Cross Elasticity and the Relevant Market

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An evaluation of conceptual difficulties that beset the use of coefficients of cross elasticity of demand for the purpose of defining a relevant market in the context of antitrust policy.

The identification of the "relevant market" has frequently been at the heart of monopoly and merger proceedings in the United States and in Europe — or it ought to be a central issue whenever the outcome of anticombines proceedings depends on the market shares of the firms concerned or on the concentration of supply or demand. Economists traditionally approach the determination of the relevant market in terms of the "closeness" of substitutes. Conceptually, one has to choose a measure of closeness, has to decide what degree of closeness is required for substitutes to be included in the same market, and can then proceed to mapping out the boundaries of the market relevant to the problem on hand. It is generally realized that this procedure has its difficulties. The choice of a cut-off point between substitutes sufficiently close to be included in the same market and those sufficiently distant to be placed in separate markets clearly involves a certain amount of arbitrariness, even if one is able to find a "marked gap" in the "chain of substitutes". Determination of the chain of substitutes itself, however, is in principle regarded as a non-controversial problem because it is widely believed that coefficients of (price) cross elasticity could serve as an appropriate measure for the relative closeness of substitutes if only sufficient data were available for the estimation of the coefficients[1]. It will be shown below that the conceptual difficulties with this measure are great enough to make one wonder whether it is worth the effort to overcome the data problems.

The central question is: How should we measure the relative closeness or the "degree of substitutability" of substitutes when we are dealing with more than two goods? To be sure, we always need more

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[1] See, for example, *M. Howe* [10, p. 42] and *F. M. Scherer* [13, p. 53].

than two goods, since closeness of substitutes is a relative concept. The statement "margarine is a close substitute of butter" makes no sense unless we have some other commodity or commodities in mind which are not "close" substitutes of butter or not as close as margarine. As it turns out there are several alternative ways of relating two or more substitutes to a commodity. And it will be shown that, for some purposes, some of these approaches are ambiguous ways of measuring the degree of substitutability. We will first demonstrate the difficulties of using the traditional cross elasticity measure with a fictitious example, will then look at alternative concepts, and finally will relate the findings of the paper to the practical use of cross elasticities in the well-known Cellophane Case[2].

I. Relative Changes in Own Sales Versus Relative Changes in Sales of Others

Let us suppose a national association of butter producers or a policy maker wanted to determine which of two potential substitutes, margarine and peanut butter, is the closer substitute for butter. One way of doing this is to assume that the prices of margarine and peanut butter vary within some narrow range while the price of butter and all other demand conditions remain unchanged. Using an arc formula, we would then have to compare the following cross elasticities[3].

$$(1) \qquad \varepsilon_{Q_b, P_m} = \frac{\dfrac{Q_b' - Q_b}{Q_b + Q_b'}}{\dfrac{P_m' - P_m}{P_m + P_m'}} \quad \text{and}$$

$$\varepsilon_{Q_b, P_g} = \frac{\dfrac{Q_b' - Q_b}{Q_b + Q_b'}}{\dfrac{P_g' - P_g}{P_g + P_g'}}$$

We thus compare the percent changes (shifts) in the demand for butter which result from a one-percent change in the price of mar-

[2] *Robert Triffin's* 1950 book [17], *E. H. Chamberlin's* 1951 article [5], and particularly *R. L. Bishop's* 1952 article [2] led to an extended debate on the use of coefficients of cross elasticity for the classification of competitive relationships between individual firms. Since that debate has overshadowed every other aspect of cross elasticities a disclaimer seems to be in order: This note is not another contribution to the *Triffin-Chamberlin-Bishop* debate. The focus is on different questions. For a discussion of the overlapping issues see the longer mimeographed version of this paper [15, pp. 13 - 20].

[3] The notation should be self-explanatory with the exception that in the second formula I use the subscript "g" (for "ground-nut butter") in order to avoid using little "p" as a subscript.

garine or the price of ground-nut butter, respectively. Let us assume both coefficients are positive indicating that the goods are substitutes[4]. The substitute which has the larger coefficient is the closer substitute for butter. This way of comparing coefficients of cross elasticity is unambiguous as far as it goes. Presumably, this is the approach which many textbook authors have in mind because it follows from the Marshallian way of considering "other prices" as arguments in the demand function for any one commodity. However, textbook authors never warn the reader that this is the only valid approach. They hardly ever deal with more than one "other" good at a time, for that matter[5].

Being predominantly concerned with the effects of its own price policy, our association of butter producers might be more interested to find out which of the two other goods is the closer substitute when the price of butter changes and the other prices are assumed to remain unchanged. For this question, it is tempting to define the relevant cross elasticities in the following way[6]:

$$(2) \qquad \varepsilon Q_m, P_b = \frac{\dfrac{Q'_m - Q_m}{Q_m + Q'_m}}{\dfrac{P'_b - P_b}{P_b + P'_b}} \quad \text{and}$$

$$\varepsilon Q_g, P_b = \frac{\dfrac{Q'_g - Q_g}{Q_g + Q'_g}}{\dfrac{P'_b - P_b}{P_b + P'_b}} \quad \text{respectively.}$$

[4] Price theory texts usually state that the coefficient of cross elasticity of demand is a measure for the closeness of substitutes when the sign of the cross elasticity between two commodities is positive and for the closeness of complements when the sign is negative. Some authors warn their readers that the sign of the coefficient can be misleading if we have the Hicksian definitions of substitutes and complements in mind. For a discussion of such cases see *Hicks* [8, pp. 42 - 52] and the longer mimeographed version of this paper [15, pp. 26 - 33]. They do not affect the basic argument presented here.

[5] The formulae (1) approach is stated explicitly by *Scherer* [13, p. 459].

[6] This approach is particularly tempting because it runs parallel to the way in which *Hicks* [8, Chapter III] relates different commodities to each other. He varies the price of one good, say butter, and looks at the changes in demand for several other goods. As is well known, *Hicks* employs his apparatus of substitution and income effects rather than coefficients of cross elasticity and no critique of his approach is intended here. *Hicks* could even argue that in his framework it would not matter which way one compares the closeness of substitutes for butter, because for each substitute the absolute "cross effects" are equal under both formulae (1) and (2) as long as the conditions for his "reciprocity theorem" are fulfilled [9, Chapter XIII]. For cross elasticities we do not stipulate those conditions. What is more important, we compare relative changes in demand rather than absolute cross effects when we employ coefficients of cross elasticity.

However, a closer look at formulae (2) reveals that relative changes in sales of substitutes imply a misleading comparison: The denominators are identical, since we want to relate the effects on the demand for the two alternative substitutes to the same change in the price of butter. The numerators, i. e. the percent changes of quantities demanded, thus determine which of the two alternative substitutes, margarine or peanut butter, appears to be a closer substitute for butter, if we judge closeness by comparing the size of the coefficients of cross elasticity. Now it is trivial to point out that the value of the numerators depends both on the absolute changes in quantities demanded and on the base quantities to which we relate the changes in demand caused by changes in the butter price. With a given absolute expansion of demand for margarine, the value of the coefficient depends on the size of the margarine market prior to the change in the price of butter. The larger the market, the lower the coefficient for margarine. The same argument, of course, holds for peanut butter and any other good.

If the size of the market influences the value of the coefficients for individual goods it may also distort a comparison between them. We could have two historical situations where the response of consumers to a rise in the butter price is exactly the same in terms of switching to substitutes for butter and still the coefficients would give a different impression if the relative sizes of the markets for substitutes would differ in the two situations. It is also easy to construct examples in which the absolute increase in quantity (measured in tons per month) is much smaller in the peanut butter market than in the margarine market, and still the coefficient of cross elasticity makes peanut butter appear to be a much closer substitute for butter than margarine. We just have to make the peanut butter market small enough relative to the margarine market.

It is implied in the above critique that absolute changes in the margarine and peanut butter markets would be a more relevant measure for comparing the closeness of substitutes. The measure appears to be more relevant in the sense that butter producers as a group would consider margarine as the closer substitute if, after an increase in the price of butter, they expect to lose more sales to margarine than to peanut butter — no matter what the percentage changes in the sales of those substitutes. The butter lobby would be guided by the absolute quantities (or percentages of own sales lost) in its efforts to procure protective measures against margarine and against peanut butter[7]. Sim-

[7] If the butter lobby were primarily interested in the potential reaction of producers of substitutes to a change in the price of butter, it would be more concerned with percentage changes in sales experienced by those other producers. Formulae (2) coefficients are thus an appropriate concept if the

ilarly, a policy maker would feel that the availability of margarine is a more important check on the price policies of a butter monopoly than the availability of peanut butter, if margarine could potentially attract a larger volume of butter customers. Thus the decision is to which substitute is the more important component of a market labelled "butter and close substitutes" would be made on the basis of absolute changes rather than formulae (2) coefficients.

A difficulty is, of course, that we do not always feel confident that we should use a comparison of absolute changes, because we have to measure those changes in different units. Furthermore, when it comes to defining the market for butter and close substitutes, the inclusion of commodities that have a large absolute effect on butter sales, but small formulae (2) coefficients, would tend to "dilute" that market and, accordingly, would decrease the share of butter in the "relevant" market. However, a dilution effect cannot be avoided by using formulae (1) coefficients, as the market share of butter with given cut-off points for closeness, is a function of the volume of sales of all substitutes included in the market. Let us assume, for example, that total butter sales for a certain period amount to 50 units, margarine sales are 150 equivalent units, and peanut butter sales are also 50 units. If on the basis of a formulae (1) comparison only peanut butter is regarded close enough to be included in the relevant market, butter has a share of 50 per cent. If only margarine is included, the relevant market is diluted to an extent that the butter share is 25 per cent. Thus it can happen that in two different situations we measure the same formulae (1) coefficients, reflecting and equal degree of closeness, but the conclusions concerning the degree of "market power" for butter could vary widely. I shall return to the dilution problem in section III below.

Before this section on the relative merits of formulae (1) and (2) is closed, it must be pointed out that all cross elasticity concepts share certain shortcomings which in themselves severely limit the usefulness of cross elasticities as measures for the closeness of substitutes. One such shortcoming is that we only compare cross relationships for certain sets of prices, and there is no justification to extrapolate information to other price situations. It could be possible, for instance, that at a low butter price, peanut butter and butter would be closer substitutes than margarine and butter, whereas for some higher butter price peanut butter and butter are completely unrelated goods because

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discussion is focussed on the distinction between oligopolistic rivalry and other types of competitive relationship as was the case in the *Triffin-Chamberlin-Bishop* debate referred to in footnote 2.

at that price level buyers consume only peanut butter in all uses where the two products would be potentially interchangeable. Another shortcoming of cross elasticities is that they measure the cross responsiveness of demand in terms of price responsiveness only. Again, there is no justification to extrapolate results from price to non-price parameters, unless changes in non-price parameters of a seller's offer can be translated into changes in relative prices for buyers[8].

Finally, it must be said that cross elasticities are unambiguous measures of the degree of substituability only to the extent that he can resort to an unambiguous rule for the definition of products or submarkets. Take the formulae (1) approach: If we lump together all brands of margarine, the coefficient would be larger than for each brand taken separately. We might find that margarine as an aggregate is a closer substitue for butter than the closest brand of margarine. Now the formulae (2) approach: There is no distortion of the relative degree of substitutability measured in terms of relative changes of sales of substitutes as long as there is little variation in the coefficients for the aggregated sub-products. To the extent that there is variation, there is distortion from aggregation. Of course, we found earlier that formulae (2) imply an inappropriate comparison anyway[9].

II. Absolute Cross Elasticities and Coefficients of Mobility as Alternative Measures of Closeness

If butter producers wish to determine whether margarine or peanut butter is a closer substitute for butter when the butter price changes, there are two alternative measures that do not suffer from the shortcomings of the formulae (2) approach. Both of these alternatives have been proposed in the literature; however their specific advantages or disadvantages have not been discussed in the present context.

Boulding [3, p. 200] mentions the concept of an "absolute cross elasticity of demand" which he defines as "the absolute change in the quantity of A demanded which would result from a unit change in the price of B, other factors held constant". This definition is analogous to the Hicksian "cross effects" [9, p. 127]. In terms of our previous ex-

[8] Practical attempts at measuring the closeness of substitutes often emphasize non-price parameters. A United Nations study of steel substitutes [18], for example, closely examines the technical factors favouring or impeding the replacement of steel by various substitutes in various uses.

[9] In the context of the *Triffin-Chamberlin-Bishop* debate, where both formulae (1) and formulae (2) have a purpose, the problem of aggregation did not arise because products are defined as the output of individual sellers; each is assumed to be a seller of only one homogeneous product.

ample, we would have to compare the following two measures of absolute cross elasticity:

$$(3) \qquad {}^{\alpha}Q_m, P_b = \frac{Q'_m - Q_m}{\frac{P'_b - P_b}{P_b + P'_b} \times 200} \quad \text{and}$$

$$ {}^{\alpha}Q_g, P_b = \frac{Q'_g - Q_g}{\frac{P'_b - P_b}{P_b + P'_b} \times 200}$$

For reasons of symmetry with the other concepts, the denominators in formulae (3) were written as a one-percent change in the butter price rather than as a unit change. This need not be a matter of concern, however, because we relate the quantity changes in both substitute markets to the same price change for butter. In the case of formulae (1) we must use a percent price change in order to avoid a problem of units in the denominators. In the case of formulae (3) the problem of units arises in the numerators. The two coefficients answer the question for the relative closeness of butter substitutes unambiguously only if we can compare units of margarine and peanut butter on a one-to-one basis. It seems to be accepted that the problem of units can be neglected when one is dealing with differentiated products that have a common name, e. g. different brands of coffee or brands of cigarettes or even automobiles. We almost daily use percent figures for market shares or percentage registration figures for such differentiated products which strictly speaking are of the "apple-and-pear" type, the idea being that consumers substitute them pound per pound or car for car. If they do not, one could try to employ conversion factors. The changes in the demand for margarine and peanut butter, for instance, could be converted into tons of "butter equivalent". This approach definitely has its limits. Had I used butter versus margarine and eggs or even butter versus margarine and electricity (as a substitute for human kinetic energy and as a fuel for heating) the problem would have been more apparent.

If we wish to avoid the distortions of the formulae (2) approach and also dislike the use of absolute quantity changes as a measure of closeness, we can obtain unit-free coefficients by relating the quantity changes to the sales of the group or firm changing its price. *Wilhelm Krelle* [11, pp. 8 - 12] has employed this approach for constructing his measure of "mobility of demand" (Beweglichkeit der Nachfrage). The (price) mobility of demand between butter and margarine, for example, would be defined as the percentage change in butter sales lost to

(gained from) the margarine market in consequence of a one-percent rise (fall) in the price of butter. We can determine the relative closeness of the two butter substitutes, margarine and ground-nut butter, by comparing the following two coefficients of mobility of demand[10]:

$$(4) \qquad \beta Q_{bm},\, P_b = -\frac{\dfrac{\Delta Q_{bm}}{Q_b + Q_b'}}{\dfrac{P_b' - P_b}{P_b + P_b'}} \quad \text{and}$$

$$\beta Q_{bg},\, P_b = -\frac{\dfrac{\Delta Q_{bg}}{Q_b + Q_b'}}{\dfrac{P_b' - P_b}{P_b + P_b'}}$$

The formulae (4) concept appears to be an unambiguous approach to measuring relative closeness of substitutes. However, several conceptual difficulties arise when we imagine how coefficients of mobility could be measured.

Firstly, there could be a problem of units in the numerators although the definition seems to avoid this problem. How would one go about measuring the shares of butter sales being lost to (or gained from) margarine, cheese, electricity, and other products when the relative price of butter changes? Presumably, one would measure the quantity changes in substitute markets and then express them in terms of butter equivalents. Secondly, it must be recognized that the coefficients are smaller the narrower we define a substitute. This problem arises when we are dealing with several similar substitutes which easily can be aggregated. We would, for instance, find that the coefficients of mobility are smaller for each individual brand of margarine than for all brands of margarine taken together, although — in a food chemist's opinion — certain brands might be more similar to butter than the "average" brand of margarine. As noted above this problem of cir-

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[10] These definitions are strictly analogous to the "own" price elasticity of demand. Under the assumption that the price changes considered have no income effects, coefficients of mobility are sectoral own elasticities, and the sum of the coefficients for all other goods (savings included) is equal to the own elasticity of butter with respect to the given change in the price of butter. However, a warning seems to be in order: Such sectoral elasticities are not the elasticities of demand in sub-markets which sellers would like to know for purposes of price differentiation. If we wanted to measure the elasticity of demand for the sub-market in which butter competes with margarine we would have to relate ΔQ_{bm} to the butter sales in that sub-market rather than to all butter sales.

cularity also occurs with formulae (1) and (3)[11]. Thirdly, it seems that *Krelle* is concerned only with the substitution effects of a price change and that he completely disregards potential income effects. He speaks of changes in demand "going to" or "coming from" substitute markets and seems to imply that a seller who lowers his price only gains the sales which other sellers lose. To the extent that a price cut has noticeable income effects, the losses in sales of normal substitutes will be smaller than the pure substitution effects and the gains of the price cutting seller will be larger than just the sum of sales switched from substitutes. We run into similar problems, by the way, if we employ the formulae (3) approach.

III. The Use of Cross Elasticities in Antitrust Cases

According to *Singer* [14, p. 56] the use of the concept of cross elasticity of demand by the U.S. Supreme Court in the Cellophane Case (1956) marks "a high point in the use of theoretical economic concepts in judicial antitrust opinions". Other authors, like *Stocking* [16, p. 570], are more sceptical.

Whereas in important earlier monopoly cases, e. g. the Alcoa Case (1945), markets were narrowly defined, in the Cellophane Case the courts tried to face the facts of monopolistic competition, i. e. the availability of more or less close substitutes for the product of a seller who is charged with monopolization. The question was where to draw the line between substitutes to be included in and those to be excluded from the relevant market for the product under consideration. As courts do, the Supreme Court developed a doctrine: The relevant market "is composed of products that have *reasonable interchangeability* for the purposes for which they are produced — price, use and qualities considered" [19, p. 404]. In a multifarious approach, the court found that other flexible wrapping materials were reasonably interchangeable with cellophane. Cellophane made by DuPont only had a share of about 20 percent in the market of all flexible packaging materials, a figure which was insufficient to establish the requisite market power for the asserted monopolization charge.

It is important to note that the test of "reasonable interchangeability" comprises a detailed examination of various price and quality characteristics of potential substitutes, of their interchangeability in

[11] It should also be noted that *Krelle* developed the coefficient of mobility as a criterion for isolation to classify market relationships along the lines of the *Triffin-Chamberlin-Bishop* debate. In that context, a "product" is defined as the output of an individual producer. An aggregation problem does not arise as long as each firm only sells one homogeneous product.

important end-uses, as well as of sellers' policies in promoting their products in competition with each other[12]. The courts draw the boundaries of the relevant market where they feel that it is no longer reasonable to speak of interchangeable products. Presumably they are looking for a significant "gap" in the chain of substitutes. In the Cellophane Case, there seemed to be no doubt that a significant gap existed between flexible wrapping materials and other packaging materials. The issue at stake was whether there were any significant gaps between cellophane and other flexible wrapping materials.

It appears that the courts use the terms "interchangeability" and "cross-elasticity of demand" largely as synonyma. In one instance, Supreme Court Justice Reed specifically referred to the concept of cross price elasticity of demand. The following quote seems important, and it can serve as a starting point for an application of the ideas developed above:

"An element for consideration as to cross- elasticity of demand between products is the responsiveness of sales of one product to price changes of the other. If a slight decrease in the price of cellophane causes a considerable number of customers of flexible wrappings to switch to cellophane, it would be an indication that a high cross-elasticity of demand exists between them; that the products compete in the same market." [19, p. 400].

In effect, Justice *Reed* accepted the concept of cross price elasticity as a measure amongst others for the interchangeability of substitutes. I have not yet found any indication in the Supreme Court's decision nor the literature on the Cellophane case (or any other case for that matter) that the courts actually evaluated quantitative estimates of cross price elasticity[13]. Let us assume for the sake of an argument that coefficients of cross price elasticity could have been estimated in a procedure which takes care of the ceteris paribus conditions and that the courts would have admitted such evidence. Would the test suggested by Justice *Reed* have led to an unambiguous result?

In a charge under Section 2 of the Sherman Act, it seems reasonable to consider the potential own price policies of the alleged monopolist rather than price changes by others. That is what Justice *Reed* did. If he was referring to cross price elasticities defined in the usual

[12] In this respect there are strong similarities between the Antitrust consideration of interchangeability and the U. N. study of steel substitutes [18] referred to above.

[13] The strategy of the defence for Du Pont might have been one reason for lack of precision in the Cellophane Case: "The defence was not concerned with defining the outmost limits of the market but sought only to negative the existence of prohibited monopoly power. By concentrating on this narrower issue raised so specifically in the pleadings, conceptual problems about how to define the market with precision became irrelevant." [7, p. 466].

way, he would have had our formulae (2) approach in mind. The wording of his statement, however, is consistent with the formulae (3) approach, because he spoke of customers switching to cellophane rather than of relative changes in the sales of substitute materials.

It was shown above why formulae (2) are a misleading approach to measuring the relative closeness of substitutes for a product. In the present context consider the following example: We find that a substitute called "glass film" increases its sales by 20 percent when the price of cellophane is raised by one percent and that the sales of another substitute, "vinyle", increased by only 5 percent. If the Court had ruled that products to be included in the same market with cellophane must have a coefficient of not lower than 10, vinyle would have been excluded. And yet, 5 percent of the vinyle market might be a much larger quantity than 20 percent of relatively small glass film sales; the Court thus might have excluded a product which in terms of buyers switching is more important as a substitute for cellophane than products included in the relevant market. If before the price increase the cellophane sales were small relative to the total vinyle sales or if there were a large number of good substitutes, it could happen that because of a small price increase cellophane sales are severely reduced and still the formulae (2) coefficients could all turn out to be of negligible size. In such cases, would we want to conclude that cellophane has no close substitutes, therefore the product has a market for itself and the producer is a monopolist if he is the only producer of cellophane?

This is the same problem which *Chamberlin* [5, p. 265] faced when he found that low coefficients are common for all cases of isolated selling. He proposed to use the own elasticity of demand as an additional criterion. *Brown* and *Wiseman* [4, pp. 83 - 84] explicitly employ the misleading formulae (2) approach for the purposes of defining close substitutes. I repeat that the courts did not do so explicitly; and in any event, they relied on a much broader set of tests.

We saw in section II above that formulae (3) and (4) might be acceptable alternatives to the formulae (2) approach if we intend to determine the relative closeness of substitutes. However, for the purpose of defining a relevant market, formulae (3) and (4) would be ambiguous as well. In continuation of the above example let us assume that formulae (4) would lead to the result that cellophane loses one percent of its market to glass film when the price of cellophane, ceteris paribus, is increased by one percent and that cellophane at the same time loses 15 percent of its sales to vinyle producers. If the Court was looking for close substitutes and if it had used a coefficient of, say,

10 as a cut-off point, vinyle would have been included in the relevant market and glass film would not have been. This result seems unsatisfactory because glass film, which on the basis of formulae (2) increases its sales by 20 percent, should have been counted. If glass film had been grouped together with some other small close substitutes it might have been counted. The result thus depends on how narrowly we define the other products. Regarding vinyle, the result is also unsatisfactory because the relevant market would be "diluted" or "inflated" by the large volume of vinyle sales which in our example overlap only to a small degree with cellophane sales. If 5 percent of the vinyle sales equal 15 percent of the cellophane sales before the price increase, cellophane has a "market share" of only 25 percent when the total sales of the two goods combined are declared to constitute the relevant market. One would have to employ additional tests, e. g. by consideration of end-uses, in order to separate the overlapping parts of the markets from the noncompeting sales[14].

The upshot is that the concept of cross price elasticity would be useless for the intended purpose even if problems of measuring the coefficients could be overcome. Certainly, one might argue that the formulae (4) test might provide valuable insights for the evaluation of an alleged monopoly position. It makes a difference whether a cellophane producer contemplating a price increase must expect to lose 15 percent of his sales to vinyle or only 1.5 percent, and in merger cases policy makers might be the more concerned the higher are the coefficients between the sales of the merger candidates. However, this information by itself does not help in defining the relevant market in which the alleged monopolist's "market power" could be established. The reason that formulae (4) seem to convey information relevant for the monopoly problem is that the coefficients are defined as sectoral own price elasticities and that they add up to the momonopolist's own elasticity. *Chamberlin* [5, p. 258] and others have argued that the own price elasticity cannot be used to measure the degree of monopoly power. The courts in monopoly and merger cases are not interested in the total percentage of sales a seller loses when he increases his price by one percent. They do not consider how many customers buy "something else". They are rather interested in the availability of well recognizable substitutes which buyers may use for the same purposes[15]. This approach, by necessity, includes too little and too much when the relevant market is defined.

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[14] Analogous problems arise with the formulae (3) approach and, as was pointed out in section I, also with formulae (1). The latter approach was not discussed in this context because it puts the emphasis on other sellers' price policies.

Finally, it should be noted that in the context of defining a relevant market the introduction of supply considerations seems indispensable. *M. A. Adelman* [1, pp. 688 - 690] has argued this point very strongly in connection with the Bethlehem-Youngstown Case (1958), the first merger case under the revised Section 7 of the Clayton Act[16]. We could, for instance, find that the cross price elasticity of demand between re-inforcing bars and track spikes is negligible by any definition; the characteristics of the finished products are specific enough that a test of interchangeability in end-uses would classify them as separate lines of commerce. However, the technology of production seems to be such that a steel company with a basic bar mill can produce not only rolled bars, but also track spikes by adding a track spike machine at relatively low capital cost to its bar mill. Thus the potential cross price elasticity of demand for the basic output, rolled steel, can be substantial although the interchangeability of the finished product is negligible. The courts, therefore, would also have to decide at what stage of the production process the closeness of substitutes should be determined. It might be just as well that they hardly ever use numerical coefficients of cross elasticity for the determination of relevant markets.

Summary

In the context of antitrust proceedings it is frequently necessary to determine relevant markets. Economists traditionally approach the determination of a relevant market in terms of the closeness of substitutes. It is widely believed that coefficients of cross price elasticity could serve as an appropriate measure for the degree of substitutability between products if only sufficient data were available for the estimation of the coefficients. In this paper it is shown that the conceptual difficulties with cross elasticities are great enough to make one wonder whether it would be worth the effort to overcome the data problems.

Zusammenfassung

Wettbewerbspolitische Entscheidungen erfordern häufig eine Bestimmung des relevanten Marktes. Die Abgrenzung eines Marktes beruht auf der Enge der Substitutionsbeziehungen konkurrierender Produkte. Es wird gemeinhin angenommen, daß die Enge von Substitutionsbeziehungen mit Hilfe von Koeffizienten der Kreuzpreiselastizität gemessen werden könnte, sofern sich diese Koeffizienten schätzen ließen. In dem vorliegenden Aufsatz wird ge-

[15] Several formulations in the Supreme Court Decision and particularly in the minority opinion in the Cellophane Case suggest that the courts were guided by a dynamic concept of oligopolistic competition and that they were looking for markets where producers react to each others moves and where buyers could play off individual sellers against each other.

[16] See also M. *Howe's* review [10] of the decisions of the British Restrictive Practices Court involving the definition of relevant markets.

zeigt, daß die Bestimmung relevanter Märkte mit Hilfe von Kreuzpreiselastizitäten mit so schwerwiegenden grundsätzlichen Schwierigkeiten behaftet ist, daß es sich kaum lohnen würde, die Koeffizienten ökonometrisch zu ermitteln.

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