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Barriers to Entry and Exit in European Competition Policy*

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1. Introduction

> A correct analysis of entry or barriers to entry lies at the heart of an assessment of monopoly power. . . . [This is] the single most misunderstood topic in the analysis of competition and monopoly.
>
> Franklin M. Fisher in "Diagnosing Monopoly," (1979)

The analysis of barriers to entry and exit is fundamental to the assessment of market power and market efficiency. A firm or firms may exercise market power for a significant period of time only if barriers to new entry exist. Thus in determining whether or not a proposed merger is against the public interest, or whether a firm (or firms) is abusing monopoly or market power in antitrust cases, analysis of entry conditions is of primary importance. One might therefore expect to see rather extensive and sophisticated analyses of entry conditions, or barriers to entry, in monopoly and merger cases that come before competition authorities in the United States, United Kingdom, or member states of the European Union (EU). One might also expect that competition authorities would have placed a great deal of emphasis and effort on achieving a coherent and consistent framework for the analysis of entry barriers in a manner that makes use of the latest thinking on the subject by industrial organization economists.

However, until very recently no competition authority that we are aware of has attempted to formulate a coherent and detailed framework for the analysis of barriers to entry, despite the significant degree of effort that has been put into clarifying the related problems of market definition and the measurement of monopoly or market power.[1] While clear and fairly precise statements—and indeed, guidelines or proce-

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[1]The U.S. Department of Justice's 1992 Horizontal Merger Guidelines go some way toward meeting this criticism; however, despite the primary role they give to entry considerations, the analysis of entry is remarkably brief. Also, the UK's Office of Fair Trading has recently commissioned research by London Economics on the treatment of entry barriers in competition policy with a view toward developing a detailed and workable set of guidelines (London Economics, 1994). Klevorick (1993) and Salop (1993) have recently assessed the degree to which modern theories of predatory pricing and vertical restraints have had an impact in recent U.S. antitrust cases. Klevorick (1993) finds little encouraging evidence, while Salop (1993) comes to much more optimistic conclusions.

dures—on these issues have come from the courts or government authorities charged with the implementation of competition policy, the approach to dealing with questions of entry has tended to remain vague and ad hoc.[2]

There is undoubtedly more than one explanation for this. In particular, the economic analysis of barriers to entry has been subject to a remarkable amount of controversy since its inception in the 1940s and 1950s. Followers of Bain (1956, 1968) and the so-called Harvard school of industrial organization in the 1940s and 1950s tended to admit a great many things as barriers to entry and abuses of market power, while the Chicago school, represented in the writings of Posner (1976, 1979), Bork (1978), Stigler (1968), and others, is sometimes remarked as having had difficulty in finding any entry barriers at all. The debate has been particularly heated with respect to vertical issues, where the influence of the Chicago school has probably been strongest.[3]

Our view, like Schmalensee's (1987), is that recent largely theoretical work in industrial organization has clarified to a great extent the approach that should be taken to the analysis of entry conditions and barriers to entry. The so-called new industrial organization economics (IO) has brought strategic issues to the fore and has contributed greatly to our understanding of barriers to entry, and especially the interaction of traditional "Bainian" barriers to entry with strategic interaction between incumbent firms and entrants. It has also demonstrated that the Chicago school, while raising important questions on a number of difficult issues, based its analysis on overly simple economic models, and its conclusions were not robust to changes in simplifying assumptions.

In particular, the new IO allows us to isolate a small number of factors of crucial importance in assessing barriers to entry and questions concerning market power, and hence directs attention towards particular aspects of firm technology, market structure, and firm behavior. To be more specific, the new IO has revealed the fundamental importance of *sunk costs, the nature of post-entry competition,* and *strategic interaction between incumbents and entrants* as being crucial to any analysis or case study of entry conditions in particular markets.

By making use of these insights we outline here an approach to entry case studies based on a classification of barriers to entry that is amenable to use by competition authorities.[4] We then discuss a number of important cases in European competition law in light of this. For a fuller discussion of our approach and a detailed development of a set of practical guidelines for dealing with entry issues by competition authorities, see London Economics (1994).

2. Entry Barriers and Strategic Competition: A Brief Overview

2.1. Definitional Issues

The industrial organization literature, as Gilbert (1989) has remarked, is replete with definitions of barriers to entry. Bain (1968) proposed to define or measure the height

[2]For instance, the U.S. Department of Justice's guidelines contain a quite specific methodology for market definition and the use of concentration indices for deciding when a merger raises antitrust concerns. The European Commission and the European Court of Justice have also been much more specific about these issues than they have been concerning the analysis of barriers to entry.

[3]See Bork (1978).

[4]Salop (1986) has also outlined an approach to entry investigations by competition authorities by discussing at length a particular example.

of entry barriers by "the extent to which, in the long run, established firms can elevate their selling prices above the minimal average costs of production and distribution . . . without inducing potential entrants to enter the industry." Thus Bain's definition focused on the ability of established firms or "incumbents" to earn above-normal profits. Stigler (1968), in contrast, emphasized the existence of relative cost advantages of established firms over potential entrants. According to Stigler, "a barrier to entry may be defined as a cost of producing (at some or every rate of output) that must be borne by a firm which seeks to enter the industry but is not borne by firms already in the industry." In a similar vein, Baumol and Willig (1981) have defined an entry barrier as anything that requires an expenditure by a new entrant into an industry but that imposes no equivalent costs upon an incumbent.[5] Von Weizsäcker (1980) adopted the Stiglerian definition of barriers to entry but coupled it with an explicit consideration of economic welfare.

Most recently, Gilbert (1989) defines a barrier to entry as ". . . a rent to incumbency, i.e. it is the additional profit that a firm can earn as a sole consequence of being established in the industry," thus emphasizing first-mover advantages. Gilbert's (1989) view, like that of Demsetz (1982), is that absolute cost advantages, important in Bain's analysis, are not usually barriers to entry because they simply represent normal economic rent on particular scarce assets or resources (goodwill, reputation, and other firm-specific assets).

While we would agree with Gilbert that proper economic accounting of the value or opportunity costs of scarce resources is fundamental to an evaluation of barriers to entry, nevertheless, from the point of view of competition authorities, it is the impairment of economic efficiency that is of primary importance. Thus whether or not we prefer to call a patent that confers monopoly power on a firm for a significant period of time an entry barrier is not the issue of primary concern; what matters from the point of view of competition authorities is the exercise or abuse of market power, which reduces economic welfare. The problem of definition should not be allowed to obscure the important issues at stake.

In what follows we identify the key insights from modern industrial organization (IO) theory that must inform any assessment of barriers to entry. We then outline a fivefold classification of entry barriers that is useful in applying the theory to particular cases.

2.2. Strategic Competition and Entry

Modern industrial organization theory, although based upon a large number of particular game-theoretic models and examples, has nevertheless succeeded in isolating a number of crucial factors from which a categorization or "typology" of barriers to entry may be derived. At the most general level, the message of the new IO is that an analysis of business strategy, or strategic competition, is fundamental to the analysis of particular industries. The Bain paradigm, which analyzed industries in terms of a causative chain from structure to conduct to performance, and in which structure was largely determined by technological factors, has been supplanted by an approach that emphasizes the effect of conduct (i.e., strategic interaction) on industry structure

[5]However, importantly, Baumol and Willig (1981) recognized the importance of sunk costs in making this distinction, in that they represent (opportunity) costs of production for the entrant but not for the incumbent.

and performance. In brief, how firms compete partly determines how concentrated industries will be. Specifically, what is important for entry decisions is the nature of competition post-entry that potential entrants must factor into their decisions.

This has been expressed in a number of ways. Sutton (1991) uses the concept of the "toughness of price competition" in classifying entry conditions in various industries, a concept that describes "how prices change with market structure." Bresnahan and Reiss (1990, 1991) suggest a function "which determines how fast industry margins shrink with entry." However, the important point is that no analysis of a market or industry, and in particular an assessment of market power and entry barriers, can avoid an analysis of strategic competition, because it is this that determines entrants' expectations of the profitability of entry, and ultimately their entry decisions. Thus

Lesson I. The analysis of strategic interaction is necessary to an understanding of industry structure and concentration, and in particular analysis of post-entry competition is fundamental to an assessment of entry conditions.

2.3. Sunk Costs and Commitments

The second lesson from modern IO theory is the crucial role played by sunk costs in entry (and exit) decisions. Sunk costs are costs that cannot be recovered on exiting an industry, and hence serve to commit a firm or firms to staying in the market. The U.S. Department of Justice Horizontal Merger Guidelines define sunk costs as "the acquisition costs of tangible or intangible assets that cannot be recovered through redeployment of those assets outside the relevant market."

There are three important aspects of sunk costs that influence entry and exit decisions. First, sunk costs increase the risk of entering an industry because they cannot be recouped on exiting. Second, sunk costs create a cost asymmetry between entrants and incumbents. Once costs are sunk they are no longer a portion of the opportunity costs of production, and hence an incumbent will require a lower return on costs in order to stay in an industry than will be required to enter. Asymmetries of this type have been modeled by Dixit (1979, 1981) and many others. Third, sunk costs can serve as a commitment by incumbent firms not to exit the industry. (For this reason Gilbert (1989) refers to them as "exit costs.") Thus sunk costs are central to the calculations of potential entrants because if entry involves sunk costs it will be deterred if they are unlikely to be recouped, and incumbent firms may be able to exploit this fact strategically in a variety of ways.

The importance of sunk costs can be seen from a (much-discussed) simple example, which also illustrates the interaction of sunk costs with post-entry competition to create an entry barrier. Consider a market with two potential entrants, each of which face a sunk cost of entry F and constant variable cost per unit of production c (i.e., there are no capacity constraints). If a single firm enters, it will charge the monopoly price P^m and earn monopoly profits. The second firm will then enter if and only if the expected price post-entry, P^e, exceeds $c + F/q$, where q is the firm's expected post-entry output. Note that in order to stay in the market the first firm only requires a post-entry price of $P^e > c$. Thus, if post-entry competition is Bertrand-like, the second firm will never enter, no matter how small F, and the market will be a monopoly. For other types of post-entry competition, for example, Cournot, conjectural variation equilibria, etc., entry may or may not occur depending upon whether $P^e > c + F/q$.

The above example is simple but illustrates clearly how sunk costs interact with post-entry competition to create a first-mover or incumbency advantage, even in the absence of strategic preemptive behavior. The recent IO literature has also identified numerous means by which investments involving sunk costs can be used strategically to limit or deter entry in more complex environments.[6] They may be roughly classified as follows:

- investments to lower the incumbent's costs relative to those of potential entrants, that is, capacity, patents, R&D, take or pay contracts with input suppliers, learning-by-doing, etc.
- investments to alter the cost structure of rivals, that is, take or pay contracts, sleeping patents, monopolization of inputs, vertical control, etc.
- investments to favorably alter demand conditions, that is, advertising, brand proliferation, long-term contracts with buyers, etc.

In all of these examples commitment is essential, and hence the importance of sunk costs. Thus

Lesson II. Sunk costs are fundamental to the calculations of potential entrants, and the identification of sunk costs that cannot be recovered on exiting an industry is crucial to the assessment of entry conditions. Strategic behavior and post-entry competition combined with sunk costs are an important determinant of market structure via their effects on entry and exit decisions.

3. A Suggested Classification of Entry Barriers

There is no uniquely best way of measuring barriers to entry or determining their height for the purposes of antitrust investigations or competition policy. Instead there are a variety of imperfect measures and indicators. Our review of the relevant economics literature[7] has suggested a systematic approach to the assessment of entry conditions and barriers to entry in antitrust investigations based upon a fivefold classification of entry barriers. In particular, we consider the following:

(1) entry barriers arising from *absolute (cost) advantages* (e.g., exclusive access to key inputs)
(2) entry barriers arising from *strategic first-mover advantages;*
(3) entry barriers arising from *vertical integration* and *refusal to supply;*
(4) entry barriers arising from *predatory behavior;* and
(5) *entry impediments*—factors that, though not necessarily barriers to entry in the long run, may significantly delay the arrival of competitive pressures to eliminate inefficiency.

We briefly discuss these five groups of barriers to entry in this section.

[6]Strategic investments in capacity to deter entry have been analyzed by Dixit (1979, 1981), Bulow et al. (1985), and others; see Tirole (1988), Ch. 8, for an up-to-date account.

[7]For an in-depth discussion and review of the recent economic literature and a more detailed description of our methodology, see London Economics (1994).

3.1. Absolute (Cost) Advantages

Absolute (cost) advantages are costs that must be borne by the entrant but that are not borne by incumbents and that persist post-entry. They correspond to the cost asymmetries between firms that would normally be captured under the "Stiglerian" definition of barriers to entry.[8] Examples include exclusive or superior access by an incumbent firm to particular necessary inputs such as patents, airport slots, copyrights, exclusive contracts with input suppliers, ownership of a network, etc. Most legal and regulatory barriers to entry come under this heading. Cost asymmetries due to superior efficiency of incumbents, however, should not be included.[9]

3.2. Strategic (First-Mover) Advantages

Strategic (first-mover) advantages are incumbent advantages that derive from the asymmetry of timing between incumbent(s) and entrant(s). Sunk costs of various kinds and the nature of post-entry competition are fundamental to this category of entry barrier. The classic example is preemptive investments in capacity. Other examples include investments in R & D, advertising and promotion expenditures, switching costs, etc. We organize strategic entry barriers of this type into three main groups: (1) economies of scale and sunk costs; (2) product differentiation, advertising, and goodwill; and (3) capital requirements.

(i) Economies of scale and sunk costs. Economies of scale when fixed costs are (at least partially) sunk can create an entry barrier in the manner illustrated by the example in 2.2 above. In that example the incumbent (i.e., the first mover) was protected from entry without the need to engage in strategic behavior. This corresponds to what Bain called the case of blockaded entry.

Dixit (1979, 1981) showed originally how investment in capacity could be used to strategically deter entry[10] and provided the model for much subsequent work. Strategic investments in R & D and learning by doing can serve the same purpose. In sum, economies of scale, together with some sunk costs, can constitute a barrier to entry that allows long-run supernormal profits not based on superior efficiency. They may do so even without strategic behavior by incumbent firms. When the possibility of strategic behavior is added, the scope for entry deterrence in the presence of scale economies becomes greater.

(ii) Product differentiation, advertising, and goodwill. The interaction of sunk costs with economies of scale to create entry barriers may occur in industries with homogeneous or heterogeneous products. Good examples of homogeneous product industries characterized by large sunk costs of entry are discussed in Sutton (1991), for example, the salt and sugar industries. In industries where products are differentiated, advertising, brand proliferation, and reputations may be important sources of entry barriers.

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[8]Although Schmalensee (1987), for instance, argues that if one carries Stigler to the extreme, a patent would not be viewed as a barrier to entry. Demsetz (1982) and Gilbert (1989) would also exclude many cost asymmetries for similar reasons.

[9]See Bork (1978), pp. 310–311 for a clear statement of this.

[10]Judge Learned Hand in *Alcoa* (1944) should perhaps be credited with having argued this point first. See Scherer and Ross (1990), pp. 453–456.

Spence (1979) argued that there can be economies of scale in **advertising** that may give rise to entry barriers. Sutton (1991) classifies advertising and promotion expenditures as *endogenous sunk costs,* as opposed to *exogenous sunk costs,* such as investments in production processes and inputs, which can deter entry by their very nature as sunk costs.

Schmalensee (1978) argued that **brand proliferation** could be a credible instrument of entry deterrence. At its simplest, the idea is that by crowding product space with enough brands, there will be insufficient room for a rival to enter and prosper sufficiently to recover its sunk entry costs. Thus entry may be preempted by introducing many brands before rivals.[11]

Consumer **switching costs** as defined by Klemperer (1987a,b) are a closely related topic. Many products and services are differentiated for a consumer who has already purchased because of *ex post* switching costs, even though the goods or services of rival firms were perfect substitutes prior to the first purchase. Examples include computer software, bank accounts, and airlines with frequent flyer programs. Customers who have already purchased from incumbent firms are therefore locked in to a greater or lesser extent, and hence are less available to entrants than uncommitted consumers. The larger the market share (or installed base) that the incumbent obtains before entry, the smaller is the residual share left for entrants. Similar arguments also clearly apply to compatibility standards and network externalities.

Perhaps the most complex issue under the heading of product differentiation is whether, and in what circumstances, **goodwill** and **reputation** may create entry barriers. Schmalensee (1981), for example, argued that pioneering brands, that is, the first in the market, enjoy a first-mover advantage. In this model, the new brand faces greater competition than the pioneer brand did when it entered the market with no direct competition, and the pioneering brand enjoys a corresponding strategic advantage.

(iii) Capital requirements. Whether or not capital requirements can constitute a barrier to entry has been a long-disputed topic. Bork's view (1978) was straightforward:

> Capital requirements exist and certainly inhibit entry—just as talent requirements for playing professional football exist and inhibit entry. Neither barrier is in any sense artificial or the proper subject of special concern for antitrust policy.

Schmalensee (1987) argues for a more common-sense approach to this issue. Casual empiricism, for example, suggests that financing and "cash flow" problems are often responsible for bankruptcies and firm failures. However, the economic theory of debt contracts in environments with imperfect information is still in its infancy, and hence the notion of capital requirements as a barrier to entry still lacks a solid theoretical foundation.[12] This issue arises most forcefully when considering the rationality of predatory pricing, which is discussed in 3.4.

3.3. Vertical Foreclosure and Exclusion

Some of the most controversial barriers to entry in antitrust policy have been, and still are, concerned with vertical foreclosure and exclusion of competitors by incumbent

[11]But see Judd (1985) for a critique.

[12]See Gale and Hellwig (1986) for a path-breaking contribution. Roberts (1987) and Tirole (1988) discuss attempts to apply this theory in the current context.

firms; that is, practices that deny rivals access on equal terms to important inputs to production or access to consumers. Such entry barriers can arise, it has been suggested, by restrictive practices (e.g., exclusive dealing and tying), by unilateral anticompetitive practices (e.g., refusal to supply), or by vertical integration and merger. On the other hand, it has been strongly argued by economists of the Chicago school that vertical restraints and integration should *not* be a concern of antitrust policy because they are motivated by considerations of efficiency and because antitrust problems result only from a lack of *horizontal* competition.

In London Economics (1994) we discuss in detail three examples of vertical relationships that may give rise to entry barriers and that illustrate the underlying economic issues: (1) refusal to supply and tying, (2) exclusive contracts, and (3) vertical integration. In each case naive arguments that these practices must give rise to entry barriers were shown to be incorrect by critics from the Chicago school of antitrust analysis. However, more sophisticated recent analyses have shown that, except in some special cases, foreclosure and exclusion are entirely possible and by no means incompatible with the assumption that firms are rational profit-maximizing organizations.

(i) Refusal to supply and tying. With respect to refusal to supply, the Chicago argument was that it is always more profitable for an incumbent monopolist to provide access to key inputs to a more efficient rival at monopoly prices than to attempt to foreclose a potentially competitive downstream market by refusing to supply. Hence refusal to supply would occur only if it were in the interests of productive efficiency.[13] Where the monopolist's ability to exploit its rival's efficiency advantage is constrained, however, this is no longer necessarily true. Bolton and Whinston (1991, 1993) and Hart and Tirole (1990) provide formal and quite general analyses of some of these issues. In particular, they provide conditions under which refusal to supply can be a rational and credible policy, which by permitting a firm to "leverage" monopoly power from one activity to another, gains an advantage over its rivals, and possibly forecloses the downstream market.

Whinston (1990) has recently shown how product tying can be used to profitably deter entry, contrary to the view put forward by economists of the Chicago school. He considers models in which the two products (tying and tied) are either independent or complementary. In the former case tying may commit an incumbent to compete more aggressively in the market for the tied good, thus deterring entry or inducing exit. In the latter case a similar motive may operate; in addition, tying may be a means by which the incumbent monopolizes a secondary market for the tied good.

(ii) Exclusive contracts. Exclusive contracts between dominant firms and consumers that make entry more costly, and that either deter entry or allow the monopolist to capture the entrant's economic rents, have been analyzed by Aghion and Bolton (1987) and Rasmusen et al. (1991). In Rasmusen et al. (1991) the monopolist exploits a coordination problem between consumers that induces them all to sign exclusive contracts in return for a small "bribe" (e.g., price reduction). Thus their model explains how independent buyers may be induced to sign exclusive contracts that foreclose the market to further entry, even when the contracts are contrary to their collective interest. Aghion and Bolton (1987) show how exclusive contracts with penalty clauses

[13]See also Carlton and Perloff (1994), Chapter 13.

can be used to deter entry, even when buyers *can* coordinate their actions. Contracts in their model permit the incumbent monopolist and the buyers to expropriate the entrants' rents due to its superior efficiency and share it between themselves. The contracts can be a barrier to entry in the sense that an entrant that is more efficient than the incumbent may find entry unprofitable despite rational behavior on the part of incumbents and buyers.[14]

(iii) Vertical integration. Finally, the potential anticompetitive effects of vertical mergers have long been a concern of antitrust policy. Bork (1978) argued that competition authorities should concern themselves only with horizontal concentration and that vertical mergers should be presumed to be based upon efficiency motives. Recent analyses, however, have again shown that such a dismissal of the foreclosure argument was premature. Ordover, Saloner, and Salop (1990) show that vertical merger may be a means by which the integrated firm may "raise rivals costs" and (partially or totally) foreclose the downstream market. Hart and Tirole (1990) noted some deficiencies in their analysis, but nevertheless showed in their more general analysis that vertical mergers can have important anticompetitive consequences. In particular, merger can make credible a refusal to supply the independent downstream firm and in some cases result in total market foreclosure. In a similar spirit, Bolton and Whinston (1993) examine possible foreclosure in the upstream market when supply assurance issues are important. Bolton and Whinston (1991) describe and contrast each of these approaches.

The conclusion is that vertical integration or merger, like refusal to supply, tying, and exclusive contracting, can be part of a rational strategy of (partial or total) market foreclosure, at least under certain well-specified conditions. The difficulty posed for antitrust authorities by these analyses is to identify when these types of conduct and other vertical restraints are likely to have serious anticompetitive effects. The recent literature, which has been extensive, provides little guidance on this issue. Perhaps the best that can be said at present is, following Bolton and Whinston (1991), and also Bork (1978), that "foreclosure effects are more likely to be present in situations where one of the markets (i.e., upstream or downstream) is highly concentrated."

3.4. Predatory Behavior

Predatory behavior is an important element of the analysis of barriers to entry and is notoriously difficult to define. Tirole (1988) emphasizes that it involves a short-run cost or investment in order to achieve a longer term gain by inducing the exit or deterring the entry of rivals.

Not surprisingly, it has been questioned whether predatory price cutting could be a rational course of action (McGee, 1958; Bork, 1978). In the first place it is costly to the incumbent as well as to rivals, and more so if the incumbent is larger than the rivals. Second, if the "preyed upon" firms understand that the price cut is only temporary, they should not be fooled into exiting the market. Thus any coherent theory of predatory pricing must overcome these fundamental criticisms. However,

[14]See Brodley and Ma (1993) for a nontechnical description of this theory and its application to antitrust cases. See also Section 4 below.

there are good reasons to think that predatory pricing can be entirely rational, and the threat of it credible, in at least three kinds of circumstances.

The first is the "**long purse**" story originally due to Telser (1966). The idea, in its simplest form, is that an incumbent firm with large financial resources can credibly threaten to drive out of business a financially constrained rival by engaging in price cutting for a long enough period of time. Once convinced of the threat, the rival will exit before the price war has become too prolonged. The deep pocket story, however, depends upon there being limited, or asymmetric, access to capital markets in the face of positive expected profits, and this requires explanation.

Fudenberg and Tirole (1986a) provided the start of a justification. Similarly, Tirole (1988) models the idea that (1) capital market imperfections mean that firms with lower equity face higher interest rates because bankruptcy risk is greater; and (2) predatory price cutting can therefore raise rivals' costs by reducing their equity and hence raise their capital costs. Predation is successful if it raises the prey's capital costs to the point where the prey is better off exiting and the costs of doing so are recompensed by the monopoly profits gained. Another link between predatory pricing and imperfect capital markets is analyzed by Bolton and Scharffstein (1990).

Alternatives to the long purse story, which depends upon information asymmetries in capital markets, are models such as Fudenberg and Tirole's (1986b) "signal jamming" theory of predation and Robert's (1986) "signalling model," in which different kinds of informational interference occurs.

A third, but closely related, approach to explaining predatory behavior is the idea that firms may obtain a *reputation* for predation. Under certain conditions, that is, there is asymmetric information of the right type and firms operate in multiple markets or face multiple entry threats over time, it may well be credible for an incumbent firm to fight entry in some markets (or instances) in order to deter entry elsewhere in the future (see Kreps and Wilson, 1982; Milgrom and Roberts, 1982; and Yamey, 1972).[15] However, a difficulty with this theory, as explained by Wilson (1985) and Milgrom and Roberts (1987), is that by introducing the right kind of uncertainty in the appropriate extensive form game, almost any sort of strategic behavior can be made rational, that is, consistent with equilibrium play.

In summary, the presumption that predation is not a rational strategy has been shown to be false in the recent literature, at least if one believes that the sorts of informational asymmetries modeled there are present in real markets. When and whether predation should be a matter for public policy concern, however, is a more difficult question. Predation that does not succeed in inducing exit is socially costless—indeed, it may be beneficial—and hence its prohibition would be inappropriate. Even when predation is successful in inducing exit or preventing entry, it does not necessarily involve below-cost pricing or any of the other behavior patterns that have been proposed as tests for predation. Hence while the recent literature has succeeded in describing conditions under which predation may occur, it has not simplified the problem of identifying when such behavior is socially harmful.[16]

[15]More recently D. Roth, using the game-theoretic concept of rationalizability, has shown that predation may be rational even if there is no uncertainty about firms' characteristics, that is, their costs or predilection to prey, so long as there is "strategic uncertainty" concerning the strategies that each firm will play. See Klevorick (1993).

[16]See Roberts (1987) and also London Economics (1994) for a more extensive discussion of the theory of predatory pricing and a suggested procedure for identifying predatory behavior in antitrust cases.

3.5. Entry Impediments

Entry impediments are any factors that delay the process of entry into a market without increasing the (sunk) costs of entry or creating an asymmetry between incumbents and entrants. They are therefore not entry barriers, but they may be important to antitrust decisions to allow a merger, for example, because they influence the amount of time that incumbents may exercise market power before entry occurs. Good examples of entry impediments are licensing, certification, or product registration requirements that involve little or no actual costs but take significant amounts of time to satisfy. Other examples include the time required to obtain contracts (i.e., where the market's products are sold via long-term contracts) or to gain a market share large enough to significantly influence the behavior of incumbents.

4. The Assessment of Barriers to Entry in European Union Competition Policy

> The case law of the ECJ and the Commission certainly shows a cautious attitude towards allowing potential competition as a contra-indication of dominance.
> Butterworth's *Competition Law* (1992)

Competition policy in the EU has developed over the past 30 years on the basis of two key articles in the Treaty of Rome, Articles 85 and 86. The function of these articles is to allow the commission to challenge the existence or abuse of market power in the form of either restrictive practices between firms (Article 85) or the abuse of a dominant position (Article 86). For the EU competition authorities to become active, the restrictive practice or abuse must have a community dimension, that is, it must have a significant impact on trade between member states, and hence be potentially "incompatible" with the Common Market. Since September 1990, mergers of firms with a combined turnover above a certain threshold and which have a community dimension are subject to rules and procedures established by the new Merger Regulation (Council Regulation EEC 4064/89). A fairly extensive case history has been built up of cases decided by the European Commission's Competition Policy Directorate and, in some cases, taken on appeal to the European Court of Justice (ECJ). In these cases,[17] the approach of the EU competition authorities to some key antitrust issues has been developed and clarified, in particular the process of defining the relevant market and the criteria under which the existence of a dominant position is established. In addition, over the last few years the commission's merger task force has dealt with these issues in its assessment of over 200 merger applications.

The assessment of barriers to entry and exit is most directly relevant to Article 86 cases where they are treated as "secondary indicators" of dominance, with market

[17]The classic cases in EU competition law relating to barriers to entry are *Euroemballage and Continental Can v Commission*, Case 6/72 (1973), (the *Continental Can* case), *United Brands Co. v EC Commission*, Case 27/76 (1978), and *Hoffmann-La Roche v EC Commission*, Case 85/76 (1979), also known as "the vitamins case." Well-known cases dealing specifically with vertical restraints and that are often cited are *NV Nederland Banden-Industrie Michelin*, EC Commission Decision 81/969, [1981] OJ L 353/33, (the *Michelin* case), *Hugin Kassaregister AB v EC Commission*, 22/78 (1979), (the *Hugin* case), *Hilti AG v EC Commission*, T-30/89 (1992), (the *Hilti* case), and *Elopak Italia v Tetra Pak (No. 2)*, EC Commission Decision 92/163, [1992] OJ L72/1, (the *TetraPak II* case). The classic predatory pricing case is *ECS/AKZO*, Re (EC Commission Decision 85/609) (1985), on appeal *AKZO Chemie BV v EC Commission*, Case 62/86 (1991), which is also an issue in *TetraPak II*. We base our discussion of entry barriers in European competition policy largely on these cases. See Whish (1993) for further references and case descriptions.

shares being the "primary indicator" of dominance.[18] These cases have not so far been the subject of much discussion amongst economic commentators of European competition policy. Baden-Fuller (1979) is the most frequently cited economic commentator on application of Article 86 and the analysis of dominance. The recent contribution of Neven et al. (1993) on the economics and politics of European merger control is one notable exception.[19]

Our review of selective Commission decisions and some leading cases that were dealt with by the ECJ discusses barriers to entry in the light of the five categories outlined above. This review is by no means comprehensive. The selection of leading cases was made with the aim of illustrating the usefulness of our approach. In particular, *United Brands* is a benchmark—and frequently cited—case that deals with several of the issues discussed in this paper.[20]

4.1. Absolute Cost Advantages

The ECJ and the Commission have recognized the existence of absolute cost advantages as barriers to entry in a variety of cases. Intellectual property rights, such as patents, were held to constitute an entry barrier in numerous cases, including *United Brands, Hugin, Hilti,* and *TetraPak II*.[21] Legal regulations, such as the allocation of radio frequencies, were also considered as such in an investigation of navigator systems.[22]

In a number of leading cases there are discussions of the superior technology of the incumbents or of other commercial advantages they may have had over entrants. In both *Hoffmann-La Roche* and *United Brands,* the ECJ took a lead in product development into account when adjudicating on whether or not the firms held dominant positions in the relevant product markets.

While technological superiority accompanied by R & D expenditures may increase the sunk costs of entry, and hence raise entry barriers, there is clearly a danger in assigning superior efficiency per se the status of a barrier to entry. One of the aims

[18]The term *dominance* in EU competition policy was explained in *United Brands* as follows:

> 38 . . . The dominant position thus referred to (by Article 86) relates to a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by affording it the power to behave to an appreciable extent independently of its competitors, customers and ultimately of its consumers.

As Whish (1993), p. 260, notes, this definition is a little curious since it refers both to the ability to prevent competition and the ability to behave independently of competitors, without explaining how, if at all, these two criteria relate to each other.

[19]There is far more legal commentary on the role that entry barriers play in the determination of dominant position than there is economic analysis; see Gyselen and Kyriazis (1986), Korah (1980), and Temple Lang (1979) and the discussion of entry barriers in Butterworth's *Competition Law* (1992) and Whish (1993).

[20]*United Brands Case 27/76:* The United Brands Corporation (UBC) imported bananas from Latin America into Europe and was involved in the producing, shipping, and distributing of bananas. The Commission found UBC guilty of four abuses of Article 86: (1) prohibiting its distributors/ripeners from reselling of green (unripened) bananas, (2) charging discriminatory prices, (3) charging excessive prices in some EEC countries, and (4) refusing to supply Olesen (of Denmark). UBC had refused to supply Olesen because the latter had participated in an advertising campaign of a rival brand. On appeal the Court of Justice upheld the Commission's decision on all but the third charge.

[21]See also Butterworth's *Competition Law* 1992, para 448.

[22]EC Commission Decision 89/113, [1989] OJ L 43/27.

of an economic assessment of entry barriers is to distinguish between those factors that create rents for firms due to their superior efficiency and those that confer rent due to incumbency or first-mover advantages. It is highly dubious to challenge incumbents for possessing greater skills or other sources of competitive advantage based upon superior management, expertise, etc. These are exactly the competitive structures that competition policy aims to foster.

In *United Brands* the Commission listed a large number of factors that gave the company a strong position in the relevant market for bananas. Most, if not all of them, are factors that merely explain the specific methods that the company used in order to achieve a high quality product.[23] While the ECJ does not explicitly acknowledge all of these factors as contributing to the dominant position of UBC or as constituting an abuse, the decision does not distinguish between factors that would and those that would not have this effect. The court concludes that all of the factors discussed, including more genuine entry barriers, contributed to ensuring that United Brands had a dominant position in the relevant market.[24]

4.2. Strategic First-Mover Advantages

(i) Economies of scale and sunk costs. Theoretically, economies of scale do not imply the existence of barriers to entry unless associated with sunk costs. However, without making this distinction, the ECJ and the Commission have taken the view that economies of scale do deter potential competitors. Although typically it will be only in rare cases that one finds significant scale economies with no associated sunk costs, the distinction is nevertheless a crucial one. However, the existence of sunk costs that are irrecoverable if entry is unsuccessful is clearly recognized in *United Brands*[25]:

> The particular barriers to entry to competitors entering the market are the exceptionally large capital investments required for the creation and running of a banana plantation, . . . and the actual cost of entry made up inter alia of all the general expenses incurred in penetrating the market such as the setting up of an adequate commercial network, the mounting of very large scale advertising campaigns, all those financial risks, the costs of which are irrecoverable if the attempt fails.

The view that the sunk costs are a barrier to entry is also argued by the Commission in the *de Havilland*[26] case. Aerospatiale and Alenia, who control the world's and Europe's leading producer of regional aircraft, proposed to acquire the world number two producer, de Havilland. In the aircraft industry there are high sunk costs both in plant and equipment, and in the costs of changing designs, which deter post-design

[23]For instance, the Commission noted regular, intensive publicity campaigns to establish the Chiquita brand name, ". . . accompanied by a thorough reorganisation of the arrangements for production, packaging, carriage, ripening and sales of bananas. This policy has given and enabled UBC to maintain an appreciable advantage over its competitors who have not only had to face the high cost of mounting such publicity campaigns but have also had considerable difficulty in supplying large quantities of bananas of uniform quality." The Commission then goes on to list the means by which UBC was able to achieve uniformly high product quality, apparently considered a desirable attribute by consumers. See also para 69–96 of the ECJ decision in case 27/76.

[24]See para 129 of the decision in case 27/76.

[25]Para 122 of the decision of the ECJ.

[26][1991] OJ L 334/42.

alterations. The Commission found that a time lag of 2 to 3 years for market research was required to determine exactly what type of plane the market needed, and it claimed that the total lag time was 6 to 7 years from initial research to the point of delivery. Several possible potential entrants from around the world were identified, but the Commission concluded that the additional investment in research and development and design changes required made entry unlikely.

(ii) Product differentiation, advertising, and goodwill/reputation. In the *Perrier/Nestlé* merger,[27] the Commission pointed to the high degree of brand recognition in the mineral water industry that was due to intensive advertising campaigns and the need for a new entrant to do likewise in order to attract and retain customers. The three major firms in the market (the undertakings to be merged and BSN) had sunk large amounts of expenditure into advertising over several years. The Commission's view was that a new brand would require a long lead time and heavy investment in advertising and promotion to compete in the market, and would have difficulty in establishing a presence because of the large number of existing brands already introduced by the top three firms. The judgment therefore implicitly appeals both to the theory that advertising is an entry barrier in the sense of being a sunk cost that is irrecoverable and that cannot be transferred to other uses, and the brand proliferation argument of Schmalensee (1978). While both these factors have been recognized as potential barriers to entry in the modern IO literature, neither is easy to apply and the latter in particular has been criticized by Judd (1985).

In *United Brands* the Commission claimed that the intensive advertising had resulted in the public perception of Chiquita bananas as being of high quality and took the price differential between Chiquita and unbranded bananas as clear evidence of this.[28] The Commission, as well as the ECJ, observed that UBC had a quality control system to ensure the quality of its bananas, but did not attempt to determine whether it was the high quality of the bananas or the advertising campaign that resulted in the public's differential perception of Chiquita (presumably it was both).

(iii) Capital requirements. Both the Commission and the ECJ set great store on access to financial resources and the need for large-scale investments as a source of entry barriers. Since these are rarely distinguished from the sunk costs of entry, it is difficult to evaluate in each case whether or not a real entry barrier is being identified. However, it is clear that the Commission and the ECJ take capital requirements per se to be a barrier to entry, whether or not they are associated with sunk entry costs.

In *United Brands,* for example, the ECJ found that amongst the barriers to other competitors entering the market were the exceptionally large capital investments required. In *Hoffmann-La Roche* a similar finding was made. In *Continental Can* the Commission identified access to international capital markets as a significant factor in determining the likelihood of entry, working to the advantage of large institutions. The view of both the Commission and the ECJ appears to be that "merely by being in a market which requires a large capital investment to enter, the established firm has a great advantage over potential entrants" (Butterworth's, 1992, para 461). Such

[27][1992] OJ L 356/1.

[28]There was a difference of 30–40% between the retail price of Chiquitas and UBC's unbranded bananas.

a simple view is not consistent with modern thinking in industrial organization nor with that expressed in Section 3 above.

4.3. Vertical Foreclosure and Exclusion

Many of the most controversial Commission and ECJ cases have dealt with vertical foreclosure, exclusion, or refusal to supply. Refusal to supply, market exclusion, and requirements such as tie-ins may act as barriers to entry, as described in Section 3 above, either because they restrict the availability of inputs for new entrants (thus raising their costs) or because they may be exploited strategically by incumbents to foreclose markets. The Commission does not automatically conclude that refusal to supply or product tie-ins are an abuse of dominant position but applies the concept of objective justification to such behavior.

(i) Vertical integration. In *United Brands* the Commission identified vertical integration as the major barrier to entry for potential competitors into the market. However, it was not claimed that UBC was using its market power upstream to exclude potential competitors from entering the market. Rather, the argument was that entry was difficult, UBC had substantial market power, and hence it was able to impose a vertical restriction that permitted price discrimination.

However, the entry and exclusion question deserved closer attention than it received. A number of significant existing competitors were identified in the case,[29] and exactly how potential competitors were being excluded or prevented from entering UBC's markets was never made clear. On the issue of UBC's vertical integration, the Commission stated

> The strong vertical integration of its banana business from the plantation to marketing affords UBC a distinct advantage in marketing a highly perishable product with a short shelf life and enables its bananas to be distributed more quickly and more efficiently than those of its competitors who do not have these advantages.

It seems clear that vertical integration afforded UBC quality control over its product and was probably efficient. How this created a barrier to entry was never clearly explained. The question that the Commission and the ECJ should have addressed was not what advantages UBC gained from integration, but whether it was able to make market entry, at any level, more difficult. The Commission, and the ECJ, were probably correct in identifying an anticompetitive effect and intent of the vertical restraint. But many questions were addressed inadequately, in particular those concerned with entry, and hence it is difficult to know if UBC had sufficient market power to successfully employ such a strategy.

The Commission came to a different conclusion concerning the anticompetitive effects of vertical integration in a more recent merger case, *Tetra Pak/Alfa Laval.*[30] In this case the Commission restricted its investigation largely to the question of whether or not the acquisition of an upstream supplier of processing equipment, Alfa Laval, by a dominant firm in the downstream market, Tetra Pak, would detrimentally affect

[29]UBC's market share in the EC was approximately 45%, although this varied considerably between member states.

[30]OJ (1991) L 290/3.

competition. In particular, the issue was whether the merger would reduce the potential for effective competition in the market for aseptic packaging equipment by raising the entry barriers. The Commission concluded that the merger would result in no significant increase in Tetra Pak's existing dominant position in packaging equipment. This finding was based on the observation that there were a number of alternative suppliers of processing equipment, processing and packaging equipment were normally bought separately, and that customers were typically large and had a good deal of bargaining power.

(ii) Refusal to supply and tying. *Hugin* and *Hilti* are two important refusal to supply and product tying cases. In *Hugin* a (relatively small) manufacturer of cash registers refused to supply a competitor in the machine repair and maintenance business with spare parts for its machines and operated through a network of exclusive dealerships that forced its customers to purchase these services from Hugin. The Commission found that although Hugin had only a 12–13% market share in the EC, it had a virtual monopoly in the supply of spare parts, maintenance, and repair of its machines. Further

> The refusal to supply had the result of removing a major competitor in the matter of service, maintenance, repair and the supply of reconditioned machines. . . . Similarly Hugin AB abused its dominant position by prohibiting its subsidiaries and distributors from supplying outside the Hugin organisation. Such conduct shelters Hugin AB from all effective competition in the matter of service, maintenance and repair of Hugin cash registers. . . .

Given Hugin's low market share in the cash register market, many economists would likely have accepted Hugin's argument that it could not exploit market power in the post-sales market without a more than compensatory loss in sales in the primary market. In addition, no evidence was adduced that Hugin actually was exploiting its monopoly position in the repairs and maintenance market.[31] Finally, the Commission did not explain how consumers would benefit from forcing Hugin to supply spare parts to competitors at a price of its choosing, that is, why it mattered whether Hugin's "monopoly" profits were earned in selling spare parts, or repair and maintenance services.

In *Hilti,* a leading nail gun manufacturer tied the purchase of cartridge strips for its nail guns—of which it was the only producer by virtue of patent protection—to the purchase of nails, thus excluding a number of independent nail manufacturers from supplying this market. Hilti further (1) reduced the discount offered on cartridge strips if nails were not purchased, (2) refused to supply cartridges or strips to independent nail manufacturers, and (3) refused to honor its guarantees when non-Hilti nails were used in its guns.

The Commission noted that there were a number of barriers to entry into nail gun (and nail gun cartridge strip) manufacture, including patents, R & D costs, and the costs of establishing a distribution network. The Hilti nail gun and its cartridge strips were protected by patent. There were no notable entry barriers into nail manufacture, however, apart from the commercial practices of Hilti itself.

[31]On the contrary, at the time of the investigation, Hugin presented evidence that these were loss-making activities, often given away "free" to machine purchasers.

The Commission, upheld by the ECJ, found Hilti guilty of abusing its dominant position[32] by commercial practices that hindered the entry or penetration into the market for Hilti-compatible nails of independent nail producers and that subsequently permitted Hilti to price discriminate between member states and to earn very large markups on its different products.

The economics of refusal to supply and product tying are, as noted in Section 3.3, controversial, and it is not a straightforward matter to apply recent theory to individual cases. Whinston (1990), discusses three models of tying with complementary products that are of potential relevance to *Hilti*. In the first model, tying for the purposes of market foreclosure is never a profitable strategy; however, it may permit profitable price discrimination.[33] In the second model, the "upstream" monopolist faces competition from an inferior product, and tying resulting in foreclosure of the downstream market may increase profits. In the third model, the tied product has an alternative use (e.g., nails not for guns) and tying may permit the dominant firm to profitably monopolize this secondary market.

Thus the *Hilti* ruling is not inconsistent with the findings of any of these models, although which, if any of them, applies is not easy to determine. It is also not clear that a 55% market share in the primary market is sufficient to make tying for these motives a profitable, or even possible, strategy.[34]

(iii) Exclusive contracts. Tetra Pak II is a complex case concerning exclusive contracts, contract penalties, tie-ins, and predatory pricing. Tetra Pak was a world leader in the field of packaging liquid foods in cartons, that is, primarily milk, milk products, and fruit juices. Tetra Pak produced and marketed both packaging machinery and cartons. Entry into "aseptic" packaging (i.e., for "long-life" products) was apparently made difficult by the existence of a large number of patents.[35] Entry into the "nonaseptic" market (i.e., for fresh products) presented fewer obstacles. In 1985 Tetra Pak's Community-wide market share in aseptic packaging was 90–95%, while in nonaseptic packaging its market share was 50–55%. Elopak Italia, a competitor in nonaseptic packaging, complained to the Commission that Tetra Pak was (1) selling cartons and machinery at predatory prices, and (2) imposing unfair contractual conditions on the sale or lease of its machines, the intent and effect of which was to reduce Elopak's competitiveness and drive it from the market.

The Commission and ECJ took the contractual conditions that Tetra Pak imposed on buyers and leasers of its machines, including exclusive rights to maintenance and

[32]Hilti had a 55% market share in the market for nail guns but a much larger market share in the market for Hilti-compatible nails and cartridge strips.

[33]There is some evidence that Hilti may have engaged in tying for this purpose.

[34]Both *Hugin* and *Hilti* bear close resemblance to the recent, and much discussed, *Kodak* case in the United States *(Eastman Kodak Co. v. Image Technical Services Inc., 112 S. Ct. 2072 (1992))*. Kodak sells photocopiers in competition with numerous other sellers, but effectively tied the sale of its machinery to purchase of repair and maintenance services by refusing to supply independent repair shops with spare parts. The Supreme Court ruled, in effect, that even though Kodak had no appreciable market power in the primary (photocopier) market, it had a virtual monopoly in the supply of spare parts, and if consumers were uninformed or unable to predict "lifecycle" repair and maintenance costs, they could be exploited. This would then make exclusionary strategies, such as refusal to supply, potentially profitable. For commentary and discussion, see Kattan (1993), Hay (1993), or Grimes (1994). See also Carlton and Perloff (1994), p.843.

[35]Tetra Pak had over 200 patents on its machinery and cartons.

repair, tied sales of cartons and machinery, and contract penalty clauses[36] as virtually independent evidence that Tetra Pak was not subject to competitive pressures in any of the markets in which it operated. It also concluded that they were intended to foreclose the market to competition by "making the customer entirely dependent upon Tetra Pak for the entire life of the machine":

> Consequently, the only time when there is any possibility of competition coming into play is at the time of sale of the equipment, and not of cartons. Tetra Pak thus artificially limits competition to the area in which its position is strongest because equipment, in particular aseptic equipment, is the area in which its technological lead is greatest and entry barriers are at their highest.

These contractual conditions, in particular the penalty clauses, would tend to have the effect of tying customers to Tetra Pak over long periods, sometimes longer than the economic life of the machines, making entry more difficult. Given Tetra Pak's dominant position, particularly in aseptic packaging, a new entrant would need to attract Tetra Pak customers, who faced large financial costs in switching suppliers. Entrants would therefore need to compensate such consumers with low, perhaps uneconomically low, prices. Penalties frequently exceeded the total value of machines, suggesting they exceeded the actual economic losses incurred from a customer switching to a competitor's machines.

This case has been cited by Brodley and Ma (1993) as an application of Aghion and Bolton's (1987) theory of "contracts as a barrier to entry." In that analysis—see also Rasmusen et al. (1991) and Section 3.3—customers sign exclusive contracts with the incumbent monopolist in return for a lower price, which has the effect of making entry more costly. The contracts are the means by which either (1) the incumbent can prevent entry altogether, (2) capture the entrant's rents via penalty clauses that force customers to compensate the monopolist if they switch to the other supplier, or (3) capture the entrant's rents via buyouts at reduced prices.

4.4. Predatory Behavior

As an empirical matter it is very hard to determine when pricing is predatory. The offense, low pricing, is also a prime virtue of the competitive process. Distinguishing

[36]Tetra Pak's contractual conditions on the sale and lease of its machines varied somewhat across member states; however, typical conditions included:

(1) *exclusive rights* to maintenance and repair, including exclusive supply of spare parts
(2) a *sliding scale of charges* for maintenance depending upon number of cartons used, and a link between guarantees and compliance with all contractual conditions
(3) Tetra Pak *ownership of intellectual property rights* in any modifications or improvements in its machines
(4) *tied sales:* exclusive use of Tetra Pak cartons on its machines, supplied exclusively by Tetra Pak
(5) *customer surveillance:* a system of customer notifications and inspections
(6) *control of resale market:* no resale or transference of lease of Tetra Pak machinery without permission, and a condition that new owner/lessee must assume all contractual obligations of seller/leaser. On sales contracts Tetra Pak had the right to repurchase machines at "derisory" prices, which were much lower than the price Tetra Pak paid when a new Tetra Pak machine was being purchased. In addition, a financial penalty of 20–80% of the cost of a new machine was payable in three European countries for breach of this condition.
(7) *term of lease:* minimum of 3–9 years; frequently greater than economic life of the machine.
(8) *penalty clauses:* (a) Tetra Pak charged a base rental fee virtually equal to the selling price of machines, and all advance rent was forfeited by early cancellation or entry into a sublease; (b) Tetra Pak gave itself the right to fix a penalty at its own discretion of up to 10% of the base rental, 1 year's rental payments, in the event of any contractual obligation being infringed.

predatory from normal competitive behavior is therefore a subtle task. In London Economics (1994) we propose a two-part test for predatory pricing.[37] The first step is an analysis of market structure to determine whether predatory behavior is potentially a rational strategy. The crucial question is whether the alleged predator, if successful in deterring entry or inducing exit, could recover the short-term losses incurred. The second step is an examination of conduct or market behavior using a price-cost test, such as the one suggested by Areeda and Turner (1975). In addition, it is useful to investigate the history of entry-deterring behavior in the market and evidence of intent. Modern theory also suggests (see Section 3.4) that capital market imperfections, for example, information asymmetries and financial constraints, can be important in supporting predatory behavior.

The classic finding of predation in EU competition law is the *AKZO* case. AKZO Chemie was the major European producer of organic peroxides, one of which, benzoyl peroxide, was used in flour additives in the United Kingdom and Ireland. Most sales of organic peroxide, however, were in the European plastics market, where AKZO was a dominant supplier.[38] ECS, a UK producer of flour additives, began to produce benzoyl peroxide for its own use in 1977 after a series of price rises by its main supplier AKZO.[39] When ECS started to expand into the more lucrative European plastics market in 1979, AKZO responded with direct threats of overall price reductions in the UK flour additives market, and price cuts targeted at ECS' main customers if ECS did not withdraw from the plastics sector. In December 1979 ECS was granted a High Court injunction in the UK to prevent AKZO from implementing its threats. An out-of-court settlement was subsequently reached in which AKZO undertook not to reduce its selling prices in the UK or elsewhere "with the intention of eliminating ECS as competitors."

Prior to the dispute AKZO regularly increased its prices to its UK customers by increments of 10%. ECS tended to follow AKZO's UK price increases while maintaining its own prices approximately 10% below AKZO's. In March 1980, following the out-of-court settlement, AKZO again increased its UK prices by 10%, but on this occasion ECS did not follow, increasing the normal price gap between the two companies. Some of AKZO's large customers subsequently approached ECS for price quotations. AKZO responded by matching or bettering ECS price offers and undercutting ECS's prices to its own customers.[40] The result was that AKZO (and Diaflex) gained market share at the expense of ECS.

The price history, as described by the Commission, would appear to be consistent with vigourous price competition following a breakdown of previously coordinated

[37]Similar tests have been proposed by the UK's Office of Fair Trading and by Judge Easterbrook in *A.A. Poultry Farms Inc. v. Rose Acre Farms Inc. 881 F.2d 1396 (7th Cir. 1989)*. See also Klevorick (1993).

[38]AKZO's market share in the EC market for organic peroxides in 1981 was 50%.

[39]In 1982 AKZO's market share in the UK flour additives market was 52%, followed by ECS with a market share of 35%, and Diaflex with 13%. Diaflex purchased its raw materials from AKZO. There were three large buyers of roughly comparable size with a combined market share of 85%, plus a number of smaller independent flour mills.

[40]Diaflex followed suit and offered prices similar to those quoted by AKZO to two large independent customers of ECS. Price cutting continued until 1983, when ECS was granted interim measures by the Commission.

pricing strategies or with predation.[41] The Commission concluded in favor of predation on the basis of internal AKZO documents that indicated eliminating ECS was its strategy and internal management documents apparently demonstrating that AKZO prices for selected customers were less-than-average variable or marginal costs. The Commission argued that AKZO's predatory behavior was creating a barrier to entry and pointed to evidence of other predatory episodes as well as evidence of financial difficulties at ECS that limited its ability to sustain a prolonged price war.

This case thus contains practically all of the ingredients required for successful predation. AKZO had significant market power in each of the markets in question (i.e., large market shares in both the UK flour additives market and the EC plastics market); evidence of predatory intent was given, as well as evidence of previous predatory episodes; prices were found to be below average variable cost in targeted market segments; and ECS was found to be financially constrained. In addition, AKZO was apparently targeting a market of minor importance—the UK flour additives market—to protect its more lucrative European plastics market, thus minimizing the costs of predation while inflicting maximum damage on its competitor.

The case has received widespread attention. On appeal the ECJ supported the main findings of the Commission, despite a dissenting opinion by the Advocate-General,[42] and AKZO was fined ECU 7,500,000. Criticisms of the Commission's and the ECJ's findings have focused upon two issues. The first was ease of entry into the UK organic peroxide market. As Rapp (1986) noted, "the ease with which ECS began to enter suggests low entry barriers," and the Advocate-General made a similar point in his dissenting opinion. The question of entry was not subject to a detailed examination by the Commission; however, two points are worth making. First easy entry *prima facie* makes predation less likely to be profitable, as recouping lost profits post-exit is more difficult. However, second, as an empirical matter, predation appears to be more likely in markets with low entry barriers, and this is entirely consistent with modern theory.[43] Predation in markets with large entry barriers (i.e., high sunk, or exit, costs) is less likely to be either necessary to deter entry or successful in inducing exit, whereas predation may be the only means of creating an entry barrier in markets in which entry is otherwise easy. The Commission noted:

> Smaller firms which have attempted to expand their market share or penetrate new markets have almost invariably been unsuccessful in the face of AKZO's response . . . Apart from ECS (which already had a "base" in flour additives) there appear to have been no recent entrants to the organic peroxides market. Having regard to high start up costs, and the market structure, it is most unlikely that

[41]See Phlips and Moras (1993), who interpret the price history as evidence of "the reaction of a dominant firm that lost its price leadership and tries to discipline a deviant," the result being a shift from "a price leadership situation towards a more competitive one." We are not unsympathetic to this interpretation, although Phlips and Moras's (1993) argument that the market was characterized by "complete information," making predation a noncredible strategy, strikes us as far fetched. (Indeed, the Commission pointed to evidence of previous episodes of predation; see below.) See Milgrom and Roberts (1982), Roberts (1987), and Wilson (1985) for the relevant theory.

[42]The Advocate-General disagreed with the Commission's approach to market definition and argued that, in any case, it was not sufficiently proved that AKZO held a dominant position in the relevant market. He also found insufficient evidence of abuse of dominant position.

[43]See Section 3.4 above. Good examples of predation in nearly "contestable" markets are the "buses" cases recently considered by the Office of Fair Trading in the United Kingdom.

> new producers, knowing the likely reaction of AKZO, will be ready to enter the market.

The Commission thus identified AKZO's predatory behavior as *the* major deterrent to entry into this market.

The second issue was the identification of AKZO's variable or marginal costs and the application of the price-cost test. Given that the price history was consistent with both predatory and vigorously competitive behavior, the issue of whether or not prices were above or below the relevant measure of short-run opportunity costs became crucial for establishing predation. The Commission's approach to distinguishing variable costs from fixed costs was not based upon economic logic but rather an appeal to authority. While the Commission noted, rightly in our view, that no price-cost test is adequate "to cover all cases of unfair conduct designed to exclude or damage a competitor," nevertheless establishing that AKZO was selling at prices below cost became an important part of its argument.[44]

The Commission, however, did not seem to clearly understand the nature of the cost test to be applied.[45] The Commission noted that Areeda and Turner (1975) excluded from variable costs only (1) capital costs, (2) property and other taxes, and (3) depreciation. This, of course, is not evidence one way or the other. What is important is to determine which costs were truly "avoidable" in the sense that they would not have been incurred otherwise, that is, if prices had not been lowered and output or sales thereby increased. As Areeda and Hovenkamp (1992) have recently written:

> Which costs are to be considered variable and fixed is a function of the time period and how large a range of output is being considered. All costs are variable in the long run. . . . A predatory pricing rule should focus on those costs which are variable in the relevant time period. . . . The cost-based rules must focus on costs which the defendant should have considered when setting the allegedly predatory price.

Thus the distinction between fixed and variable costs will depend upon the range of output and the time period involved, the nature of the firm's contracts with its input suppliers, whether or not it has excess capacity, etc. The important point is the

[44]Similarly the ECJ in considering the case on appeal stated:

> The concept of abuse is an objective concept relating to the behaviour of an undertaking in a dominant position which is such as to influence the structure of the market. . . . It follows that Article 86 prohibits a dominant undertaking from eliminating a competitor . . . by using methods other than those which come within the scope of competition on the basis of quality. . . . Prices below average total costs but above average variable costs must be regarded as abusive if they are determined as part of a plan for eliminating a competitor. Such prices can drive from the market undertakings which are perhaps as efficient as the dominant undertaking but which, because of their smaller financial resources, are incapable of withstanding the competition waged against them.

Thus neither the ECJ nor the Commission takes the view that predation need be established by a mechanical application of a *per se* test based on marginal or variable costs.

[45]Rapp (1986), p. 240, makes a similar point: "The Commission . . . looks at accounting textbooks for the conventional categories of variable cost—a procedure which advances its grasp of the lowest competitive price in this market not one iota. All we know, in the end, is that internal management accounting showed the flour additives business ran at a loss (that is, below somebody's idea of total cost) and that certain vitamin sales were made at prices that were clearly below average variable cost."

identification of the avoidable costs upon which economic decisions are based. No arbitrary list or enumeration of cost items will in general be able to capture this.[46]

Finally, the general observation that AKZO appeared to be inflicting substantial harm on ECS, at little cost to itself, may well have been true, but this raises the question of what, and how large, the expected benefits were. The Commission repeatedly cites evidence to suggest that AKZO was concerned with maintaining its market share against competitors in the European plastics market. Given the irrationality of this as a business goal, however, perhaps it should not be taken too seriously. A possible explanation for AKZO's behavior is that it was building a reputation for "toughness," and this would appear to be consistent with the Commission's analysis.[47]

4.5. Entry Impediments

In the application of Article 86 by the Commission and the ECJ, a wide variety of factors have been considered to hinder or prevent the entry of new competitors into the market. For this reason they have been described as taking a traditionalist approach to the subject. The traditionalist viewpoint is described by Butterworth's (1992) as "taking anything which makes entry into a market more difficult as a barrier to entry."

We distinguish, following Schmalensee (1987) and others, between *impediments to entry* and *entry barriers*. The former may be of concern to antitrust authorities where incumbent firms are already in a position to exert market power to the detriment of consumers, for a period of time, although in the long run they have no advantage over potential entrants. In a number of cases the Commission has described as entry barriers factors that we prefer to call entry impediments. For example, in *Perrier/Nestlé* the long lead time required to develop a brand name was described as a barrier to entry; in *de Havilland* the time lag before entry could occur on a significant scale was similarly viewed.

5. Conclusions

This paper describes an approach for assessing entry conditions by competition authorities that is both practicable and makes use of recent developments in industrial organization theory. A fivefold classification of barriers to entry was described that is both consistent with modern thinking in industrial organization and provides a useful organizational framework for applying the theory to practical cases. In light of this approach, we have discussed a number of leading cases that have been decided by the European competition authorities (i.e., the Commission and the European Court of Justice). Although there is now a good deal of legal commentary concerning these cases, few economists, outside of their role as expert advisers, have given them serious attention. Our review of the leading cases has been brief and necessarily anecdotal. Nevertheless, this exercise would appear to have led to some worthwhile conclusions.

[46]For this reason Areeda and Turner (1975) and Areeda and Hovenkamp (1992) suggest an arbitrary definition or classification, on the grounds that identifying the relevant costs in many cases will be too difficult and open to dispute. However, they intend their classification to be "presumptive" rather than conclusive.

[47]Although as noted, Phlips and Moras (1993) discount this possibility by arguing that the market did not satisfy the necessary informational conditions.

First, it has verified the seemingly widely held belief that the European Commission and ECJ have yet to develop an economically coherent and consistent approach to issues to do with market power and barriers to entry. The opinions of the Commission and the court frequently fail to consider entry conditions and barriers to entry explicitly, and no framework exists for determining when the fact of a firm's large market share is offset by the fact of ease of entry.

Second, when entry barriers are considered, explicitly or implicitly, the Commission frequently finds more barriers to entry than most economists would be willing to admit, that is, economies of scale, efficiency advantages, large capital requirements, vertical restraints, etc. This is in marked contrast to the "Chicago" school of antitrust analysis, which tends to admit very few things as entry barriers.

Perhaps the Commission should not be criticized too strongly for its failings in this area, however. As we noted in the introduction to this paper, the subject of barriers to entry has been both highly controversial and rapidly evolving. While we may feel confident that a new "consensus" has emerged on the approach that should be taken to the analysis of entry conditions in particular cases, one could forgive a competition authority for taking a more cautious view. Nevertheless, the analysis of barriers to entry is fundamental to the assessment of market power and its abuse, and the costs of failing to treat these questions seriously and with care are likely to be high.

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