

Market Definition and Market Power in Competition Analysis: Some Practical Issues

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Abstract: Market definition plays a key role in competition analysis and has often proved controversial. However, it is merely a means to an end, the real issue being to establish whether or not firms have significant market power, i.e. the power to increase prices. This objective is rather different to the traditional neo-classical economic view of a market. The introduction of the SSNIP test in the US Department of Justice 1982 Merger Guidelines resulted in the development of new methods for defining markets and for measuring market power directly, thus eliminating the need to define the market at all.

I INTRODUCTION

Market definition has long been a controversial issue in competition and merger cases. The past twenty years has seen the development of new methods of defining markets more suited to the particular demands of competition analysis than those traditionally used by economists. Attention has also focused on methods of measuring market power directly thereby obviating the need to define markets in some instances. The current paper reviews developments in the methodologies of market definition and measuring market power.

The paper is structured as follows. The case law on market definition in the

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United States, the European Union and Ireland is briefly outlined. The paper then reviews various economic approaches for defining markets. It argues that these are not suited to competition analysis. The SSNIP¹ test is then outlined. Some practical aspects of applying this test are described in the following section. Methods of measuring market power directly are then considered. Some conclusions are offered in the final section.

II CASE LAW ON MARKET DEFINITION

In general, the more narrowly the market is defined the more likely a firm or firms will be found to have market power. Not surprisingly, firms tend to advocate wider market definitions than those adopted by competition authorities.

Government antitrust enforcers have often been accused of arbitrarily defining markets broad enough to make merging firms competitors but narrow enough to make the market highly concentrated. (Morris and Mosteller, 1991, p. 599).

Werden (1981) conceded that the methodology employed in US merger cases in the 1960s and 1970s deserved much of the criticism it was given. Similarly, Whish (1993, p. 200) criticised the EU Commission, arguing that because unilateral behaviour by a firm without market power cannot breach the competition rules, “in some cases fairly outlandish claims of dominance have been made.” Kauper (1996, p. 303) notes that in some abuse of dominance cases markets “seem to have been drawn more narrowly than a purely economic concern about adverse price and output effects would warrant.”

(i) *United States*

The US Supreme Court first accepted cross-price elasticities of demand in defining the relevant market in *Times-Picayune*.² This approach was confirmed in the famous ‘*Cellophane*’ case³ where Mr. Justice Reed noted that, in order to define a market and ascertain whether du Pont had a monopoly, “what is called for is an appraisal of the “cross-elasticity” of demand in the trade”. In a dissenting judgment, Mr. Chief Justice Warren stated that: “In defining the market in which du Pont’s economic power is to be measured, the majority virtually emasculated Section 2 of the Sherman Act”.

1. The test, which was originally contained in the US Department of Justice 1982 Merger Guidelines, asks whether a hypothetical monopolist or cartel could impose a small significant non-transitory increase in price.

2. *Times-Picayune Publishing Co. v. United States*, 345 US 594 (1952).

3. *United States v. E.I. du Pont de Nemours & Co.*, 353 US 586 (1957).

Although Du Pont produced 85 per cent of all cellophane wrapping, the Court determined that other packaging materials were substitutes for cellophane at prevailing market prices and concluded that the relevant product market was wider than cellophane. Many commentators argued that the majority judgment made a serious error, in what has come to be referred to as the *cellophane trap*. A profit-maximising monopolist will generally raise price to the point where other products become close substitutes. Looking at the degree of product substitution at prevailing prices involves considering the position after the firm or firms have already raised prices. In those circumstances cross elasticities establish that the firm or firms lack the power to raise the price any further. In abuse of dominance cases, it is the cross price elasticities at the competitive price rather than at the prevailing price level that must be used to define the market. However, competitive prices cannot be observed and must be inferred.

In *Philadelphia National Bank* the Court defined the relevant market as the four-county Philadelphia metropolitan area “which would roughly seem to delineate the area in which bank customers that are neither very large nor very small find it practical to do their banking business”.⁴ Simons and Williams (1993) claim that this judgment appeared to do nothing more than split the difference between two extremes.

The Court subsequently concluded that there was sufficient competition between aluminium and copper conductors to include them in the same market but went on to state that the degree of competitiveness did not preclude “their division for purposes of s.7 (of the Clayton Act) into separate submarkets”.⁵ Simons and Williams claim that the Court failed to explain the apparent inconsistency between the idea that aluminium and copper constituted a single market and yet could be divided into separate sub-markets. Kauper (1996, p. 240) notes that this case has been described as the “best example of gerrymandering of ‘sub-markets’ to find a merger unlawful”.

In these cases the Court established a framework for defining markets based on the concept of substitutability but failed to provide meaningful guidance as to how much substitutability was required. “Not providing a proper answer to this question permits enormous leeway for ‘rigging’ the market definition.” (Simons and Williams, 1993, p. 816). Werden (1992, p. 112) cautions that “one should not conclude that a product or area is in the relevant market just because there is *some* competition or substitutability between it and products and areas for which one is trying to delineate the relevant market.” (Emphasis added.) This point had in fact been recognised by the Court in *Times Picayune* where it stated:

4. *United States v. Philadelphia National Bank*, 374 US 321 (1963).

5. *United States v. Aluminium Company of America*, 377 US 271 (1964).

For every product substitutes exist, but a relevant market cannot meaningfully encompass that infinite range, the circle must be drawn narrowly to exclude any other products to which, within reasonable variations in price, only a limited number of buyers will turn.⁶

(ii) *EU*

The European Court of Justice first considered the question of market definition in *Continental Can*.⁷ It found fault with the Commission's market analysis and stressed the role of supply substitutability "a factor which over time has tended to disappear from Commission decisions." (Kauper, 1996, p. 249). In *United Brands*⁸ the Court decided not to rely on cross-elasticity of demand data, opting for a more subjective test based on what the Court regarded as the banana's special features.

The banana has certain characteristics, appearance, taste, softness, seedlessness, easy handling and a constant level of production which enables it to satisfy the constant needs of an important section of the population consisting of the very young, the old and the sick.

Korah (1990, p. 59) criticised this judgment arguing that "the interests of the toothless are sufficiently protected by the inability of the dominant firm to discriminate against them. It would lose so much market share from the rest of the population that it would not be worth raising prices to exploit the weak." According to Kauper (1996) *United Brands* set the stage for a series of cases placing emphasis on the demand side with physical characteristics of the products playing a leading role, while relatively limited attention was paid to supply substitutability. He also claims that the Court of Justice has generally deferred to the Commission's views on market definition, although the Court of First Instance has shown a greater willingness to examine the issue in a number of cases.

In its *Notice on Agreements of Minor Importance*, the EU Commission (1986) stated that deciding whether products were interchangeable "must be judged from the vantage point of the user, normally taking the characteristics, price and intended use of the goods together." Kauper (1996, p. 245) observes that the "characteristics, price and intended use" formula "appears regularly, in an almost ritualistic way, in other commission regulations and decisions".⁹ The Commission

6. *Times-Picayune Publishing Co. v. United States*, *op. cit.*

7. *Europemballage Corp. and Continental Can Inc. v. Commission*, ECR 215; (1973).

8. *United Brands Co. v. Commission*, (1978), ECR 207, (1978) 1 CMLR 429.

9. It appears in the Commission Notice on Market Definition, although this adopts the SSNIP test.

(1997, p. 10) has stated that it will only take into account quantitative evidence that is “capable of withstanding rigorous scrutiny for the purposes of establishing patterns of substitution.” Market definitions based on the more subjective “characteristics, price and intended use formula” might not satisfy such stringent requirements.

(iii) *Ireland*

There are relatively few decided Irish cases as the legislation is less than ten years old. In *Deane v. VHI*¹⁰ Keane J. found the relevant market to be that for health insurance without giving any basis for the finding. Similarly in *Donovan v. ESB*¹¹ no guiding principles were set out by Costello J. for defining the market. In *Mars / HB*, Keane J. defined the market as that for impulse ice-cream products “largely on what has been described as the ‘common sense’ or ‘innate characteristics’ test. I do not think that someone going into a confectioner’s or newsagent to buy an ice cream who finds the cabinet temporarily empty would treat their appetite as slaked by a can of coke or a bag of crisps.” The judgment, which echoes the approach of the Court of Justice in *United Brands*, dismissed cross price elasticity analysis because the “acknowledged incapacity of that procedure to embrace all the significant variables which would have to be taken into account significantly reduces its value.”¹²

III ECONOMIC TESTS FOR DEFINING MARKETS

Historically economists have devoted little attention to the issue of market definition. Stigler (1982, p. 9) stated that the “battle on market definitions. ... has received virtually no attention from us economists” and “the determination of markets has remained an undeveloped area of economic research at either the theoretical or empirical level.” Similarly Horowitz (1981, p. 1) noted:

Because economists, from Adam Smith forward, have with confidence and enthusiasm, although not necessarily with shared views, written about markets, it is plausible to expect that they would have had quite a bit to contribute to the resolution of the market-definition issue. Plausible, but erroneous.

The position has changed considerably since the early 1980s.

10. *Deane & others v. VHI*, High Court, Keane, J., 22.4.93.

11. *Donovan v. ESB*, (1994) 2 IR 305.

12. *Masterfoods t/a Mars v. HB Ice Cream Ltd.* (1993) ILRM 145.

(i) Cross-Price Elasticity

Traditionally market definition was based on the cross-price elasticity of demand, which measures the responsiveness of the change in demand for a product, to changes in the price of another product. The cross price elasticity of demand is defined as:

$$(\delta q_i / \delta p_j) / (q_i / p_j) \quad (1)$$

where q_i and p_j denote the quantity and price of products i and j respectively. This approach suffers from a number of shortcomings.

It is unclear how high the cross price elasticity of demand needs to be before goods can be considered to be part of the same market. In abuse of dominance cases, estimating cross price elasticities at the prevailing market price will lead to the wrong conclusion due to the *cellophane trap*. Stigler and Sherwin (1985) point out that cross elasticity tests involve additional complexity and more stringent data requirements than price correlations and suggest that this makes the latter tests seem preferable.

Werden (1998) argues that a small increase in the price of one product A may cause sufficient consumers to switch to another product B to render it unprofitable for the manufacturer of A to impose a unilateral price increase. However, the reverse need not be true. More importantly Werden also notes that asking whether one product is in the same market as another focuses only on the competitive significance of individual substitutes rather than on the collective competitive significance of all substitutes. Citing the case of breakfast cereals, where there are many product brands, he observes that the cross elasticities between any pair of products may be quite small. Nevertheless, it may be the case that no individual brand has any significant market power because a small increase in its price would induce substitution to many other brands, with each of them gaining only a small fraction of the switching customers.

(ii) Price Correlations

On the basis that prices of substitute products cannot move too much out of line with one another a number of economists have suggested using price correlations in order to define product or geographic markets.¹³ Price correlations display certain shortcomings for the purpose of defining a market for competition analysis. The prices of two products will be perfectly correlated if a specified percentage change in the price of one results in a consistent percentage change

13. See, for example, Shrieves (1978), Horowitz (1981), and Stigler and Sherwin (1985).

in the other.¹⁴ They can also yield misleading results since it is possible to have high levels of correlation even though the products are not good substitutes. Slade (1986) points out that spurious correlations can result if mutually causal factors are not held constant. It will generally be necessary to specify a structural model to correct for this but Kaserman and Zeisel (1996) observe that price correlations were considered superior to cross-price elasticity tests because they avoided the need to develop complex structural models.

Price data may however show that products are in different economic markets in which case one can safely conclude that they are not substitutes. Areeda and Turner (1978, p. 355) observe that “separate (geographic) markets are indicated for a given product where its price in separate areas differs and where price movements are relatively uncorrelated.” Similarly Benson (1980, p. 735) argues that:

The only way to really determine whether or not two firms are in the same geographic market is examination of reactions by one firm to price changes of another.

Massey and O'Hare (1996) note that the EU Commission has on occasion considered the past pricing behaviour of firms as a useful indicator of the relevant market.

(iii) Product Flows

Elzinga and Hogarty (1973 and 1978) suggested defining geographic markets based on product flows arguing that “the only data required to estimate market areas — at least in most cases — are shipments data in physical terms.” The Elzinga-Hogarty test measures the percentage of a product consumed in an area that is produced there and the percentage of a product produced in an area that is consumed there. If both values are high the test states that the geographic area in question should be regarded as a separate geographic market. Elzinga and Hogarty proposed critical values for the test but Kaserman and Zeisel (1996) point out that there is no theoretical or practical justification for the suggested critical values.

Stigler and Sherwin (1985) show that the presence or absence of trade flows between two areas is neither a necessary nor a sufficient condition to establish whether or not they constitute a single market. It is possible to have large trade flows between two areas but, if they are distinct markets, price discrimination may result in large and persistent price differentials between them that are unrelated to transport costs. Producers may be able to identify and take

14. Unfortunately this is likely to be true irrespective of whether one increases by 100 per cent and the other by .01 per cent or whether they both increase by 10 per cent at a time.

advantage of differences in demand elasticities between the two areas without driving prices to equality. Hilke and Nelson (1989) report that, in the *Coffee (General Foods)* case,¹⁵ the majority of the FTC adopted a wide geographic market definition because transport costs were low. They note, however, that price data and company planning documents supported a narrower geographic market definition.

In the *Pabst*¹⁶ beer case it was successfully argued that the appropriate market was that for beer in the State of Wisconsin on the basis of evidence that Wisconsin had the highest per capita beer consumption in the US and relatively little beer was imported into the State. According to Schrank and Roy (1991) the fact that 75 per cent of the beer brewed in Wisconsin was shipped out of the State was ignored.¹⁷

The Elzinga Hogarty test treats regions as constituting separate geographic markets if there are no cross shipments between them at a point in time, even though the cross elasticities between the regions may be quite high. Kaserman and Zeisel (1996, p. 670) note that the possibility of shipments from outside an area “may sufficiently temper the pricing decisions of producers ... to make actual shipments unnecessary.” The EU Commission in *Italian Flat Glass*¹⁸ urged that the market should be defined based on actual product shipments, not those that were “theoretically possible”. It concluded that, since Italian producers supplied 80 per cent of Italian flat glass, there could be “no doubt” that the geographic market was Italy. The decision ignored the fact that prices in Italy may already have been at competitive levels. The absence of trade flows did not indicate how consumers and other suppliers might respond to any significant price increase. Certain documents indicated that Italian producers took account of competition from producers in other member states and in Turkey and Eastern Europe (Kauper, 1996). Werden (1981, p. 720) concluded that: “Shipments data, while useful, simply are not sufficient to define markets.” Elzinga (1981) conceded that the test only estimated minimum market size.

(iv) Partial Adjustment Approach

Horowitz (1981) proposed a regression based approach designed to reflect the fact that equilibrium price adjustments across geographic areas or products that are in the same market may not occur instantaneously. The Horowitz model assumes that there exists some unobservable and stable long-run equilibrium price difference between the areas or products, where this difference is

15. *General Foods Corp.*, 3 Trade Reg. Rep. (CCH), 142 (April 6, 1984).

16. *United States v. Pabst Brewing Co.*, 384 US 546 (1966).

17. Ignoring such “exports” is not consistent with the Elzinga-Hogarty test.

18. 1988 OJ L33/34.

approached with a lag. It uses a partial adjustment model to estimate the long-run equilibrium price difference and the speed of adjustment to that difference.

Stigler and Sherwin (1985) argue that the Horowitz model has no general validity as an approach to equilibrium. Slade (1986) indicates that it can yield erroneous results if price series are autocorrelated or if they exhibit either a trend or systematic seasonal movements. She further argues that the model is unnecessarily restrictive in its assumption concerning the pattern of dynamic adjustment. There is also no reason to believe that a stable long run price difference should exist between two areas as shipments can go in either direction and prices can differ in either direction by an amount equal to or less than per unit transport costs.

(v) The Causality Approach

Slade (1986) proposed a methodology based on the concept of causality as developed by Granger (1969); Sims (1972) and Wu (1983) as a means of testing the hypothesis that price movements in one geographic area or product have discernible effects on price movements in some other area or product. The causality literature indicates that a variable Y is “caused” by some other variable X if one obtains significantly better predictions of Y when X is included as an explanatory along with all other explanatory variables than when X is excluded.¹⁹ Kaserman and Zeisel (1996), note that causality tests are likely to be highly sensitive to the model specification used and if important variables are excluded the test will yield biased results. They argue that, given data limitations, such bias is likely. Kimmel (1987) concludes that such tests “may be among the worst cases of confusion of statistical significance and economic significance.”

IV THE DISTINCTION BETWEEN ECONOMIC AND ANTITRUST MARKETS

A common feature of all of the approaches considered thus far is that they are concerned with defining economic markets. An important development in the literature on market definition in the past twenty years is the distinction between the concept of a relevant market used in competition analysis, and traditional economic definitions of a market. Werden (1992, p. 108) describes markets as “the tools used to aid in the assessment of market-power related issues. The best tool for any task is one designed to perform it.” Traditional

19. Causality tests are carried out by estimating two separate regressions on Y, one of which includes lagged values of X while the other excludes them. Where X and Y are prices of a product in two geographic areas or of two products in one area, finding of a causal relationship indicates that they belong to the same market.

economic definitions of markets have their origins in the work of neo-classical economists such as Cournot (1838) and Marshall (1890). Economic markets identify the range of products and geographic areas for which arbitrage keeps price linked. However, this does not establish whether or not a firm or firms have market power, i.e. whether they have the ability to increase prices. Werden (1981, p. 721) therefore argues that:

A market for *antitrust purposes* is any product or group of products and any geographic area in which collective action by all firms (as through collusion or merger) would result in a profit maximizing price that significantly exceeded the competitive price. (Emphasis in original).²⁰

The shortcomings of traditional economic markets for competition analysis can be illustrated by an example. Suppose there are four firms producing similar products. Further assume that two of the firms are located in city A and two in city B. Arbitrage may lead to uniform prices in both cities. Based on traditional economic definitions the two cities constitute a single market. However, if the products are not perfectly homogeneous, then cross elasticities of demand, relative output volumes and other factors are also important. It is possible that if the firms in A raise their prices, arbitrage may cause prices in B to rise also. Thus the two firms in A could collude to profitably raise prices without the participation of the firms in B. In considering a merger between the two firms in A, treating A and B as a single market will produce a misleading result.

V THE SSNIP TEST

The US Department of Justice 1982 Merger Guidelines established a new approach to market definition with the introduction of the SSNIP test. This test seeks to identify the smallest market within which a hypothetical monopolist or cartel could impose a small but significant non-transitory increase in price. It does so by asking whether such a monopolist or cartel could sustain a price increase of 5 per cent for at least one year. If such a price increase is not profitable, because there are sufficiently close substitutes, or because consumers will switch to products produced by firms in a different location, then the firm or cartel lacks the power to raise price. The relevant market therefore needs to be expanded to include other products or geographic areas.

20. Areeda and Turner (1978, p. 347) point out that 'In economic terms a "market" embraces one firm or any group of firms which, if unified by agreement or merger, would have market power in dealing with any group of buyers.' Similarly the EU Commission (1997) states that: "The objective of defining a market..... is to identify those actual competitors of the undertakings involved that are capable of constraining those undertakings' behaviour and of preventing them from behaving independently of effective competitive pressure".

The next closest substitute is added to the relevant market and the test is applied again. This process continues until the point is reached where a hypothetical cartel or monopolist could profitably impose a 5 per cent price increase. The range of products or the geographic area so defined constitutes the relevant market. Products not included are not sufficiently close substitutes to effectively constrain the hypothetical cartel from raising price.²¹ The EU Commission (1997) adopted the SSNIP formulation in its Notice on Market Definition. The Guidelines “identify a market as a region or set of commodities within which demand is highly elastic, but outside of which demand is inelastic.” (Kamerschen and Kohler, 1993, p. 908).

The residual demand curve is the demand curve faced by an individual firm and is defined as the total market demand curve less the supply of all other firms in the market. The residual demand curve incorporates the effects of changes in the prices of other products in response to changes in a given product's price in plotting the quantity demanded of a product. In effect the residual demand curve is the demand curve for a firm that acts as a “Stackleberg leader”, i.e. a firm that takes its rivals' reactions into account in determining its own optimal action. Firms try to shift their residual demand curves closer to the market demand curve through merging. Estimating residual demand analysis was thus seen as a means of evaluating gains in economic power arising from mergers.

Baker and Bresnahan (1984) developed a method of estimating residual demand elasticity faced by a single firm as a means of determining whether a merger involving producers of differentiated products would increase the market power of the merged entity. Subsequently, Scheffman and Spiller (1987) developed an empirically based approach for directly implementing the Merger Guidelines. They estimated residual demand elasticities by analysing whether cost increases were largely passed through or whether they had little or no effect on the final price using data from past “natural experiments”. If cost increases are mostly passed through, then demand is relatively inelastic. If the cost increase is not reflected in the price then the residual demand is relatively elastic.²²

Morris and Mosteller (1991) used critical demand and loss measures to estimate the extent of a geographic market for supermarkets. Kamerschen and Kohler (1993) estimated residual demand elasticities of demand for firms in the

21. This approach makes it essential to rank substitutes in order of closeness. Werden (1998) suggests that cross elasticities of demand can play a key role in this ranking.

22. In order to measure the effect of a price increase on demand, it does not matter whether a price increase is due to an exercise of market power or whether it is due to an increase in costs peculiar to the product concerned.

ready to eat breakfast cereals market to analyse the consequences of potential mergers in that industry. They noted that, despite its shortcomings, this approach addressed “the real issue of whether the price will increase as the result of, e.g., a proposed merger”. Simons and Williams (1993) argued that the introduction of the SSNIP test in the Guidelines significantly advanced merger analysis by introducing the concept of residual demand elasticity to bound the market. Kaserman and Zeisel (1996, p. 678) pointed out a number of shortcomings of the residual demand approach and argued that while it “represents a significant step toward implementation of the DOJ Guidelines’ criteria, it cannot be expected to be probative in all cases.” More recently Amel and Hannan (2000) have estimated residual elasticities of supply for deposits to define relevant markets in banking.

Unlike the residual elasticity of demand, the Marshallian demand curve is based on a *ceteris paribus* assumption and measures the effect of a change in price on demand for a particular product by keeping the prices of all other products constant. The 1992 Merger Guidelines incorporated a *ceteris paribus* assumption that “the terms of sale of all other products are held constant”. Therefore, the SSNIP test should be applied by estimating the *own elasticity of demand*. The Appendix outlines how the critical elasticity of demand (ε) can be derived such that:

$$\varepsilon = 1/(m+t) \quad (2)$$

where m is the pre merger price cost margin (defined as the gap between price and marginal cost) and t is the minimum price increase considered significant.²³ For the purposes of the analysis the price increase is a given.²⁴ Thus, in order to calculate the value of the critical elasticity of demand all that is required is information on the firms’ price cost margins.

If the pre-merger elasticity of demand exceeds the critical elasticity it means that the decline in sales arising from the price increase will be large enough to render the price increase unprofitable and the products concerned do not constitute the relevant market. The critical demand elasticity decreases as margins increase, e.g. given a hypothetical price increase of 5 per cent, at a margin of 5 per cent the critical demand elasticity is 10 but at a margin of 25 per cent it drops to 3.33. It follows that critical demand elasticities will be lower where prevailing price is above the competitive level because margins will be higher. This reflects the fact that firms with market power who are

23. This formula applies in the case of a linear demand curve. The formula for the critical elasticity of demand where the demand curve is isoelastic is also given in the Appendix.

24. The US merger guidelines specify a 5 per cent increase as significant.

profit maximisers will increase price up to the point where other goods become close substitutes and thus act as a constraint on raising prices further.²⁵ Goods characterised by high fixed costs or sharply upward sloping cost curves will have lower critical residual demand elasticities than those with low fixed costs or relatively flat cost curves.

It may not always be possible to obtain data on actual elasticities of demand that can then be compared against the value of the critical elasticity. Kaserman and Zeisel (1996), however, describe how results from consumers' surveys were used to estimate price elasticities by the Federal Trade Commission in opposing proposed mergers in the US soft drinks industry in the mid 1980s.

Harris and Simons (1989) developed an alternative method for determining whether a "small but significant" price increase would be profitable, where demand elasticities cannot be estimated. Their method involves estimating the critical loss (y) for a given percentage margin and price increase, i.e. the 5 per cent used in the SSNIP test. The critical loss is defined as the maximum sales loss that could be sustained as a result of the price increase without making the price increase unprofitable. If the evidence in a specific case indicates that the likely loss of sales to the hypothetical monopolist (cartel) is less than the Critical Loss, then a 5 per cent price increase would be profitable and the market would be defined. Harris and Simons suggest using average variable cost as a proxy for marginal cost so that the only information required is data on average variable cost and price. The critical loss (y) may be written as:

$$y = t/(m+t) \quad (3)$$

Table 1 illustrates values for the critical elasticity of demand and critical loss for various percentage margins assuming a price increase of 5 per cent.

Table 1: Critical Residual Demand and Loss for 5 Per Cent Price Increase

<i>Per Cent Margin</i>	<i>Critical Residual Demand Elasticity</i>	<i>Critical Loss</i>
50	1.82	9.1
45	2.00	10.0
40	2.22	11.1
35	2.50	12.5
30	2.86	14.3
25	3.33	16.7
20	4.00	20.0
15	5.00	25.0
10	6.67	33.3

25. As previously noted this is precisely the issue which arose in the *Cellophane* case.

VI SOME PRACTICAL POINTERS ON MARKET DEFINITION

Instead of formally estimating own demand elasticities, Werden (1992) points out that focusing on the price marginal cost gap may provide some indications as to the relevant market.²⁶ If the price marginal cost gap is small, then the profits decline due to lost sales will be relatively small. If the gap is relatively large then losses on sales forgone will be quite high. The size of the price-marginal cost gap needed to materially alter the proper conclusion on market definition varies greatly depending on the elasticity.

Werden (1992) observes that under the simplest textbook case of linear demand and constant marginal cost a monopolist would set output at exactly half the level of a competitive industry. With non-linear demand and constant marginal cost or linear demand and increasing marginal cost, a monopolist would select an output greater than half that of the competitive industry but not substantially greater. In general he argues that a monopolist is likely to select a level of output at least 30 per cent less than a competitive industry. Now suppose that a significant price increase is likely to lead to a drop in sales of less than 30 per cent. Such a fall in sales is likely to be insufficient to render the price increase unprofitable, since, in general, a profit maximising monopolist would be likely to set output at least 30 per cent below the competitive industry level. This implies that demand is sufficiently inelastic for a hypothetical monopolist to increase price by more than 5 per cent and no further products need to be added to define the relevant market. "Thus, a showing of inelastic demand is a sufficient (but not necessary) condition for demonstrating a relevant antitrust market." (Kaserman and Zeisel, 1996, p. 679)

In *FTC v. Staples*²⁷ the US FTC successfully argued that the relevant market was that for office equipment superstores. The companies had argued that it should include all office equipment supply outlets. Had this wider market definition been used the parties' market shares would have been unlikely to trigger a challenge. The FTC produced detailed econometric data showing that where the two firms competed directly with one another their prices were lower than in other locations where they did not. The data also indicated that the presence of smaller suppliers in a given geographic location did not act as a constraint on the pricing behaviour of the two firms involved in the proposed merger.²⁸ Documentary evidence also strongly suggested that the two firms

26. Werden argues that rough estimates of marginal cost can be easily constructed from average production cost data which firms can produce with little difficulty.

27. *Federal Trade Commission v. Staples, Inc.*, 970 F. Suppl. 1066 (DDC 1997).

28. For a more detailed account of the econometric evidence in this case see Barker (1996).

involved responded to each other's prices but paid little attention to the pricing strategies of smaller outlets.²⁹

Applying the SSNIP test ignores the fact that a firm may already have market power. However, such considerations are not relevant for defining a market in merger cases. In assessing the competitive impact of a merger the crucial issue is not whether one of the merging parties already enjoys a degree of market power, but whether, as a result of the merger, the degree of market power would increase. Thus the SSNIP test defines the market correctly for the purposes of merger analysis. The *cellophane* trap means that a different approach is required in abuse of dominance cases.

VII TESTING FOR MARKET POWER

Kahai *et al.* (1996) note that developments in the literature have produced an alternative, econometrically based, approach to the evaluation of market power. They employ a dominant firm/competitive fringe model (DM/CF) to estimate residual elasticities of demand for AT&T to establish if it should continue to be regarded as being dominant in the US inter-state telecommunications market. They note that one advantage of their approach is that "no a priori assumptions about the extent of the relevant market are required." (*ibid.* p. 913).

Kammerschen and Kohler (1993) argue that all the information needed to determine economic power is contained in the slope of the residual demand curve. They also note that residual demand elasticities may also provide some insights into firms' market behaviour and in particular into "whether the firms are colluding or competing." Several techniques have been devised to estimate the extent to which individual firm's output decisions influence market price and how, under certain market conditions, these can yield an estimate of the individual firm's residual elasticity of demand.

As noted the residual demand curve is the horizontal difference between the market demand curve and the total supply of all other firms. In perfectly competitive markets with homogeneous products no firm has any economic power, i.e. each producer faces an infinitely elastic residual demand curve. For the more general case of either product differentiation or certain oligopoly behaviour, the residual demand curve has a negative slope and its slope gets steeper as the

29. Similarly in *Nestle / Perrier* (1992, OJ L356/1) the EU Commission concluded that "an appreciable non-transitory increase in the price of source waters" would not cause a significant shift to soft drinks. Price movements in the five years preceding the merger suggested that "the incentive and possibility to increase prices jointly had already been recognised by the companies in the past and that the proposed concentration would facilitate and reinforce the likelihood of such a strategy." (Venit, 1998).

substitutability of the products decreases. In other words the steeper (more inelastic) the residual demand curve the greater the degree of market power.

Lerner (1934) proposed using the gap between price and marginal cost as a measure of the degree of firms' market power. This measure is known as the Lerner index and can be written as follows:

$$(p-c)/p \quad (4)$$

where p equals price and c is marginal cost. The Lerner Index is the left-hand side of the profit maximisation condition for a monopolist which is commonly expressed as:

$$(p-c)/p = 1/\epsilon \quad (5)^{30}$$

In effect this states that the size of the price cost gap is determined by the elasticity of the demand curve facing the monopolist. Werden (1998, p. 370) observes that: "The profit-maximization condition for the dominant firm is precisely the same as that for a monopolist, provided that the elasticity of demand ... is understood to be that faced by the dominant firm." This is because the dominant firm takes as given the competitive supply by smaller rivals (the "competitive fringe") that produce competing products. The dominant firm is a monopolist with respect to the portion of industry that remains when the supply of the competitive fringe at each price is subtracted.

Werden (1998) notes that it has become common for economists to estimate residual demand elasticities and for US courts, to rely on such evidence. In *Eastman Kodak* the US Supreme Court cited Areeda and Kaplow (1988) noting that "[w]hat constrains (a) defendant's ability to raise prices ... is 'the elasticity of demand faced by the defendant — the degree to which its sales fall ... as its price rises.'"³¹ In a number of US cases appeal courts have held that:

Market share is just a way of estimating market power, which is the ultimate consideration. When there are better ways to estimate market power, the court should use them.³²

30. See, for example, Carlton and Perloff (1990).

31. *Eastman Kodak Co. v. Image Technical Services Inc.*, 540 US 451 (1992).

32. See, for example, *Allen-Myland, Inc. v. IBM Corporation*, 33 F.3d 194, 209 (3rd Cir. 1994); *United States v. Baker Hughes, Inc.*, 908 F.2d 981, 992 (DC Cir. 1990) and *Ball Memorial Hospital Inc. v. Mutual Hospital Ins.*, 784 F.2d 1325, 1336, (7th Cir. 1986).

VIII CONCLUSIONS

Until the introduction of the 1982 US Department of Justice Merger Guidelines, economists paid relatively little attention to devising methods for defining markets for competition analysis. The publication of the Guidelines, however, led to significant theoretical developments on the subject in the economics literature. In recent years such theoretical advances have been employed in actual US cases. Market definition in competition analysis is only a means to an end. The real issue of interest is establishing the presence or absence of market power. Recent developments in the literature offer means for measuring market power directly, dispensing with the need to identify the relevant market first. It remains to be seen whether the Irish courts will be prepared to accept direct estimates of market power.

APPENDIX

The Critical Elasticity of Demand and Critical Loss

P^0 = The pre merger price.

P^1 = P^0 plus some specified price increase t .

c = Short Run Marginal Cost

m = Pre merger price-cost margin defined as $(P^0 - c)/P^0 = 1 - (c/P^0)$

t = Minimum price increase deemed significant. $(P^1 - P^0)/P^0 = (P^1/P^0) - 1$.

For a price increase to be profitable, profits after the price increase must at least equal the profits from selling a greater quantity at the lower original price. Assuming c is constant, profit is quantity times the difference between price and marginal cost thus, following Werden (1998), the break even condition becomes

$$q(P^0)(P^0 - c) = q(P^b)(P^b - c) \text{ where } P^b \text{ is defined as the break-even price.}$$

Rearranging gives

$$q(P^b)/q(P^0) = (P^0 - c)/(P^b - c)$$

If we now set $P^1 = P^b$ we can rewrite this as

$$[(P^0 - c)/P^0]/[(P^1 - c)/P^0] \text{ which, substituting gives } m/(m+t).$$

For the case of linear demand:

$$q(P^1)/q(P^0) = (a - P^1)/(a - P^0) = 1 - [(P^1 - P^0)/P^0][P^0/(a - P^0)].$$

and the elasticity of demand $\varepsilon = P^0/(a - P^0)$ giving

$$1 - t\varepsilon(P^0)$$

Break-even requires that $q(P^b)/q(P^0) = m/(m+t)$ so this gives us

$$m/(m+t) = 1 - t\varepsilon(P^0) \text{ and solving gives us } \varepsilon(P^0) = 1/(m+t).$$

When demand is isoelastic demand the critical break-even elasticity of demand $\varepsilon(P^0)$ can be written as $[\log(m+t) - \log(m)]/\text{Log}(1+t)$. (Werden, 1998.)

The critical sales loss (y) for a given price increase is defined as the proportionate decrease in quantity sold as a result of the price increase that is just large enough to make the price increase unprofitable. The sales loss resulting from a price increase from p^0 to p^1 is given by

$$1 - q(p^1)/q(p^0)$$

In the case of linear demand $q = (a - p)/b$. We can therefore write that:

$$1 - q(p^1)/q(p^0) = 1 - (a - p^1)/(a - p^0) \\ = [(p^1 - p^0)/p^0][p^0/(a - p^0)] \text{ which in turn reduces to } t\varepsilon(p^0).$$

Applying the break-even value of $\varepsilon(P^0)$ derived above then gives the value for the break even critical sales loss as:

$$y = t/(m+t).$$

If the actual loss likely to occur as a result of the price increase is less than this amount, then it would be profitable for the firm to increase prices. The break-even value of the critical sales loss is the same for both linear and isoelastic demand curves.

REFERENCES

- AMEL, D.F., and T.H. HANNAN, 2000. "Defining Banking Markets According to Principles Recommended in the Merger Guidelines", *Antitrust Bulletin*, Vol. 45, No. 3 (Fall), pp. 615-639.
- AREEDA, P., and L. KAPLOW, 1988. *Antitrust Analysis*, 4th edition, Boston: Little Brown.
- AREEDA, P., and D.F. TURNER, 1978. *Antitrust Law*, Boston: Little Brown.
- BARKER, J.B., 1996. "Econometric Analysis in *FTC v. Staples*", American Bar Association's Antitrust Section Economics Committee, 18 July 1997, mimeo.
- BAKER, J.B., and T.F. BRESNAHAN, 1984. *Estimating the Elasticity of Demand Facing a Single Firm: Evidence on Three Brewing Firms*, Stanford Workshop on Factor Markets: Research Paper No. 54.
- BENSON, R.L., 1980. "Spatial Competition: Implications for Market Area Delineation in Antimerger Cases", *Antitrust Bulletin*, Vol. 25, No. 4 (Winter), pp. 729-749.
- CARLTON, D.W., and J.M. PERLOFF, 1990. *Modern Industrial Organisation*, London: Scott Foresman/Little Brown.

- COURNOT, A.A., 1838. *Recherches sur les Principes Mathematiques de la Theorie des Richesse*, translated by N.T. Bacon, (1927), New York: Macmillan.
- ELZINGA, K., 1981. "Defining Geographic Market Boundaries", *Antitrust Bulletin*, Vol. 26, No. 4 (Winter), pp. 739-752.
- ELZINGA, K., and T. HOGARTY, 1973. "The Problem of Geographic Market Definition in Antimerger Suits", *Antitrust Bulletin*, Vol. 18, No. 1 (Spring), pp. 45-81.
- ELZINGA, K., and T. HOGARTY, 1978. "The Problem of Geographic Market Delineation Revisited", *Antitrust Bulletin*, Vol. 23, No. 1 (Spring), pp. 1-18.
- EUROPEAN COMMISSION, 1986. *Notice of 3 September 1986 on Agreements of Minor Importance Which Do Not Fall Under Article 85(1) of the Treaty Establishing the European Economic Community*, OJ C231.
- EUROPEAN COMMISSION, 1997. *Notice on Market Definition*, OJ C372.
- GRANGER, C., 1969. "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods", *Econometrica*, p. 37.
- HARRIS, R. and J.J. SIMONS, 1989. "Focusing Market Definition: How Much Substitution is Necessary?", *Journal of Research in Law and Economics*, Vol. 12.
- HILKE, J.C., and P.B. NELSON, 1989. "Strategic Behaviour and Attempted Monopolization: *The Coffee (General Foods) Case*", in J.E. Kwoka and L.J. White (eds.), *The Antitrust Revolution*, Harper Collins.
- HOROWITZ, I., 1981. "Market Definition in Antitrust Analysis: A Regression-based Approach", *Southern Economics Journal*, Vol. 48, pp. 1-16.
- KAHAI, S.K., D.L. KASERMAN, and J.W. MAYO, 1996. "Is the 'Dominant Firm' Dominant? An Empirical Analysis of AT&T's Market Power", *Journal of Law and Economics*, Vol. 39 (October), pp. 499-517.
- KAMERSCHEN, D.R., and J. KOHLER, 1993. "Residual Demand Analysis of the Ready-to-Eat Breakfast Cereal Market", *Antitrust Bulletin*, Vol. 38, No. 4 (Winter), pp. 903-942.
- KASERMAN, D.L., and H. ZEISEL, 1996. "Market Definition: Implementing the Department of Justice Merger Guidelines", *Antitrust Bulletin*, Vol. 41, No. 3 (Fall), pp. 665-690.
- KAUPER, T.E., 1996. "The Problem of Market Definition Under EC Competition Law", in B. Hawk (ed.), *International Antitrust Law and Policy*, London: Sweet and Maxwell.
- KIMMEL, S., 1987. *Price Correlation and Market Definition*, Economic Analysis Group Discussion Paper, US Department of Justice, Antitrust Division.
- KORAH, V., 1990. *An Introductory Guide to EEC Competition Law and Practice*, 4th edition, Oxford: ESC publishing.
- LERNER, A., 1934. "The Concept of Monopoly and the Measurement of Market Power", *Review of Economic Studies*, Vol. 1, pp. 157-175.
- MARSHALL, A., 1890. *Principles of Economics*, London: Macmillan.
- MASSEY, P., and P. O'HARE, 1996. *Competition Law and Policy in Ireland*, Dublin: Oaktree Press.
- MORRIS, J.R., and G.R. MOSTELLER, 1991. "Defining Markets for Merger Analysis", *Antitrust Bulletin*, Vol. 36, No. 3 (Fall), pp. 599-640.
- POSNER, R., 1976. *Antitrust Law: An Economic Perspective*, London: Chicago University Press.
- SCHEFFMAN, D.T., and P.T. SPILLER, 1987. "Geographic Market Definition Under the US Department of Justice Merger Guidelines", *Journal of Law and Economics*, Vol. 30.
- SCHRANK, W., and N. ROY, 1991. "Market Delineation in the Analysis of the United States Groundfish Market", *Antitrust Bulletin*, Vol. 36, No. 1 (Spring), pp. 91-154.

- SLADE, M.E., 1986. "Exogeneity Tests of Market Boundaries Applied to Petroleum Products", *Journal of Industrial Economics*, Vol. 34 (March).
- SHRIEVES, R.E., 1978. "Geographic Market Areas and Market Structure in the Bituminous Coal Industry", *Antitrust Bulletin*, Vol. 23, pp. 589-625.
- SIMONS, J.J., and M.A. WILLIAMS, 1993. "The Renaissance of Market Definition", *Antitrust Bulletin*, Vol. 38, No. 4 (Winter), pp. 799-857.
- SIMS, C.A., 1972. "Money, Income, and Causality", *American Economic Review*, Vol. 62.
- STIGLER, G., 1982. "The Economists and the Problem of Monopoly", *American Economic Review*, Vol. 72 (May).
- STIGLER, G. and R.A. SHERWIN, 1985. "The Extent of the Market", *Journal of Law and Economics*, Vol. 28 (October).
- UNITED STATES DEPARTMENT OF JUSTICE, 1982. *Horizontal Merger Guidelines*, Washington D.C.
- UNITED STATES DEPARTMENT OF JUSTICE/FEDERAL TRADE COMMISSION, 1992. *Horizontal Merger Guidelines*, Washington D.C.
- VENIT, J., 1998. "Two Steps Forward and No Steps Back: Economic Analysis and Oligopolistic Dominance After Kali & Salz", *Common Market Law Review*, Vol. 35, No. 5, pp. 1101-1034.
- WERDEN, G.J., 1981. "The Use and Misuse of Shipments Data in Defining Geographic Markets", *Antitrust Bulletin*, Vol. 26, No. 4 (Winter), pp. 719-737.
- WERDEN, G.J., 1992. "Four Suggestions on Market Delineation", *Antitrust Bulletin*, Vol. 37, No. 1, (Spring), pp. 107-121.
- WERDEN, G.J., 1998. "Demand Elasticities in Antitrust Analysis", *Antitrust Journal*, Vol. 43, pp. 363-414.
- WHISH, R., 1993. *Competition Law*, 3rd edition, London: Butterworths.
- WU, D., 1983. "Tests of Causality, Predeterminendness and Exogeneity", *International Economic Review*, Vol. 24.