Agenda

Advancing economics in business

Diversion ratios: why does it matter where customers go if a shop is closed?

Diversion ratio evidence can be critical in competition cases, since it measures the degree of competition between products. This article explores the uses of diversion ratios in merger analysis and market definition, and considers the crucial role that they played in the recent Co-op/Somerfield supermarket merger in the UK

Diversion ratios can be useful for unilateral effects analysis of mergers, finding the closest substitutes as part of the market definition test, and market definition analysis in cases of a merger in differentiated goods markets.

Recent cases where diversion ratio evidence played an important role include the Co-op/Somerfield supermarket merger and the LOVEFiLM/Amazon online DVD rental service merger, both cleared at phase 1 by the UK Office of Fair Trading (OFT).[1] The European Commission considered diversion ratio evidence in the Ryanair/Aer Lingus merger case—high diversion ratios between the two airlines indicated that each was the other's closest competitor, which, along with other relevant evidence, led the Commission to block the merger.[2]

This article explains what diversion ratios are and why they capture the degree of competition between firms and products, and examines how they have been used in recent competition cases.

What are diversion ratios?

Diversion ratios measure the proportion of sales captured by different substitute products when the price of a product is increased. For example, suppose 100 fewer units of product A are sold when A's price increases by a small amount (eg, 5%), and 30 and 70 of

these units are captured by products B and C, respectively (Figure 1 illustrates). Here, the diversion ratio from A to B is 30%, and the diversion ratio from A to C is 70%. This indicates that product C is the closest substitute for product A. The box on page 2 defines various types of diversion ratio, and highlights how they are related to own- and cross-price elasticities. Cross-price elasticities capture the degree of substitutability between products; hence diversion ratios also measure how closely products or firms compete. In general, the higher the diversion ratio between products or firms, the closer substitutes they are, and the more intense the competition between them.

How are they obtained?

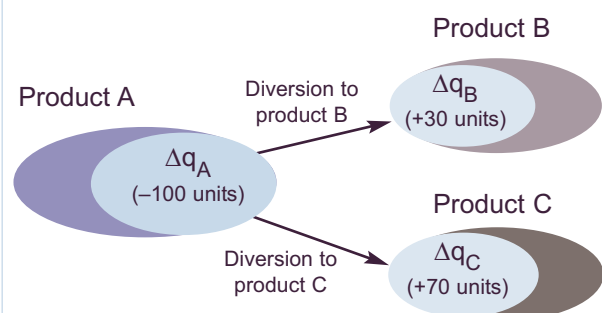There are three principal ways of obtaining diversion ratios, discussed below.

Diversion ratios based on data collected during the course of business

Businesses sometimes ask existing customers who are leaving where they divert to, or ask new customers where they purchased the product(s) before. In such cases it may be possible to estimate diversion ratios

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Uses of diversion ratios in competition cases

– **Unilateral effects analysis of mergers (merger simulations).**

– **Finding the closest substitute products as part of the market definition (SSNIP) test.**

– **Market definition assessment in cases of a merger in differentiated goods markets.**

Figure 1 Illustration of diversion from product A as a result of a 5% price increase

Product A — Δq_A (−100 units)

Diversion to product B → Product B — Δq_B (+30 units)

Diversion to product C → Product C — Δq_C (+70 units)

Source: Oxera.

Diversion ratios: definitions and relation to price elasticities

Diversion ratios are directly related to own- and cross-price elasticities of products. Own-price elasticity (ε_A) is the percentage change in demand for product A when its price is changed by 1%, whereas the cross-price elasticity of product B with respect to A's price (ε_{BA}) measures the percentage change in demand for product B. The own-price elasticity is negative for 'normal' goods; substitute products have a positive cross-price elasticity.

There are two commonly used types of diversion ratio: the unit sales (or customer) diversion ratio, and the revenue diversion ratio.

Sales or customer diversion ratio:

$$\Delta q_B / \Delta q_A = (\varepsilon_{BA} q_B)/(-\varepsilon_A q_A)$$

– an increase in unit sales of substitute B as a result of an increase in price of product A, relative to a decrease in unit sales of product A. Customer diversion instead of unit sales diversion is also commonly used.

Revenue diversion ratio:

$$(\Delta q_B p_B)/(\Delta q_A p_A) = (\varepsilon_{BA} q_B p_B)/(-\varepsilon_A q_A p_A)$$

– an increase in revenue of substitute B as a result of an increase in price of product A, relative to a decrease in revenue of product A.

Following the example in the main text, own-price elasticity (ε_A) is –2; cross-price elasticity (ε_{BA}) is 1.2; and sales of products A and B are 1,000 units and 500 units, respectively. A 5% price increase leads to a fall in demand for product A by 100 units ($0.05 \times 2 \times 1,000$), and an increase in demand for product B by 30 units ($0.05 \times 1.2 \times 500$). Thus the sales diversion ratio is 30%. If prices of products A and B are €3 and €2, respectively, by applying the formula detailed above the revenue diversion ratio is 20%.

Source: Werden, G. (1998), 'Demand Elasticities in Antitrust Analysis', *Antitrust Law Journal*, **66**: 2.

based on this information, although in practice such information is rarely complete or available in an appropriate form for the purposes of calculating diversion ratios reliably.

Diversion ratios based on demand system estimation

Diversion ratios can be directly calculated from own- and cross-price elasticities if estimates are available (eg, from previous competition cases or economic literature). In cases where detailed price and quantity data can be collected (eg, store scanner data), a demand system can be modelled and own- and cross-price elasticities can be obtained. Cases where this approach has been adopted include the Volvo/Scania and Kimberley-Clark/Scott mergers.[3]

Diversion ratios based on consumer surveys

Given the difficulties with the above two approaches when insufficient data is available, customer surveys tend to be the most common and practical method for obtaining diversion ratios in competition cases. This involves asking consumers directly which products or firms they would substitute to if they were to switch away from the currently chosen product following a small price increase.

For example, in the LOVEFiLM/Amazon merger case, 2,001 online DVD rental service customers were asked, first, whether they would leave their provider if the subscription price were to increase by 10% and, second, which substitute service they would divert to (eg, bricks-and-mortar DVD rental or Pay-TV).[4] In the Co-op/Somerfield merger case, the OFT based its decision on diversion ratios collected as part of what is described as 'probably the largest consumer survey ever conducted in a merger case'.[5] More than 40,000 customers were surveyed in over 400 Co-op and Somerfield stores. Here, customers were asked (if and) where would they do their grocery shopping if the store where the survey was conducted were to close. This case is further discussed below.

One drawback of the survey approach is that the survey must be very carefully designed, since what respondents say may differ from what they do. Choices must also be meaningful to the respondents.

Use in merger analysis

Diversion ratios can be especially useful when assessing the unilateral effects of mergers in differentiated goods industries. Unilateral effects occur if the merged firm has incentives to raise prices relative to the pre-merger situation. There are two main types of product or firm differentiation:

– branding—eg, cola, tissue, pens, clothing;
– location—eg, grocery stores, cinemas, hospitals.

Market definition and an assessment of the competitive effects of mergers on the basis of market shares alone may be problematic when firms with differentiated products are involved in the merger. In such cases, a direct assessment of the effects may be more appropriate. In this regard, diversion ratios are directly relevant to unilateral effects analysis because they capture the closeness of competition between the merging parties, and hence may enable the estimation of the effect of a loss of competition between the merging parties.

To simulate or 'illustrate'?

Unilateral effects analysis involves an assessment of expected post-merger prices—ie, would the merger lead to an added incentive for the merged entity to raise prices on one or more of its products, and, if so, would the magnitude of the price rise(s) lead to competitive concerns?

In the absence of any direct relevant evidence, the most thorough approach to determining likely post-merger price increases would be to perform a merger simulation based on an econometric estimation of the demand system (ie, elasticities) comprising products subject to the merger. This has been undertaken in a number of merger cases, such as Volvo/Scania and Kimberly-Clark/Scott.

Full merger simulation may be prohibitively demanding in terms of data, and often involves complex modelling. However, there are simplified models of competition that are less data-intensive and that can be—and indeed have been—applied in order to calculate 'illustrative' price increases post-merger. In particular, competition authorities have applied a symmetric, differentiated goods, price (Bertrand) competition model to estimate indicative price changes following a merger, based solely on diversion ratio and margins data. Details of this approach are set out in the box below.

This approach was applied in the groceries merger cases in the UK, where the Competition Commission first applied the illustrative price increase formula as part of the assessment of local competitive effects in the Somerfield/Morrisons case.[6] More recently, illustrative price rises were analysed at over 400 locations in the UK for the Co-op/Somerfield merger.

As detailed above, extensive customer surveying was undertaken in order to obtain estimates of diversion ratios in those locations in the UK where the merger

might have raised concerns—eg, because some Co-op and Somerfield stores were in close proximity to each other. By combining the diversion ratio and store margin data, 'illustrative' price rises (assuming isoelastic demand) were obtained for each location. Predicted price rises above 5% were indicative of a potential problem and those locations were investigated further, in keeping with what the Competition Commission had done in the past. Together with other evidence, this analysis formed the basis for the OFT's decision to clear the merger and for drawing up the list of stores that it considered should be divested because of potential competition concerns.

In general, higher diversion ratios between merging stores imply more intense, or 'closer', competition between the stores pre-merger, and hence higher predicted post-merger price rises. The reason for this is that high diversion ratios mean that many customers would shop at the Co-op (acquiring) store if the Somerfield (target) store were closed (ie, customers view the merging stores to be close substitutes). A merger between the stores would remove the competitive constraints that they impose on each other and may lead to price increases. The question still remains: when are close competitors too close?

The '14.3% test'

In the Co-op/Somerfield case, the illustrative price rise test was used in conjunction with another test relying on diversion ratios—whether the observed diversion ratio from the target store to the acquiring store(s) in a given local area is greater than 14.3%. The rationale behind the 14.3% threshold is as follows: it is the diversion ratio value that would be observed if there were eight equally sized grocery retailers and the diversion ratios followed the market shares. With eight firms, a merger between two would lead to a combined market share of 25%, which is the Competition Commission's market share threshold for potential concern regarding the effects of a

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Illustrative post-merger price increase simulation

Suppose there were a merger between (single-product) differentiated goods firms A and B (eg, A and B could be two different brands of the same underlying product, such as two brands of breakfast cereal). The Bertrand competition model, where firms compete on prices, could be used to illustrate possible price rises post-merger. In this model, diversion ratios reflect the degree of differentiation—the higher the diversion ratio between two products, the less differentiated they are, and the greater the competition between them.

Given symmetric margins (m) and diversion ratios from A to B and from B to A (d), and a constant-elasticity demand

specification, which assumes that demand is equally sensitive to price changes at all price levels, the proportional post-merger price increase of A would be:

$$\Delta p_A / p_A = md/(1 - m - d).$$

For example, for a margin of 30% and a diversion ratio of 10%, the estimated post-merger price rise is 5%. If a linear demand is assumed instead, the proportional post-merger price increase is:

$$\Delta p_A / p_A = md/2(1 - d).$$

For the same margin and diversion ratio as above, the estimated price rise is 1.7%.

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

merger.[7] Thus, evidence of the (customer) diversion ratio between the merging stores being greater than 14.3% was interpreted as indicative of competition concerns.

The interesting issue is that this test assumes that grocery chains are 'equally close' (ie, that they are undifferentiated, or homogeneous, goods firms), rather than that they are differentiated and compete according to a differentiated goods price competition model. This may be a plausible scenario when considering competition between grocery chains on a national level, but it does not account for differentiation arising from the physical locations of the stores. Thus the 14.3% test relies on a different rationale for the possible competition concerns (ie, the post-merger market share being in excess of 25%) than the illustrative price rise test.

Both the illustrative price rise test and the 14.3% test were used by the OFT to support its decision in the Co-op/Somerfield case, and both relied on diversion ratios. For most locations, the two tests had the same result, although there were a number of locations in the 'grey area' where one test was passed but the other failed. Those stores that failed both tests, and hence gave rise to competition concerns, were considered for divestments by the OFT, in place of a referral to the Competition Commission. This and other merger cases demonstrate that diversion ratios may have a significant influence on the outcome of the merger decision and the cost of the merger faced by the parties.

Use in market definition

Since they measure the degree of substitutability between products or firms, diversion ratios can also be useful in assisting market definition analysis.

Role in establishing the closest substitutes

Market definition is usually implemented via the hypothetical monopolist, or SSNIP (small but significant and non-transitory increase in price), test. The SSNIP test seeks to establish the smallest group of products such that a hypothetical monopolist of those products would find it profitable to increase prices by a small (but significant) amount. In effect, the SSNIP test aims to include in the relevant market all those products that are sufficiently close substitutes—ie, that pose immediate competitive constraints on the focal product.

In practice, the analysis starts by considering a hypothetical monopolist of the focal product (eg, the product of the merging parties), say, product A. If an application of the SSNIP test shows that the price increase would not be profitable, the relevant market must be wider. The next step is to find the closest substitute and include it in the group of products that is hypothetically monopolised, and repeat the SSNIP test.

Figure 2 Illustration of the market definition test—finding the closest substitute

Source: Oxera.
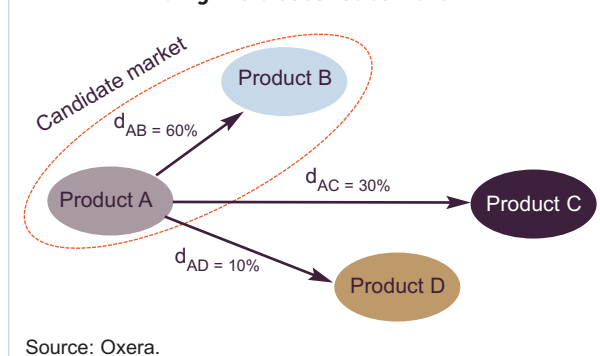
This process continues until the relevant market is found. Although other approaches are available, diversion ratios can be used to identify and rank the closest substitute product(s). For example, if the diversion ratios to products B, C and D are 60%, 30% and 10%, respectively (see Figure 2), B is the closest substitute to product A, since it has the highest diversion ratio, and product B should be included in the market.

There may be cases when diversion ratios do not unambiguously establish the closest substitute(s) to be included in the candidate market. In the LOVEFiLM/Amazon merger case referred to above, survey evidence showed that a price increase for all online DVD rentals would not be profitable, hence the relevant market is wider. However, customer diversion ratio evidence did not suggest a definite closest substitute that could be included in the relevant market. On the basis of diversion ratios, any one of the three alternative ways of watching movies—renting DVDs from a shop, purchasing DVDs, or downloading or streaming films from the Internet—could be the closest substitute to online DVD rental, since its diversion ratios exceeded diversion ratios to other alternatives, but were just 1–2% apart. In this case, the OFT did not make a final decision on which products constitute the relevant market.[8]

Use of an aggregate diversion ratio in critical loss analysis

The SSNIP test for market definition is usually implemented via critical loss analysis.[9] A relatively recent development in critical loss analysis is to make use of an 'aggregate diversion ratio' (ADR), or diversion ratios more generally, in order to calculate the critical loss of a hypothetical monopolist of several differentiated products.[10] The ADR is defined as the proportion of lost sales captured by other products in the candidate market, and a higher ADR makes price increases more profitable and implies a narrower market. For example, this approach to critical loss analysis was recently used by the OFT in the LOVEFiLM/Amazon case.

This area of critical loss analysis is still evolving. Use of the ADR in critical loss analysis and to assess the profitability of a price rise means a blurring of boundaries between market definition analysis and unilateral effects analysis.

Concluding remarks

As the above discussion has shown, diversion ratios can be used to answer different questions in competition economics, such as whether unilateral effects are likely to arise as a result of a merger, or which products should be included in the relevant market. The common feature of these questions is that they require an estimate of the closeness of competition between products or firms. This is where diversion ratio evidence may be crucial.

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[1] Office of Fair Trading (2008), 'Anticipated Acquisition by Co-operative Group Limited of Somerfield Limited', November; and Office of Fair Trading (2008), 'Anticipated Acquisition of the Online DVD Rental Subscription Business of Amazon Inc. by LOVEFiLM International Limited', May. Oxera advised the merging parties in these cases.

[2] European Commission Case No COMP/M.4439—Ryanair/Aer Lingus, June 27th 2007.

[3] European Commission Case No COMP/M.1672—Volvo/Scania, March 15th 2000; European Commission Case No. IV/M.623—Kimberly-Clark/Scott, January 16th 1996.

[4] For further detail see Walters, C. (2008), 'Customer Surveys and Critical Loss Analysis for Market Definition', *Agenda*, September, available at www.oxera.com.

[5] Office of Fair Trading (2008), 'OFT Considers Grocery Store Divestments in Co-op/Somerfield Merger', press release 120/08, October 20th.

[6] 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'.

[7] With eight equally sized firms, the market share of each is 12.5%—hence the market share of the merged entity would be 25%. If diversion ratios are assumed to follow market shares, the pre-merger diversion ratio between firms is 12.5%/(100% − 12.5%)—ie, 14.3%. Para 7.12 of the Somerfield/Morrisons decision provides more detail.

[8] Office of Fair Trading (2008), 'Anticipated Acquisition of the Online DVD Rental Subscription Business of Amazon Inc. by LOVEFiLM International Limited', Decision, May 8th.

[9] For a discussion, see Oxera (2008), '"Could" or "Would"? The Difference between Two Hypothetical Monopolists', *Agenda*, November. Available at www.oxera.com.

[10] These ideas were pioneered in Katz, M. and Shapiro, C. (2003), 'Critical Loss: Let's Tell the Whole Story', *Antitrust*, Spring, and in O'Brien, D. and Wickelgren, A. (2003), 'A Critical Analysis of Critical Loss Analysis', *Antitrust Law Journal*, **71**, and further developed in Daljord, O., Sørgard, L. and Thomassen, Ø. (2008), 'The SSNIP Test and Market Definition with the Aggregate Diversion Ratio: A Reply to Katz and Shapiro', *Journal of Competition Law and Economics*, **1**:8, and Farrell, J. and Shapiro, C. (2008), 'Improving Critical Loss Analysis', *Antitrust Source*, February.

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

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