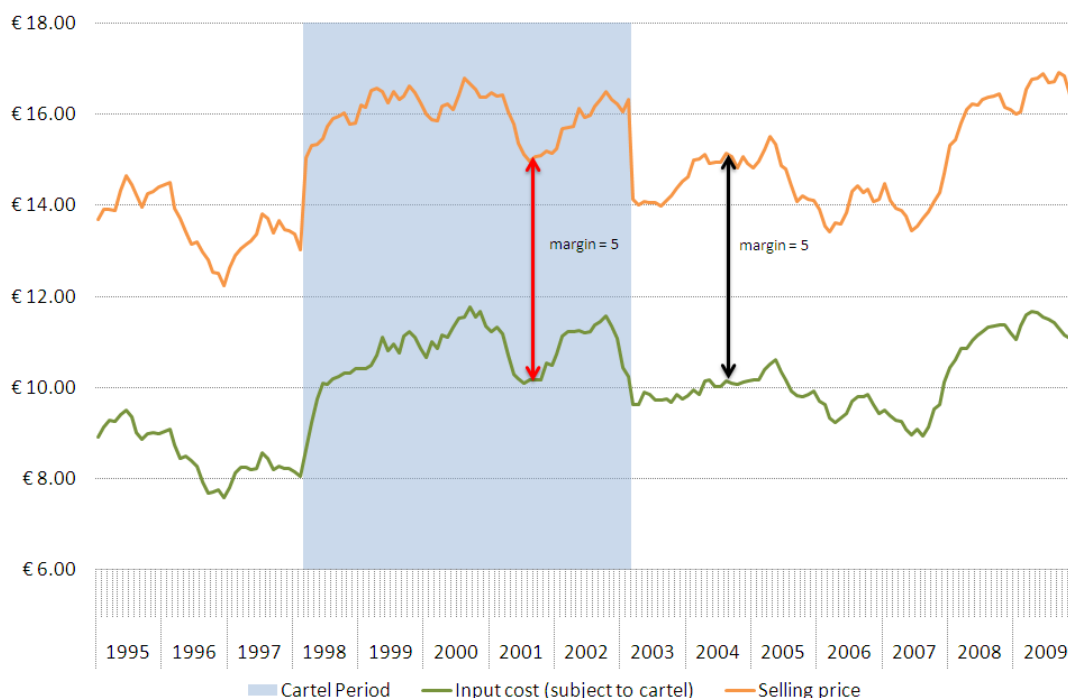
In order to estimate the degree of pass-on of input cost changes in practice, it is necessary to examine the relationship between prices charged by the downstream firm and the input costs of this firm that were subject to the cartel. When considering the output effect, it is furthermore necessary to consider the impact on the cartel on volumes sold by the downstream firms, as well as the margin earned foregone on any lost volumes.

The two charts below provide an example of an analysis of pass-on in a simple setting where the cartelized input represents the main input into the downstream product. In each of the charts, the green line represents the cost of the input that was subject to a cartel between 1998 and 2002. Based on the information contained in the charts, the cartel appears to have given rise to higher prices during these years. The orange line represents the selling price of the downstream firm.

In Figure 1, the overcharge resulting from the cartel appears to have been fully passed on to consumers. A visual inspection suggests that the input price increase that occurred during the cartel period is broadly reflected in selling prices during this period. Indeed, the margin between the selling price and the input costs remains at broadly the same level during the cartel period as outside the cartel period.

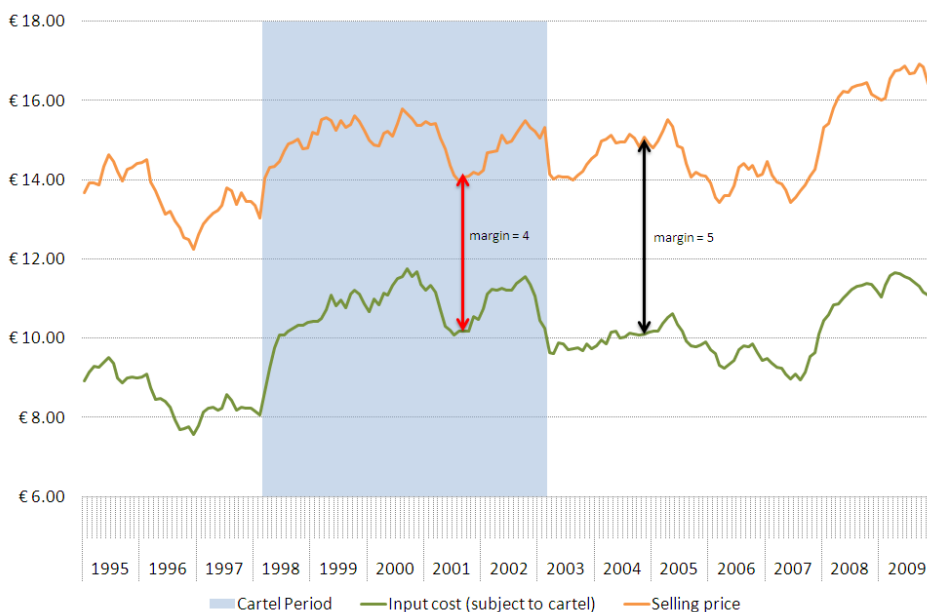
⁵ See F. Verboven & T. van Dijk, *Cartel damages claims and the passing-on defense*, (57) J. INDUS. ECON., 457-491 (2009).

Figure 1



In Figure 2, there is also some evidence of pass-on. As is the case with the price of the input, the selling price increases at the start of the cartel period and falls again at the end of this period. However, in this case, only part of the cost increase appears to have been passed on, resulting in unit margins during the cartel period being lower than outside this period.

Figure 2



In cases like Figure 2, the degree of pass-on can be estimated using simple techniques. For example, the analysis could compare average margins both during and after the cartel and relate

these to the amount of the cartel overcharge. If in Figure 2 the average cartel overcharge per unit was equal to EUR 2 and if average unit margins dropped by EUR 1 during the cartel (from EUR 5 to EUR 4), this would suggest that 50 percent of the overcharge would have been passed on.

Although these simple techniques usually also have some value in more complex settings, an issue that often arises in practice is that the price of the cartelized input is only one of many factors impacting on the selling price of the downstream firm. For example, prices of the downstream firms may also be influenced by the price of other, non-cartelized inputs, or by other factors such as the strength of demand. If other factors impacting on prices display a high degree of variation (e.g. because of strong demand fluctuations with significant effects on market prices), it can become difficult to disentangle the effect of the cartel overcharge from the effect of these other factors.

These issues can, in principle, be addressed by undertaking an econometric analysis. Econometric analysis can be used to test how changes in one variable, the “dependent” variable (e.g. the selling price or the margin) can be explained by changes in other, “independent” variables (e.g. the price of input or the strength of demand). Crucially, the analysis is able to isolate the effect of each of the factors impacting on the selling price, controlling for the impacts of the other factors. Another key benefit of econometric analysis is that such analyses provide an indication of the degree of confidence in the results of such an analysis. For example, the analysis indicates whether the effect of a particular factor is “significant.” The impact of a particular variable is statistically significant if the analysis gives a high degree of confidence (typically a 95 percent probability or more) to conclude that the very existence of that impact is real and not caused by chance.

For example, an econometric model could be set up that explained prices charged by the downstream firm as a function of the cost of the various inputs. If a statistically significant relationship is found between the price of the cartelized input and the selling price, this would suggest that some degree of pass-on is likely to have occurred. Alternatively, the analysis could test whether margins during the cartel period are lower than outside the cartel period. If the answer to this question is affirmative, this would suggest that pass-on would have been less than complete. Econometric analysis can also be used to examine the output effect, for example by examining the relationship between selling prices and volumes sold by the downstream firm.

Although econometric analyses can be very powerful, they tend to require significant amounts of data. The reason for this is that only with sufficient data can the model estimate the effect of the various factors to a reasonable degree of accuracy. The more data are available, the higher the degree of confidence one can have in the model’s results. Moreover, since all econometric analyses rely on assumptions, there is invariably scope for disagreement on the appropriate assumptions to use. As a result, it is often the case that parties on different sides of a case produce differently specified econometric models that obtain conflicting predictions. This can give rise to significant debate during a case. While this can be time-consuming, such a debate does often shed important light on the quality of the different models being proposed.

IV. CONCLUSION

Since firms normally have an incentive to pass on cost increases to their customers, the analysis of cartel damages should always consider to what extent any cartel overcharges have been passed on. Since higher prices typically result in a reduction of sales, any analysis of pass-on should also take into account the value of lost sales caused by any price increase.

Theoretical models provide some insights into the incentives of firms to pass on cost increases under different circumstances and, in particular, suggest that firms will often choose to absorb a portion of the cost increase. However, an accurate estimate of the actual magnitude of pass-on can only be obtained on the basis of a detailed empirical analysis. Undertaking detailed quantitative analyses of the extent to which cartel overcharges have been passed on should ultimately result in damage awards that more accurately reflect the actual damage incurred by the claimant.