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Agenda

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Best of both worlds? Innovative approaches to modelling merger price rises

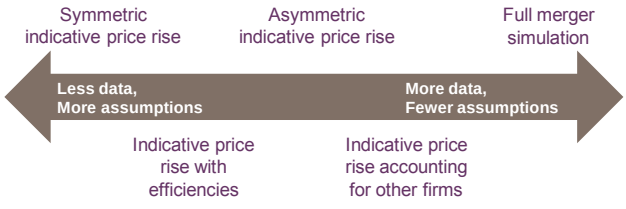
The use of merger price rise analysis in the assessment of unilateral effects of mergers features prominently in the ongoing merger guidelines consultations in the USA and UK. While sophisticated tools such as merger simulation have had limited influence on merger decisions, simpler approaches such as indicative price rise tests have been used extensively in a number of recent cases, but rely heavily on assumptions. Can other techniques strike a balance between the two?

One of the theories of harm at the heart of merger control is that of unilateral effects in mergers between competitors. Unilateral effects arise if there is a worsening of the competitive offers by the merging firms to their customers due to the loss in rivalry between them after the merger; the offers by other firms in the market may also deteriorate following the merger.

This worsening of the competitive offers may manifest itself through higher prices, lower quality or reduced innovation in the market; of these, the post-merger price rise is often the easiest to quantify. Consequently, the assessment of the likely post-merger price increase has been a primary concern of competition authorities in merger cases across jurisdictions. It is also reflected in the emphasis on price rise calculations in recent consultations on new horizontal merger guidelines in both the USA and the UK.[1]

In order to assess the likely price rise following a merger, competition authorities potentially have available a whole spectrum of tools of varying levels of complexity. At one end there is the symmetric indicative price rise, which uses very simple assumptions on firm behaviour and demand.[2] At the other end there is full merger simulation, which can incorporate sophisticated demand conditions and various forms of interaction among firms in the relevant market. Between these extremes, there is a variety of tools which relax some of the assumptions of the simple indicative price rise (such as symmetry between firms) without being as comprehensive as a full merger simulation (see Figure 1).

Figure 1 Merger price rise analysis: a spectrum of tools



Source: Oxera.

This article takes a look into the 'black box' of merger price rise calculations, and presents the intuition of these tools. It discusses the methods commonly considered by authorities as well as other techniques (referred to here as advanced indicative price rise tests) that aim to strike a balance between the basic price rise tests and full merger simulation models.

Why (and how to) assess potential merger price rises?

Typically, price increases by a firm producing a particular product are constrained by competing products, since a price rise would lead to a loss of customers to these alternatives, decreasing the firm's profits. Following a merger with a competitor that produces any of those competing products, these constraints are weakened, thus increasing the ability and incentives of the merged entity to raise prices. In fact, the merger may also increase the incentives of the other firms in the market to raise prices for their products as well. The strength of these incentives is the focus of merger price rise analysis.

Thus it is important to assess the pre-merger competitive constraints in the market. The extent of such constraints is often a function of the degree of substitutability between the products and the ability of the firms to set prices independently in the face of competition. For example, the degree of substitutability may be measured by diversion ratios, which represent

the proportion of sales captured by different substitute products when the price of a product is increased. The competitive constraints can also be measured by elasticities of demand—both own-price elasticity (ie, the percentage change in demand for product A when its price is changed by 1%), and cross-price elasticity (the percentage change in demand for product B when the price of product A is changed by 1%).

The specific measures used to capture these competitive constraints vary depending on the tool used—the simplest of these are used in the symmetric indicative price rise approach. More complex measures of the competitive constraints are used in full merger simulation, but the intuition is similar to that of the simpler approaches.

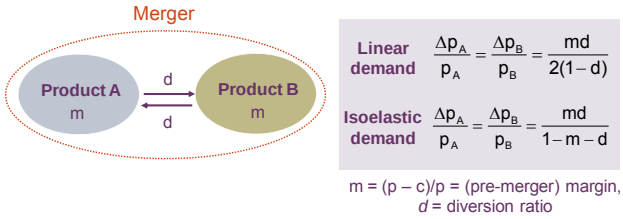
The simple price rise test

The simple indicative price rise is increasingly used by competition authorities to assess potential price increases following a merger. The approach calculates the likely price rise after a merger between two firms, using data on margins and diversion ratios between the merging parties. The box below explains the main elements of the approach and the steps used to arrive at the price rise formulae.

The simple price rise formula assumes that the merging products/firms are symmetric in the sense that they have identical margins and diversion ratios. The calculation also involves an assumption about the shape of the demand curve that the firms/products face; the most common alternatives are linear demand and constant elasticity (isoelastic) demand. Figure 2 illustrates the symmetric case and shows the formulae for the price rise with linear and isoelastic demand. The formulae also assume that the price levels of the two merging products are the same.

For example, a margin of 40% and a diversion ratio of 10% imply a 2.2% price increase with linear demand and an 8% increase with isoelastic demand. The price rise in either case would be greater with a higher diversion ratio. Intuitively, the diversion ratio measures the proportion of sales of a product diverted to a competing product following a price rise of the given product, and therefore captures the degree of substitution between competing products. The higher the diversion ratio between the merging parties, the more closely they compete. Consequently, the greater the loss of competition after the merger, implying a higher price rise.

Figure 2 Indicative price rise with linear demand and isoelastic demand



m = (p – c)/p = (pre-merger) margin,
d = diversion ratio

Source: Oxera, based on Shapiro, C. (1996), 'Mergers with Differentiated Products', *Antitrust*, Spring.

Similarly, a higher pre-merger margin would imply a higher price increase. The margin indicates the degree to which a firm can set prices independently of its competitors—theoretically, the higher the margin, the weaker the competitive constraints faced by the firm, and hence, the greater the ability to increase prices post-merger.

The symmetric price rise formula has been used to inform the unilateral effects assessment in a number of recent cases, including in the UK and South Africa. One of the first important cases in the UK was the Competition Commission's assessment of the Somerfield/Morrison supermarket merger.[3] More recently, the same approach was used to analyse the likely price increase at over 400 locations in the UK for the Co-op/Somerfield merger.[4] Together with other evidence, this analysis formed the basis of the UK's Office of Fair Trading (OFT) decision to clear the merger and for deciding which stores should be divested because of potential competition concerns. The indicative price rise was also examined by the OFT in the online DVD rental service merger between LOVEFiLM and Amazon.[5] The OFT used a linear demand along with diversion ratios of around 30–40%

Indicative price rise: a step-by-step explanation

- **The underlying economic model of firm behaviour is the Bertrand oligopoly model of a differentiated goods market, where each firm is a monopolist for its own product/brand, but where the demand for its brand also depends on the price of competing brands.**
- **These competitive constraints between brands are captured by two simple measures: diversion ratios, which indicate the degree of substitutability of the products/brands, and margins, which reflect the ability to set prices independently.**
- **The model yields a formula for the profit-maximising price level of the firm's products pre-merger, which depends on the diversion ratios and margins.**
- **The same model is applied to the post-merger situation, where one firm now owns two competing products/brands, and a formula for the post-merger profit-maximising price is obtained.**
- **The new (post-merger) price level and the old (pre-merger) price level are then compared in order to derive a formula for the likely price rise due to the merger.**

from LOVEFiLM to Amazon, as well as the relevant margins, and estimated a price rise of around 0–10% for LOVEFiLM. The diversion ratios were estimated using consumer survey results.

The basic indicative price rise therefore lies at the simplistic end of the spectrum of methods, shown in Figure 1. It has the important advantage of being a straightforward and transparent tool. However, this comes at the expense of a number of restrictive assumptions, which do not allow it to incorporate a number of possible features of the case under examination, such as:

- asymmetries between firms;
- merger efficiencies;
- the reaction of other firms in the market;
- other forms of competition between firms (such as competition in capacity or quantity rather than prices).

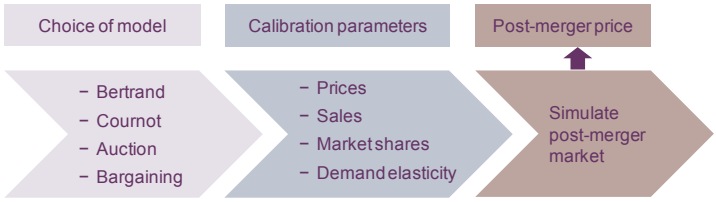
It is relatively straightforward to relax some of these assumptions and use other more advanced indicative price rise approaches. Some of these are introduced below.

Full merger simulation

A full merger simulation is possibly the most comprehensive, albeit complex, approach to estimating the likely price rise after a merger, accommodating a variety of features such as asymmetries among firms, merger-specific efficiencies, and various forms of interaction among firms in the market (such as bidding markets).

The approach involves specifying an appropriate industrial organisation (IO) model that reasonably reflects the nature of competition in the market, and a demand function reflecting consumer preferences and responses in the market. Both are then calibrated using market observables such as prices, quantities and market shares. This calibrated model is used to 'simulate' the proposed merger and measure the associated price rise. Figure 3 illustrates the two main components of the merger simulation approach—theoretical models and calibration—and the menu of choices for each component.

Figure 3 Components of full merger simulation



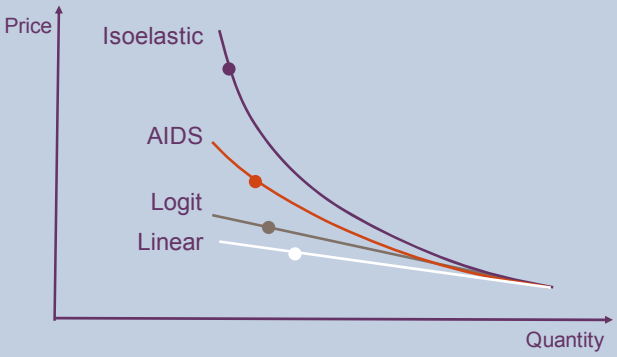
Note: Elasticity of demand often needs to be estimated from observed prices and quantities.
Source: Oxera.

Calibration is an important component of merger simulation models since, without it, the exercise is likely to produce nonsensical results that are inconsistent with the reality of the market. Some of the data used for this purpose, such as pre-merger prices and market shares, is often readily available (eg, from industry reports or the merging parties' own market intelligence). However, parameters such as the elasticity of demand would often need to be estimated from the specified demand function. The choice of the specific functional form is crucial in this regard as different demand functions imply different predicted post-merger price rises (illustrated in the box below).

The comprehensive analysis of the market in a merger simulation means that the data requirements are greater. Consequently, in most jurisdictions the use of full merger simulation models has been limited. Even when they have been used, these models have often not been relied on by competition authorities in final decisions due to doubts regarding assumptions and data. Nonetheless, it is useful to consider some cases where such models have been considered to analyse the effect of a proposed merger.

For example, merger simulation has been explored in *United States v. Interstate Bakeries Corp. and Continental Baking Co.*, which involved a merger

Predicted price rise for different demand functions



The demand for a product may be represented by a number of types of demand function such as linear, isoelastic (constant elasticity), logit and almost ideal demand system (AIDS). Each functional form implies a different level of post-merger price rise. For example, all other assumptions remaining the same, the post-merger predicted price rise with isoelastic demand is higher than that with linear demand; hence, an isoelastic demand assumption is more likely to highlight a merger as problematic. However, the isoelastic demand function should be used with caution as it may predict very high and unrealistic price increases.

between two leading wholesalers of white pan bread in Chicago and Los Angeles.[6] The approach used a Bertrand oligopoly model to reflect the brand-level competition in the market, and a logit demand to represent the demand conditions; it also accounted for the competitive constraints imposed by the closest competitor of the merging parties in the two areas. Under this approach, the predicted price increases were around 5–10% for the merging parties and 3–6% in the overall market. However, the merger simulation was not relied on in court as the parties reached an out-of-court settlement.

A similar model was considered by the European Commission in the Volvo/Scania merger between two manufacturers of trucks, buses and other industrial equipment.[7] The simulation employed a logit demand and a Bertrand model of price competition, and predicted price increases in excess of 10% in most markets. However, the model was criticised by the merging parties in relation to data measurement errors, and the mismatch between actual price–cost margins and those estimated by the model. In its final decision, the Commission did not rely on the results, stating that:

> Given the novelty of the approach and the level of disagreement, the Commission will not base its assessments on the results of the study.

The Commission did rely on a similar model in the Lagardere/Natexis/VUP merger between suppliers in the market for communication, media and creative publishing. In this case the model and the simulated price rise were found to be robust and reliable.[8]

A very different simulation model, involving auctions, was used by the Commission in the Oracle/Peoplesoft merger between the second- and third-largest vendors of service software products.[9] A sealed-bid auction model was used to represent the competition in procurement along with possible efficiency gains. Although the model predicted price increases of 6.8–30% for various products, it was later disregarded by the Commission in light of new evidence and subsequent doubts over the reliability of results. The US Department of Justice, which was also assessing the merger, found similar price effects while using a very different auction format (English auction with complete information). Nonetheless, the District Court rejected the model on the basis of the uncertainty of the predictions.[10]

As evident from above, merger simulation often involves extensive data requirements and complex modelling. The latest US horizontal merger guidelines consultation states that:

> Where sufficient data are available, the Agencies may construct economic models designed to quantify the unilateral price effects resulting from the merger … The Agencies do not treat merger simulation evidence as conclusive in itself, and they place more weight on whether their merger simulations consistently predict substantial price increases than on the precise prediction of any single simulation.[11]

Advanced approaches to the indicative price rise

Between the two ends of the spectrum, there are tools available that have less restrictive assumptions than the simple price rise approach, and that are less complex than a merger simulation. For example, merger assessment typically involves a consideration of merger efficiencies, and it is important to explore the possibility of incorporating efficiencies in the price rise analysis—they reduce the potential price rises and, if large enough, can lead to price reduction post-merger.

For example, the price rise formula with efficiencies for linear demand is $\Delta p/p = m*d/2(1–d) – \Delta m/2$, where, as above, m is the pre-merger margin and d is the diversion ratio. Δm reflects the increase in the pre-merger margin due to the cost reductions from efficiencies—part of which is passed on to a lower price increase.

As an illustration, using the same example as referred to above (40% margins, 10% diversion ratios), a 3% reduction in margins as a result of merger efficiencies leads to a 0.7% price increase with linear demand compared with 2.2% without efficiencies. Efficiencies of 5% lead to a predicted price reduction post-merger: 0.3% with linear demand, and 1% with isoelastic demand.

A recent case where merger efficiencies were considered as part of the price rise analysis was the South African Competition Tribunal assessment of the Masscash/Finro merger in the groceries wholesale sector.[12] Assuming linear demand, the Tribunal found that a 1% efficiency assumption would lead to a reduction in the predicted price rises by 0.5 percentage points.

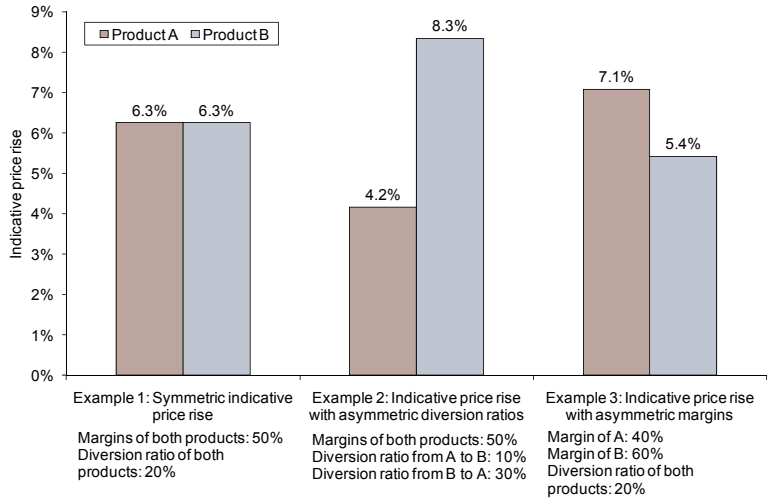
This South African case also used another extension of the simple approach. Given that there were considerable differences between the merging parties, the symmetry assumption was relaxed and the asymmetric predicted price rises were calculated. This extension is relevant when there are asymmetries between the merging firms—for example, if one firm constrains other firm's pricing more strongly than the other way round. The additional data requirements to calculate the price rise using this approach are relatively limited: data on margins and diversion ratios of both merging parties are required in this case.[13] This ignores any merger efficiencies. Although more

complex, it is also possible to calculate the price rise for an asymmetric model with efficiencies.[14]

Figure 4 presents examples of asymmetric indicative price rises assuming linear demand, and compares these to the basic symmetric results. Example 2 in the chart shows that the price rise is lower for the product with the higher diversion ratio (product A in this example). The intuition for this result is that greater diversion away from product (B) is more profitable, since a large proportion of sales is captured by the other product (A), thus a larger price rise is possible (for product B). Example 3 also shows that the price increase is greater for the product with the lower margin. This is because less profit is lost as a result of a price rise when margins are low.

These advanced indicative price rise methods, which relax the assumptions on symmetry and/or merger-specific efficiencies, are relatively modest in data requirements, and not as complex as a full merger simulation. It is also possible to model other more complex merger situations, such as considering the price response of non-merging firms, and multi-product firms, within the same framework, albeit with a corresponding movement towards the more data-intensive end of the spectrum.

Figure 4 Illustration of asymmetric indicative price rise



Source: Oxera analysis.

Concluding remarks

The use of the simple indicative price rise and full merger simulation highlights the trade-off between sophistication and complexity in assessing the likely price effects of a merger. While the choice between these approaches may typically be based on available data and the nature of the case, both approaches have gained increased acceptance by competition authorities in recent years.

The advanced price rise approaches retain much of the simplicity and intuition of the basic approach while incorporating realities such as asymmetry and efficiencies. It is this balance between simplicity and realism that makes these tools appealing in assessing the likely price rise after a merger.

[1] See Federal Trade Commission and Department of Justice (2010), 'Horizontal Merger Guidelines. For Public Comment', April 20th; and Competition Commission and the Office of Fair Trading (2010), 'Review of Merger Assessment Guidelines', draft, April 14th.
[2] This approach is also known as the illustrative price rise (IPR) approach, as introduced in Competition Commission (2005), 'Somerfield plc/ Wm Morrison Supermarkets plc: A Report on the Acquisition by Somerfield plc of 115 Stores from Wm Morrison Supermarkets plc', September.
[3] Ibid.
[4] Office of Fair Trading (2008), 'Anticipated Acquisition by Co-operative Group Limited of Somerfield Limited', October 20th. Oxera advised the merging parties in this case.
[5] Office of Fair Trading (2008), 'Anticipated Acquisition of the Online DVD Rental Subscription Business of Amazon Inc. by LOVEFiLM International Limited', pp. 13–14. Oxera advised the merging parties in this case.
[6] Werden, G. (2000), 'Expert Report in *United States v. Interstate Bakeries Corp. and Continental Baking Co.*', *International Journal of the Economics of Business*, **7**, pp. 139–48. This analysis was prepared, along with traditional merger analysis, for use in possible litigation. However, the District Court issued a final judgment requiring divestments by Interstate Bakeries Corp. pre-empting the litigation.
[7] European Commission (2000), *Volvo/Scania*—Case No COMP/M.1672, March 15th. See also Ivaldi, M. and Verboven, F. (2005), 'Quantifying the Effects from Horizontal Mergers in European Competition Policy', *International Journal of Industrial Organisation*, **23**, pp. 669–91.
[8] European Commission (2004), *Lagardere/Natexis/VUP*–Case No COMP/M.2978, January 7th. See also Budzinski, O. and Ruhmer, I. (2008), 'Merger Simulation in Competition Policy: A Survey', MAGKS Papers on Economics 200807.
[9] European Commission (2004), *Oracle/Peoplesoft*–Case No COMP/M.3216, October 26th.
[10] *United States of America et al v Oracle Corporation* (2004), United States District Court for the northern district of California, No C 04-0807 VRW.
[11] Federal Trade Commission and Department of Justice (2010), op. cit., p. 21.
[12] Competition Tribunal of South Africa (2009), Case No. 04/LM/Jan09. Oxera assisted the South African Competition Commission in this case.
[13] The asymmetric indicative price rise formula for linear demand for product A is $\Delta p_A/p_A = (d_{ba}(d_{ba}+d_{ab})m_a+2d_{ab}m_b)/(4-(d_{ba}+d_{ab})^2)$, where d_{ab} is diversion ratio from A to B, d_{ba} is diversion ratio from B to A, and m_a and m_b are margins of products A and B, respectively.
[14] See Farell, J. and Shapiro, C. (2010), 'Upward Pricing Pressure and Critical Loss Analysis: Response', *The CPI Antitrust Journal*, February.

If you have any questions regarding the issues raised in this article, please contact the editor, Dr Gunnar Niels: tel +44 (0) 1865 253 000 or email g_niels@oxera.com

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