

# Quantitative Economic Techniques in EC Merger Control

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# Quantitative Economic Techniques in EC Merger Control

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Recent reforms of the EC Merger Regulation (ECMR)<sup>1</sup> and EC Commission's practice have seen the ascendancy of economics. The Court of First Instance's (CFI) annulments of three merger decisions in 2002 showed that the Commission had adopted unacceptably lax evidentiary standards.<sup>2</sup> The CFI pointed unequivocally to the legal necessity for the EC Commission to adopt proper economic and factual analysis. This it seems to have embraced – it has appointed a Chief Economist for the first time, and adopted a more economics oriented approach. Even prior to the CFI judgments the Commission had begun to overhaul its approach. This year the Horizontal Merger Guidelines<sup>3</sup> - the first ever – were published bearing the strong imprint of economic learning, after extensive discussion and debate.

As a result of these developments quantitative analysis and evidence will play a greater role in the presentation and assessment of EC mergers. This can be seen from Commission's decisions affecting the Scandinavian region. In *Volvo/Scania*<sup>4</sup> the Commission stated that it had undertaken an econometric study<sup>5</sup> of the impact of the proposed merger on the prices charged for heavy trucks in various national markets. In *GE/Instrumentarium* (Instrumentarium being a Finnish health equipment company) the EC Commission '*conducted a series of econometric analyses and has examined econometric studies provided by a third party and the parties.*'<sup>6</sup> While these were

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<sup>1</sup> Council Regulation (EC) No 139/2004 on control of concentrations between undertakings. This replaced Regulation 4064/89 on 1 May 2004.

<sup>2</sup> Case T-342/99 *Airtours v Commission* (2002); Case T-310/01 *Schneider Electric v Commission* (2002); Case T-5/02 *Tetra Laval BV v Commission* (2002).

<sup>3</sup> EC Commission Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings, 2000/C 31/03 (2004). For a survey of merger guidelines see the ICN Merger Working Group's Project On Merger Guidelines - Report for the 3rd ICN annual conference, Seoul, April 2004 [www.internationalcompetitionnetwork.org/analysisofmerger.html](http://www.internationalcompetitionnetwork.org/analysisofmerger.html).

<sup>4</sup> Case No COMP/M.1672 - *Volvo/Scania* (2000). M. Ivaldi & F. Verboven, 'Quantifying the Effects of Horizontal Mergers in European Competition Policy', CEPR Discussion Paper Series, No. 2697 (2001).

<sup>5</sup> For a general introduction to econometrics accessible to lawyers see F. M. Fisher, 'Multiple Regression in Legal Proceedings' 80 *Columbia Law Review*, 702-736 (1980).

<sup>6</sup> Case No COMP/M.3083 - *GE/Instrumentarium* (2003) para. 166.

treated as complementing the Commission's more qualitative analysis,<sup>7</sup> they show that greater weight is now being placed on statistical analysis in merger clearance decisions. This chapter focuses on quantitative concepts and techniques relevant to the initial aspects of merger analysis, namely market definition and market concentration.<sup>8</sup>

## MARKET DEFINITION

Market definition is the cornerstone of any competition law investigation whether it is a merger clearance,<sup>9</sup> antitrust matter,<sup>10</sup> or even sectoral regulation.<sup>11</sup> The EC Notice on Market Definition<sup>12</sup> published in 1997, marked a watershed by introducing a more systematic approach to the definition of markets and the assessment of competition.

### The Legal Concept of a Market

Before examining the application of quantitative techniques to define markets, it is necessary to explore the notion of a market itself. The concept of a relevant product market is a legal construction. It arose from the rather common sense reaction of the US courts in the late 1940s that in order for market power to be present, there must be a

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<sup>7</sup> In *Volvo/Scania* (para 72) the Commission states: 'The results of such econometric studies can be a valuable supplement to the way the Commission has traditionally measured market power'.

<sup>8</sup> Quantitative Techniques in Competition Analysis, UK Office of Fair Trading Research Paper No. 17, (1999). Also J. B. Baker & D. L. Rubinfeld, 'Empirical Methods in Antitrust Litigation: Review & Critique', 1 *American Law & Economics Review*, 386-435 (1999); ICN, 'Role of Economists and Economic Evidence in Merger Analysis' (2003) [www.internationalcompetitionnetwork.org/Role%20of%20Economists.pdf](http://www.internationalcompetitionnetwork.org/Role%20of%20Economists.pdf). For recent examples from US merger decisions see generally J. E. Kowka, Jr & L. J. White, eds., *The Antitrust Revolution*, 4<sup>th</sup> edn., Oxford University Press, (2004). Chief Justice Poser referring to econometric analysis used in *FTC v Staples Inc.* 970 F. Supp. 1066 (D.D.C. 1997) declares 'Economic analysis of mergers had come of age'. R. A. Posner, *Antitrust law*, 2<sup>nd</sup> Edn, University of Chicago Press (2001) 158.

<sup>9</sup> The European Court of Justice has held that: 'A proper definition of the relevant market is a necessary precondition for any assessment of the effect of a concentration on competition.' *Joined Cases C-68/94 & C-30/95, France and Others vs. Commission*, 1988 ECR I-1375, para. 143.

<sup>10</sup> See Commission Notice - Guidelines on Vertical Restraints, 2000/C291/1; Horizontal Agreements Guidelines; Commission Regulation (EC) No 2659/2000 of 29 November 2000 on the Application of Article 81(3) of the Treaty to Categories of Research and Development Agreements, 2000/L 304/7; Commission Regulation (EC) No 2658/2000 of 29 November 2000 on the application of Article 81(3) of the Treaty to categories of specialisation agreements, 2000/L 304/3.

<sup>11</sup> Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services, (2002), and in particular Commission Guidelines on Market Analysis and the Assessment of Significant Market Power under the Community Regulatory Framework for Electronic Communications Networks and Services, 2002/C 165/03 (2002); Commission recommendation on relevant product and service markets within the communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and the Council on the common regulatory framework for electronic communications networks and services, 2003/311/EC (2003).

<sup>12</sup> EC Commission's Notice on the definition of the relevant market for the purposes of Community competition law 1997/C372/05 ('Market Definition Notice').

market.<sup>13</sup> And as is the case in judicial proceedings where there is a concept and a claim by one side, there will be a dispute as to its validity by the other. Hence as the case law developed there were different linguistic formulations and legal applications to specific facts which lacked rigour. Indeed, the situation was described as ‘a bloody mess’.<sup>14</sup> Given the judicial requirement for market definition, economists responded by applying their analytical toolkit to assist the courts and the regulators to define relevant product markets more rigorously.<sup>15</sup>

It would seem that the concept of a market should have been well defined and furrowed area in economics. This was not the case.<sup>16</sup> Economists tended to assume the existence of markets. In most economics textbooks a market is implicitly defined, at least in the early chapters, as an arena – or to use a more contemporary word, a ‘space’ - where homogenous products are exchanged at a uniform price. Thus product homogeneity and price uniformity seemed key aspects of market definition. Moreover, as the goods were identical, then a market implied that they were perfect substitutes for one another. Thus a market is a ‘space’ in which buyers and sellers interact to exchange goods and services which are perfect if not close substitutes sold at a uniform price. This highly restrictive view of a market is not accepted by economists or competition law. Nonetheless the idea that markets are defined as products which are ‘substitutes’, close substitutes’ or ‘sufficient substitutes’<sup>17</sup> is central to the competition law approach.

This is particularly the case in EC law where demand-side substitutability is the main determinant of market definition. The EC Market Definition Notice (para 7), and the Commission’s Form A/B, state: ‘*A relevant market comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products’ characteristics, their prices and their intended use.*’<sup>18</sup> The Court expanded on the meaning of ‘sufficient’ substitutability or interchangeability in

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<sup>13</sup> *United States v. Columbia Steel Co.*, 334 U.S. 496 (1948). In 1974, the U.S. Supreme Court held that ‘determination of the relevant product and geographic markets is a ‘necessary predicate’ in merger cases; *Marine Bancorporation*, 418 U.S. 618 (1974).

<sup>14</sup> D. F. Turner, ‘The Role of the ‘Market Concept’ in Antitrust Law’, 49 *Antitrust Law Journal*, 1145, 1150 (1980).

<sup>15</sup> Chief Judge Posner states: ‘It is the lack of confidence in the ability to measure elasticities reliably by the methods of litigation that necessitates the definition of the market’, R. A. Posner, *op. cit.*, 148.

<sup>16</sup> In 1982 Professor George Stigler declared: ‘My lament is that this battle on market definition ... has received virtually no attention from us economists. Except for a casual flirtation with cross elasticities of demand and supply, the determination of markets has remained an undeveloped area of economic research at either the theoretical or empirical level.’ G. Stigler, ‘The Economist and the Problem of Monopoly’, 72 *American Economic Review*, 1-11 (1982).

<sup>17</sup> The test of ‘sufficient substitutes’ or interchangeability was first set out by the European Court of Justice in case 6/72 *Europemballage and Continental Can v Commission* [1973] ECR 215, para 32, and *Hoffman La-Roche & Co. AG v Commission* [1978] ECR 461, para 23. In *Hoffman-La Roche* the Court said: ‘The concept of the relevant market in fact implies that there can be effective competition between the products which forms part of it and this presupposes that there is a sufficient degree of interchangeability between all the products forming part of the same market insofar as a specific use of such products is concerned.’

<sup>18</sup> Based on binding case law in Case 27/76, *United Brands v. Commission*, [1978] ECR 3461; Case No COMP/M.53, *Aerospatiale-Alenia/de Havilland*, OJ 1991 L334/42.

L'Oreal v. DeNieuwe AMCK where it stated that: *'The possibilities of competition must be judged in the context of the market comprising the totality of the products which, with respect to their characteristics, are particularly suitable for satisfying constant needs and are only to a limited extent interchangeable with other products.'*<sup>19</sup>

These definitions are imprecise and inaccurate. They are imprecise because they do not tell us how 'close' consumers regard the different products as substitutable or interchangeable before they are placed in the same relevant product market. There is rarely a sharp break in the substitutability between products, and therefore the delineation of a relevant product market is arbitrary to varying degrees. The statements are also inaccurate because a relevant product market can contain products which are complements or at different functional levels in the chain of production/supply, and therefore not interchangeable in use. Thus products which are technical complements but which are purchased as a bundle by consumers (sometimes called 'cluster markets') may all be in the same relevant product market even though they are not substitutable or interchangeable, or not even physically similar. Other products which are technical but variable complements - such as computers and software maintenance or photocopiers and technical assistance and consumables - may be in the same relevant market as opposed to two or more separate markets (sometimes called 'after markets') depending on the conditions of demand and supply. The analysis is further complicated where products/services are heterogeneous, varying along a wide continuum of different attributes, such as hotels<sup>20</sup> and cruises.<sup>21</sup> In these cases products which differ markedly in price and quality and which are not perfect substitutes, may be linked in the same relevant product market by a 'chain of substitution'.<sup>22</sup>

More recently there has been recognition that many markets - particularly in the communications sector - have significant network effects where there are strong horizontal and vertical interactions which may make it difficult to delineate one market which captures the competitive nature of the sector. Thus the newer literature makes a distinction between standard 'one-sided' markets, such as iron bars and cars, and these 'multi-sided markets'.<sup>23</sup> Yet another development are so-called - 'nascent', 'emerging'

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<sup>19</sup> Case 31/80, *L'Oreal v. DeNieuwe AMCK*, [1980] ECR 3775.

<sup>20</sup> Case No IV/M.1133 *Bass PLC/Saison Holdings B.V* (1998); Case No COMP/M.1596 *Accor/Blackstone/Colony/Vivendi* (1999).

<sup>21</sup> Case COMP/M.2706 *Carnival Corp/PO Princess Cruises* (2002).

<sup>22</sup> A 'chain of substitution' refers to linkages between differentiated products which result in significant substitution at the margin in response to changes in relative prices. If luxury cruises are in the same market as premium cruises because of evidence of substitutability, and the same evidence also exists for premium and economy cruises, then it could be claimed that all cruises are in the same product market. The EC Market Definition Notice (para 57-58) states: *'In certain cases, the existence of chains of substitution might lead to the definition of a relevant market where products or areas at the extreme of the market are not directly substitutable. .... if product B is a demand substitute for products A and C. Even if products A and C are not direct demand substitutes they might be found to be in the same relevant product market since their respective pricing might be constrained by substitution to B.'*

<sup>23</sup> D. S. Evans, 'The Antitrust Economics of Multi-sided Platform Markets', 20 *Yale Journal of Regulation*, 325- 381 (2003); J. Wright, 'One-sided Logic in Two-sided Markets', 3 *Review of Network Economics*, 44-64 (2004).

and/or innovative markets.<sup>24</sup> This is where innovation and non-price factors are seen as the driving forces of competition in the industry, and with this the claim that market definition based on price competition is not appropriate.<sup>25</sup> Some have suggested that a new concept of an ‘innovation market’ should be defined.<sup>26</sup>

The point of the above general discussion is to stress that market definition is a moving feast which is more complicated than simply identifying products as ‘sufficient’ substitutes and interchangeable in use. This has become particularly the case as economists (usually assisting competition authorities), and competition authorities identify more subtle and indirect competition concerns.

## **The Practice of Market Definition**

Under the ECMR markets are often defined in a loose way as part of the screening process to determine whether grounds exist, or more often do not exist, for competition concerns. This is because of a variety of practical reasons, such as insufficient data, expediency and administrative necessity – or just lack of rigour.

In routine initial merger investigation (Phase I), the EC Commission will usually consider a number of market definitions to see whether the notified concentration has a high market share. If it does not, then the Commission will state that it has not been necessary to define any markets since under all possible definitions that notified concentration does not raise concerns. The difficulty with this procedure is that Phase I market definitions are often used as a basis for subsequent decisions, almost taking on precedential status, even though they are not based on detailed empirical investigation.

Notwithstanding this, the EC Market Definition Notice added much needed conceptual rigour to market definition by introducing the concept of a Hypothetical Monopolist Test (HMT) or the so-called SSNIP (an acronym ‘Small but Significant Non-transitory Increase in Price’) test.<sup>27</sup> The HMT is not a legally required ‘test’ for market definition as such, but is suggested as a more rigorous way of thinking about market definition. It seeks to establish the type and range of products over which a hypothetical

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<sup>24</sup> E.g. Case No IV/M.3042 - Sony/Phillips/InterTrust JV (2002). Also referred in France Case No COMP/M.2016 - Telecom/Orange (2000) para 106; and Case No COMP/M.2598 - TDC/CMG/Migway JV (2001), footnote 56. ERG Common Position on the approach to appropriate remedies in the new regulatory framework, ERG(03) 30rev1, 1 April 2004.

<sup>25</sup> C. G. Veljanovski, ‘EC Antitrust in the New Economy – Is the European Commission’s View of the Network Economy Right?’, 22 *European Competition Law Review*, 115-121 (2001). OFT/Oftel, *Innovation and Competition Policy - Economics Discussion Paper 3* (2002); W. J. Baumol, *The Free Market Innovation Machine*, Princeton University Press (2002).

<sup>26</sup> R. Gilbert & S. Sunshine, ‘Incorporating Dynamic Efficiency Concerns in Merger Analysis – The Use of Innovation Markets’, 63 *Antitrust Law Journal* 569-602 (1995); Cf R Rapp, ‘The Misapplication of the Innovative Market Approach to Merger Analysis’, 64 *Antitrust Law Journal* 19-47 (1995).

<sup>27</sup> US Department of Justice/Federal Trade Commission, *Horizontal Merger Guidelines, and Trade Regulation Reports (CCH) 13, 104* (1992, revised 1997). Also Department of Justice, ‘20<sup>th</sup> Anniversary of the 1982 Merger Guidelines: The Contribution of the Merger Guidelines to the Evolution of Antitrust Doctrine’

monopolist of all the products under consideration would find it profitable to raise price 5-10% above the competitive price.

Many commentators regard the HMT as a useful ‘thought experiment’ with little practical use. As stated the HMT is counterfactual - there is no ‘monopolist’, and prices have not been raised by 5% or 10%. This is particularly so when it is recognised that the HMT goes beyond the usual discussions of demand-side substitutability (the cross elasticity or direct own elasticity of demand) to take account of the profitability of the price increase. It is therefore not surprising that use of the HMT has not been a feature of EC merger decisions. In practice, with some notable exceptions, market definition is more informal, based on qualitative analysis supported by data and relatively simple empirical analysis.

The EC Market Definition Notice does set out the type and approach to evidence needed to define relevant product (and geographical) markets. It lists six categories of evidence:

1. **event analysis** - evidence of substitution in the recent past due to recent events or shocks in the market that offer actual examples of substitution between two products when relative price have changed;
2. **econometric/statistical approaches** - estimates of elasticities and cross-price elasticities, correlation analysis, causality analysis and similarity of price levels and/or their convergence;
3. **customers’ & competitors’ surveys** - surveys of their views on the boundaries of the product market and other relevant factual information;
4. **consumer preference surveys** - marketing studies used by companies for pricing and marketing actions; consumer surveys on usage patterns and attitudes, data from consumer's purchasing patterns, views of retailers, and market research studies;
5. **switching costs** – analysis of switching costs to determine whether consumers and firms have difficulty in substituting between products; and
6. **price discrimination** – to determine whether firms are able to segment customers.

Ignoring categories 5 & 6, the remaining categories fall into two generic approaches - those based on evidence on past consumer decisions and behaviour (*revealed preference*), and those using consumer responses to hypothetical questions (*stated preference*). The former embraces event analysis and statistical/econometric techniques (1 and 2 above), and the latter based on survey evidence to determine preferences for various products and anticipated choices or actions (3 and 4 above).

## Statistical Techniques

There are a number of statistical approaches which can be used to determine consumer substitutability from hard evidence on past consumption decisions. These range from price correlations (1 above), to more sophisticated techniques such as econometric analysis such as 'event analysis' and the estimation of demand elasticities (2 above). The data required to undertake these differ, and the more rigorous and sophisticated techniques - such as residual demand analysis - often cannot be attempted because of data and time limitations.

Consider the simplest statistical approach - price correlation analysis. A price correlation examines to what extent the prices of two products move in parallel over time, and whether these movements are statistically significant. A statistically significant high correlation between the prices of two products can be interpreted as evidence that they may be close substitutes and in the same relevant product market. Price correlation analysis is based on the notion that prices will tend to maintain any differential if consumers regard the two products as close substitutes.<sup>28</sup> This is because if the price difference, which reflects quality differences, becomes out of balance consumers will shift purchases to the relatively less expensive substitutes and re-establish the differential. The most quoted example of the use of price correlation analysis in an EC merger law was in the Nestle/Perrier<sup>29</sup> decision where it was used to assist in determining which types of beverages comprised the relevant market.

While price correlation analysis can be useful and is relatively simple to undertake, it has its pitfalls. Perhaps the major drawback is that the correlation of prices may not be due to competitive forces but because they are correlated to a third factor.<sup>30</sup>

A more sophisticated approach is to estimate from historical data the responsiveness of consumers to changes in prices. This is called elasticity analysis. A high elasticity indicates that consumers have choice, and therefore a greater number of substitutes, with the implications that the product is in a wider relevant product market.

Elasticity estimates can be done crudely, or with sophistication and rigour. For example, it may be possible to see from the data whether an increase in a firm's price has resulted in an effect on the quantity purchased. Thus if one were fortunate enough to have a recent price increase, then evidence of its impact on the quantity purchased could enable a (crude) estimate of the own price elasticity (see below for a definition of this term). To illustrate, assume that the price of a product is increased by 10% and it is observed that within a short period that the quantity consumed falls by 20%, this would imply a price elasticity of -2 (minus because as price goes up quantity demand goes down), with the implication that the product had substitutes and that the relevant product market was wider.

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<sup>28</sup> G. Stigler & R. Sherwin, 'The Extent of the Market' 28 *Journal of Law & Economics*, 555-585 (1985).

<sup>29</sup> Case No IV/M. 190 - Nestle/Perrier (1992).

<sup>30</sup> Price correlation assesses the degree of association between two time series of price data without making direct inference on causation of their relationship. Granger causality analysis seeks to determine whether there is a causal relationship between two time series of price data. Cointegration similarly examines whether there is a long run relationship between two time series.

However, this rough and ready approach is fraught with pitfalls. If the price increase in question was by a specific firm, then sales would be diverted to other firms supplying the same product so that the estimated elasticity would not give an indication of market definition. It would be necessary for an across-the-board price to be examined if any useful inference were to be made. However, even in this case, it would be necessary to assume that other prices did not change to make robust inferences as to an elasticity and market definition. Simple bivariate comparisons, while useful, may be misleading.

If we move to the statistical estimation of elasticities more rigour and accuracy can be added. At least three elasticity measures are used in market definition and demand studies – cross price elasticity, own price elasticity, and residual demand elasticity.<sup>31</sup> Consider each in turn, and their respective relationships to market definition.

1. **Cross-elasticity of demand** - The cross-elasticity of demand measures the proportionate change in demand of product A and B in response to a change in their relative prices.<sup>32</sup> A high cross price elasticity indicates that they are substitutes. This would seem a strong and direct test of demand-side substitutability, and hence market definition. There are at least three problems with the cross-price elasticity measure. First, it is selective, therefore does not necessarily consider the range of products which are actual substitutes (also see the third reason below). Second, there is no pre-ordained value for a cross-elasticity which would act as a cut-off point to distinguish close from weak substitutes i.e. those ‘in’ or ‘out’ of the relevant product market. Third, and perhaps most troublesome, a low cross-elasticity or a set of low cross-elasticities, do not imply that the product is not in a wider product market. There may be a number of weak substitutes which collectively make consumers as a group highly responsive to changes in relative prices. These considerations suggest that reliance on cross-elasticity measures would, at best, lead to a market being defined too narrowly.
2. **Own price elasticity** - The own price elasticity of demand is an estimate of the proportionate change in the quantity demanded for a given change in price, holding all other prices constant. This is a more expansive measure. However, it also has its drawbacks. First, own price elasticity estimates often do not identify which products consumers regard as close substitutes and therefore which are in the same relevant product market. Second, while the own price elasticity indirectly takes account of supply-side responses, these are limited to those which occur fairly rapidly, and not the interactive effects which may arise from a merger (see discussion on residual demand analysis below). The explicit assumption is that all other prices remain constant. Further, again there is no cut-off value for the own price elasticity to determine whether it is in a wider or

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<sup>31</sup> See G. Werden, ‘Demand Elasticities in Antitrust Analysis’, 66 Antitrust Law Review, 363-414 (1998); L. Froeb & G. Werden, ‘Residual Demand Estimation for Market Delineation: Complications and Limitations’, 6 Review of Industrial Organisation, 33-48 (1992).

<sup>32</sup> Cross price elasticity of demand measures the responsiveness of the quantity of product A to the price of product B. More formally:  $(\Delta Q_a / \Delta P_b)(P_b / Q_a)$  where  $\Delta$  (delta) represents the change, P the price, and Q the quantity with subscripts a and b designating the product.

narrower market. The own price elasticity approach would tend, all things equal, to define wider markets than the cross-elasticity approach.

3. **Residual demand elasticity**<sup>33</sup> - Residual demand analysis takes account of the supply-side substitution effects.<sup>34</sup> The type of supply-side response captured by residual demand analysis is as follows. Suppose that consumers switch to other products as a result of a price increase. The shift of demand to these other products may cause their prices also to rise, if, for example, the producers of substitute goods unit costs rise as output expands. Therefore in response to a 5% -10% price increase, the prices of substitute products will also rise, and this will dampen the extent to which consumers ultimately shift to other products. Residual demand elasticities incorporate this supply-side response and hence provide a better measure of price responsiveness. Where this knock-on effect in price is present, the estimated own price elasticity of demand will over estimate the 'true' elasticity. All things equal, the residual demand elasticity will result in a narrower market definition than the own price elasticity.<sup>35</sup>

### Survey approaches

An alternative approach to establishing market definition is to draw on survey evidence. This can vary from collecting marketing material used by firms which indicate what they regard as their competitors and the products which they feel are alternatives, to especially commissioned surveys seeking to establish consumer preferences for different products.

In practice three types of survey approaches can be used – price reaction, consumer preference, and conjoint surveys:

1. **Price Reaction Surveys** - The EC Market Definition Notice states that survey evidence seeking to quantify the HMT is acceptable: '*... reasoned answers of customers and competitors as to what would happen if relative prices for the candidate products were to increase in the candidate geographical area by a small amount (for instance of 5% to 10%) are taken into account when they are sufficiently backed by factual evidence.*' For such survey evidence to be useful,

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<sup>33</sup> D. T. Scheffman & P. T. Spiller, 'Geographic Market Definition under the US Department of Justice Merger Guidelines', 30 *Journal of Law & Economics*, 123-147 (1987), and 'Econometric Market Delineation', 17 *Managerial & Decision Economics*, 165-178 (1996).

<sup>34</sup> Note that the EC Notice of Market Definition excludes most supply-side responses from market definition. It expressly states that any supply-side responses to be taken into account must be as fast as the demand-side substitution: 'those situations in which its effects are equivalent to those of demand substitution in terms of effectiveness and immediacy' (para 27). Supply-side substitutability which would 'entail the need to adjust significantly existing tangible and intangible assets, additional investments, strategic decisions or time delay' (para 23) are excluded. Thus the own price elasticity descriptive is closer to the wording of the EC Notice on Market Definition. Also the US Horizontal Merger Guidelines expressly state that all other prices should be held constant when applying the SNIPP test.

<sup>35</sup> G. J. Werden & L. M. Froeb, 'The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy', 10 *Journal of Law, Economics & Organisation*, 407-426 (1994).

the consumers' potential reduction in the quantity consumed must also be quantified. For some products this is not a problem since the consumption decision is a binary one i.e. whether or not to buy a ticket, or to subscribe to specific pay TV package. These yes/no responses can be aggregated over the sample to give the percentage response for the group (market) as a whole. In other cases some estimate of the reduction in the quantity demanded will be needed, and reliable responses may be difficult to elicit from those questioned. If there are concerns about the reliability of responses to output effects, it is possible to use plausible assumptions together with sensitivity analysis, although this will be less satisfactory;

2. **Preference Surveys** - It is not uncommon for consumer preference surveys to be submitted to competition authorities. For example, considerable market and survey evidence was submitted to competition authorities in the EC, UK and US in the Royal Caribbean/PO Princess/Carnival Cruises merger investigations (see below). Often these surveys provide evidence that a certain percentage of consumers in the sample have a strong or weak preference for a particular product or product grouping, or that the preferences overlap across statistical or marketing categories. In *BSkyB*<sup>36</sup> the OFT stated that survey evidence which showed that consumers have strong preferences, while not conclusive proof of lack of substitutability, was 'strong evidence' that prices are likely to be above the competitive price, and that a separate relevant market could be defined; and
3. **Conjoint Analysis** - Conjoint analysis is a marketing research technique which has recently been used to define markets in antitrust proceedings. It consists of first identifying the critical attributes/characteristics of the different products, and asking those surveyed to place 'valuations' on the different attributes. Those interviewed are asked to allocate a fixed sum – say a budget of 100 points – across each set of product options offered. The individual preferences of each interviewee are then extrapolated using a preference model to estimate the probability of a consumer choosing a particular product i.e. set of attributes. These are then aggregated to derive a demand curve for the product.

Survey evidence however raise a number of difficulties:

- **Survey status** – A survey commissioned specifically as evidence for a competition investigation may have less evidentiary weight. The EC Market Definition Notice states that such surveys '*... will usually be scrutinised with the utmost care. Unlike pre-existing studies, they have not been prepared in the normal course of business for the adoption of business decisions*' (para 41). The International Competition Network (ICN) also takes this position. In some investigations this will not be a problem as the surveys will have been commissioned for marketing purposes. For others it will be a concern, but it is legitimate to emphasise that the product/consumer substitutability issue in antitrust proceedings is more technically defined than that associated with marketing surveys;

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<sup>36</sup> No CA98/20/2002 - B SkyB investigation: alleged infringement of the Chapter II prohibition (2002).

- **Hypothetical nature** – There will always be concerns that stated preferences do not accurately reveal true preferences and the choices consumers will make in practice. It will be usual for such evidence to be challenged on the grounds of relevance, reliability and bias.<sup>37</sup> The onus will therefore be squarely on those submitting such evidence to ensure that it is carefully undertaken, and subject to cross-checks to ensure its reliability and consistency. Here one can draw on techniques developed by economists and behavioural psychologists in cost-benefit analysis and experimental economics; and
- **Marginal consumers** – Consumer preference surveys may not capture product substitutability properly. The fact that a majority or a large percentage of those surveyed have a strong preference for watching football, or consuming crisps, does not reveal information on whether those who have weaker preferences for the product would switch in sufficient numbers to defeat a price increase. Indeed, it is those consumers with weak preferences for the product who are most inclined to switch, and who have the greatest influence on market definition since they determine the response to any hypothetical price increase. Thus, paradoxically, the focus of a stated preference survey should be on consumers who have weak preferences (the marginal consumers), and are most likely to switch, and not some core consumer group with strong preferences. This point goes not to the usefulness of such surveys but their interpretation, and the need to design them so that they capture the correct test for market definition.

## CRITICAL LOSS ANALYSIS

The concept of Critical Loss flows from the definition of a relevant market.<sup>38</sup> It asks what the group of producers (the hypothetical monopolist) in a proposed market could gain or lose from a price increase. Typically, a price increase will cause the group of producers to lose some sales and the profits earned from them. At the same time, they will earn increased profits from higher prices on the retained sales. The price increase will be profitable, if profits lost due to reduced sales are less than profits gained from higher prices. The Critical Loss is the level of lost sales at which the group of producers is indifferent between raising the price and not raising the price i.e. where it has a negligible impact of profits.<sup>39</sup>

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<sup>37</sup> R. Cummins, G. Harrison, & E. Rutström, 'Home Grown Values and Hypothetical Surveys: Is the Dichotomous Choice Approach Incentive Compatible?', 85 *American Economic Review*, 260-266 (1995); J. Hausman, *Contingent Valuation: A Critical Assessment*, Contributions to Economic Analysis, North Holland, (1993).

<sup>38</sup> B. C. Harris & C. G. Veljanovski, 'Critical Loss Analysis in Competition Law', 24 *European Competition Law Review*, 213-128 (2003).

<sup>39</sup> A related concept often used is the Critical Elasticity. This is the maximum pre-merger elasticity of demand for a candidate group of products and area, such that a hypothetical monopolist with control of the candidate market could profitably increase price by at least an established threshold value such as 5%.

The formula used to calculate the Critical Loss depends only on the magnitude of the price increase being considered, and the contribution (or profit) margin (CM) of the group of firms attempting to increase prices. More precisely, in its simplest form, the Critical Loss is equal to  $[Y/(Y + CM)]100$ , where:

$Y$  = the hypothesised price increase (e.g. 5 or 10 percent) expressed as a proportion; and

$CM$  = the contribution margin defined as the difference between the original price and average variable cost stated as a proportion of the original price.

Small adjustments to the formula allow for the calculation of the Critical Loss when there are supply or demand interdependencies, such as when two or more products necessarily result from a single production process.

To illustrate the Critical Loss calculation consider a merger between two cruise operators such as was investigated in 2002 by the UK Competition Commission,<sup>40</sup> US Federal Trade Commission,<sup>41</sup> and the EC Commission.<sup>42</sup> In that case there were two competing bids for P&O Princess Cruises by Carnival Corp. and Royal Caribbean Cruise Lines. The issue at hand was whether the relevant product market was wider than oceanic cruises, oceanic cruises only, or some sub-class of oceanic cruises such as premium oceanic cruises which was initially favoured by the EC Commission. In the UK Competition Commission's report individual operator Critical Loss figures were calculated for a hypothetical 5 and 10 per cent price increase per passenger cruise day.<sup>43</sup> However, assume for illustrative purposes that the contribution margin for oceanic cruises was 48%, then for a 5% hypothetical price increase the Critical Loss would be  $9.5\% = .05/ (.05 + .48) * 100\%$ . That is, in the absence of price discrimination, for the potential relevant market to be wider than oceanic cruises the hypothetical monopolist of all oceanic cruises would have to anticipate losing 9.5% or more of its total passenger cruise days, and less than 9.5% for oceanic cruises to define the relevant market.

The Critical Loss only identifies the reduction in output which would have to occur to make the hypothetical price increase unprofitable. It does not tell us whether such a

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<sup>40</sup> P&O Princess Cruises plc and Royal Caribbean Cruises Ltd., Cm 5536 (2002) para 5.3 –5.6 & App. 5.

<sup>41</sup> Statement of the Federal Trade Commission concerning Royal Caribbean Cruises, Ltd./PO Princess Cruises plc and Carnival Corp./P.O. Princess Cruises plc, FTC File No. 021 0041, October 2002.

<sup>42</sup> Case. COMP M/2706 Carnival Corporation/ P&O Princess (2002).

<sup>43</sup> In the report individual cruise operator Critical Loss estimates are given of 9.5% and 11.5% for P&O Princess and Royal Caribbean respectively. For confidentiality reasons the report does not give the contribution margins but they can be derived from the formula given the figures by manipulating the Critical Loss formula to give  $CM = Y(100\%/CL - 1)$ . This gives contribution margins of 48% and 38% for Royal Caribbean and P&O Princess respectively, and individual operator Critical Losses for Royal Caribbean is  $.05/ (.05 + .48) * 100\% = 9.5\%$ , and for P&O equals  $.05/ (.05 + .38) * 100\% = 11.5\%$ .

reduction would actually occur. To estimate actual lost sales would require analysis of the reactions of consumers (demand-side factors), and the reactions of producers whether of the same or other products. As such Critical Loss analysis is what is called a simulation approach. Nonetheless, the Critical Loss provides important information on the magnitude of the output effects required for market definition purposes which can be compared to company, industry and general market information to see whether substitution effects greater than or less than the Critical Loss seem plausible and reasonable.<sup>44</sup> The great attraction of Critical Loss analysis is that it is easily calculated and ‘requires amazingly little information’.<sup>45</sup>

Despite the increasing use of Critical Loss in US antitrust, it has been ignored by the EC Commission. In the UK the concept has been used, and identified as a useful quantitative technique.<sup>46</sup> In the cruise merger example above the three competition authorities all defined the market as ‘oceanic cruises’. Two of the three began their discussion of market definition by referring to Critical Loss estimates. The FTC concluded (without providing the evidence): *‘In view of a high elasticity of demand in the cruise industry relative to the Critical Loss, an across-the board price increase would be unprofitable and unlikely under current market conditions.’* Therefore absent price discrimination oceanic cruises was considered not to be a relevant product market. The UK Competition Commission was more agnostic but used Critical Loss estimates to launch its discussion of market definition stating *‘Though fully aware of its [Critical Loss] limitations, we found this estimate a useful benchmark against which to compare views on customers’ likely responsiveness to price changes, and to assess the profitability of a 5 to 10 per cent price rise.’*<sup>47</sup> The EC Commission on the other hand ignored the issue commenting in a footnote that it *‘has ... been unable to gather data that would enable it to perform any quantitative tests on the boundaries of the relevant market.’*<sup>48</sup>

## CONCENTRATION MEASURES

Market share and concentration indices are frequently used as a summary measure of the degree of competition. They are based on the assumption that the market has been properly defined, and that its structure in terms of the number, size, and disparity of

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<sup>44</sup> For a recent application to ‘test’ the (in)validity of a sector regulator’s market definition see I. Dobbs & P. Richards, ‘Biases and Errors in the Assessment of Market Boundaries for Ex Ante Regulation with an Application to Internet Services in the UK’, 5 *Journal of Network Industries*, 193-217 (2004).

<sup>45</sup> Office of Fair Trading, *Quantitative Techniques in Competition Analysis*, Research Paper No. 17 (1999), para. 10.8.

<sup>46</sup> UK Competition Commission, *Merger References: Competition Commission Guidelines*, (2002), para 2.18.

<sup>47</sup> P&O Princess Cruises plc and Royal Caribbean Cruises Ltd., Cm 5536 (2002), para 5.6.

<sup>48</sup> Case COMP M/2706 - Carnival Corporation/ P&O Princess (2002), n. 10.

firms is directly correlated with market power. In reality the structural features of a relevant product market may not give an accurate picture of competitive factors.

In EC law market shares play a prominent role. Indeed the substantive legal test for dominance are almost defined in terms of market shares of above 40% to 50%, with references sometimes to the market shares of the next two or three largest firms. The elimination of a competitor which leads to a market share exceeding this threshold generally gives rise to competition concerns.

In many other jurisdictions more sophisticated concentration measures are used. The most common is the three (C3) or four (C4) firm concentration ratio. The C3 or C4 is the combined market share of the three or four largest firms in the industry respectively. The higher the share, the more likely it is believed that the market is uncompetitive. There is no magic in the choice of four firms, as opposed to three or five. Nonetheless the C4 does have the advantage of broadening the measure beyond the leading firm.

An alternative and more satisfactory measure is the Herfindahl-Hirschman Index (HHI). This takes account of the market shares of all firms in the industry. The HHI is calculated by summing the squares of the individual market shares of all firms in the market. The squaring of market shares gives greater weight to larger firms, so that the measure takes into account the disparity in the size of firms in the market. The HHI ranges from 10,000 for a monopoly (= 100% x 100%) to a very low figure of an industry with many firms with small shares.

The US Horizontal Merger Guidelines (1997) sets out three bands for post-merger HHIs. The competitive threshold is set at below 1000 equivalent to 10 equally sized firms. Mergers which take place in markets with a HHI less than 1000 usually do not attract the interest of the US authorities. Where the post-merger HHI is between 1000 to 1800 the market is regarded as 'moderately concentrated' and may lead to investigation depending on the size of the merger. HHIs above 1800 indicate a 'highly concentrated' market. In addition the way a merger increases the HHI – to so-called 'delta' - is taken into account. For example, under the DOJ/FTC Horizontal Merger Guidelines if a proposed merger increases the HHI by more than 100 points in a moderately concentrated market or 50 points in a highly concentrated market it will be scrutinised (see table below).

The C4 and HHI first formally appeared in the 2001 EC Horizontal Agreements Guidelines (para 29), although the former was given only passing mention. These guidelines replicated the US approach. The EC Horizontal Merger Guidelines (para 20) adopts the HHI measure but with different post-merger bands and deltas – 'moderately concentrated' is set between 1000 and 2000 and a 'delta' above 250, and 'highly concentrated' above 2000 with a delta above 150. These thresholds and deltas exceed the US ones, suggesting that EC merger clearance may be (slightly) more permissive.

DOJ/EC post-merger HHI thresholds and deltas		
Concentration	Thresholds	Delta triggers
Unconcentrated	US/EC - below 1000	No further analysis required
Moderately concentrated	US - 1000 to 1800 EC - 1000 to 2000	over 100 over 250
Highly concentrated	US - above 1800  EC - above 2000	over 100 - merger creates/enhances market power or facilitates its exercise over 50 - potentially raises significant competition concerns below 50 - unlikely to have adverse competition effects  above 150

The first question of interest is how the above HHI thresholds relate to the traditional market shares used to trigger dominance? Assume for illustrative purposes that the HHI's were to replace in some sense the use of market shares (which they do not – see below). Market shares of 40% and 50%, ignoring other firms in the industry, give HHIs of 1600 and 2500 placing the industry immediately in the moderately to highly concentrated bands respectively. If the remaining firms in the market are taken into account it lifts the HHIs further. For example, if the leading firm has a 40% market share with the other firms at 10% each, then the HHI is 2000. A proposed merger between the leading firm and another would increase its market share to 50%, the post-merger HHI to 3000, and have a delta of 800. Similarly, if the leading firm has 40% and the others market shares of 5%, the HHI is 1900. A merger between the leading firm and another would result in a 45% market share, a post-merger HHI of 2400 and delta of 200. Both market shares and HHIs point to competition concerns. However this is not always the case.

While the EC thresholds/deltas appear more permissive than the US, they may nonetheless trigger more scrutiny than previously. There are permutations of market shares and number of firms which can trigger concerns where none were likely to exist before. For example, markets with 8 or 9 equally sized firms with market shares of 11.1% and 12.5% respectively would be classed as 'moderately concentrated', and a merger between two firms would trigger a competition concern even though the combined market share in both cases is 25% or below (see table below). Also a merger in a market with 6 equally sized firms would give the merged firm a market share of around 33% in a 'highly concentrated' market, and a delta over 800 triggering serious competition concerns. One can play around with the figures to identify other 'anomalies'. For example, an industry with 14 firms, with market shares of 20%, 16%, 9% and the others at 5% each would have a post-merger HHI of 1300 and delta of 288 if the second and third largest firms merged yet a market share of only 25%. Clearly, used in isolation the HHI guidelines would lead to a significant increase in merger scrutiny!

<b>Market shares/HHIs for 9, 8 and 6-firm markets</b>			
<b>Market shares/HHIs</b>	<b>9-firms</b>	<b>8-firms</b>	<b>6-firms</b>
<b>pre-merger:</b>			
<b>Market share</b>	11.1%	12.5%	16.7%
<b>HHI</b>	1110	1250	1673
<b>post-merger:</b>			
<b>Market share</b>	22.2%	25.0%	33.4%
<b>HHI</b>	1481	1719	2510
<b>delta</b>	370	469	836

Fortunately, the EC Horizontal Merger Guidelines make clear that HHIs are a complement to market shares and case-by-case assessments of competitive factors. Indeed the HHIs are used not to identify competitive concerns as such but ‘as initial indicators of the absence of competition concerns’. Further, the anomalies identified above are partly dealt with by the ‘safe harbour’ provisions which exempt from scrutiny proposed mergers with market shares not in excess 25% (para 18). These considerations nonetheless beg the question whether the routine use of HHIs will lead to a more restrictive merger regime. This fear which is somewhat reinforced by the ‘special circumstances’ provision which can override the thresholds if the proposed merger involves a new entrant, significant cross shareholding, one or more of the merging parties is an innovator, or there is evidence of past and/or on-going coordination.

It is possible to take account some of these ‘special circumstances’ in the HHI calculation itself. For example where there is substantial cross-ownership between firms in the industry. In Exxon/Mobile<sup>49</sup> the EC Commission made reference to a ‘modified HHI’ which treated the controlled entities as one entity thus raising the pre- and post- merger HHIs and the delta. A similar adjustment (it is suggested) can also be made where a substantial amount of output is committed under long-term contracts and not available (contestable) to other buyers/suppliers. In such a case the firms’ shares would be expressed only as a proportion of the contestable output, and not total output. This would increase the HHIs to give a better snapshot of the competitive factors in the industry. The HHI can be modified to take account of other structural features such as complementary products and vertical integration.

## **CONCLUSION**

The discussion above has only touched the surface of the economic, legal and empirical issues surrounding market definition and competitive analysis relevant to merger analysis. There are a range of more sophisticated empirical techniques to determine the competitive consequences of proposed mergers and joint ventures which build on the techniques discussed above, but go further in terms of modelling, complexity and the information they can generate to assist competition authorities, and those under

<sup>49</sup> Case IV/M.1383 - Exxon/Mobile (1999).

investigation. The newer techniques also employ different approaches such as experimental analysis and simulation models now under active discussion in Europe. The EC Commission's Horizontal Merger Guidelines opens the way for application of quantitative techniques, but also more complex structural and competitive concerns associated with oligopolistic markets which call for even more sophisticated empirical analysis.