6   The law and economics of predatory pricing
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I   Introduction

Predatory pricing is a specific form of exclusionary pricing conduct in which the predatory firm sacrifices short term profits in order to achieve long term gains. The most general definition of predation would be 'any action taken by a firm with market power which causes a rival to exit and in doing so reduces social welfare'. (Scheffman (1981)). Antitrust regulation of predatory pricing is limited, however, by the challenges of differentiating potentially anticompetitive predatory pricing from procompetitive price competition. As a result, antitrust rules aimed at regulating predatory pricing have paid special attention to the administrability of the rule, as well as the potential deterrent effect such rules may have on procompetitive price competition. Thus, despite recent articles showing that predation is both theoretically possible and may occur in the marketplace, the courts have adopted and generally maintained permissive rules to regulate predatory pricing under the antitrust laws.

This chapter focuses on and is organized around two primary issues relating to the economics of predatory pricing: the economic analysis of predatory pricing as a form of anticompetitive exclusion and the economics of optimal antitrust rules. Section II of this chapter reviews both the theoretical and empirical literature on predatory pricing then examines the economics of optimal antitrust rules. Section III sets out the optimal theory of antitrust rules, and examines definitions and tests of predatory pricing.

Section IV examines the antitrust regulation of predatory pricing, tracing the Supreme Court's consideration of the economic analysis of predatory pricing and its application of this knowledge in choosing to set out a bright line and administrable test in *Brooke Group.* It then examines some of the issues faced in administering such a rule, including the relevant measure of costs and the extension of the *Brooke Group* rule to issues such as multiproduct pricing, market share and other loyalty discounts and predatory buying. Section V concludes.

II   The economics of predation

This section reviews the economic literature on predation. Part (a) reviews the pre-1980s theoretical and empirical literature on price predation that resulted in widespread skepticism regarding the rationality and frequency of predatory pricing. Reviewing the literature and evidence to date in his influential 1978 book, *Antitrust Paradox*, Bork noted that while '[t]hese considerations do not demonstrate that price cutting could never under any circumstances be a successful method of predation', it was nonetheless 'unwise, therefore, to construct rules about a phenomenon that probably does not exist'. Easterbrook (1981a) concluded that, while predation was possible, 'there is no sufficient reason for antitrust law or the courts to take predation seriously' and that if there is 'any room in antitrust law for rules of *per se* legality, one should be created to encompass predatory conduct'. Moreover, this literature was cited by the US Supreme Court in its recent decisions on price predation. The Court, in addressing predatory pricing in *Matsushita*, cited the literature discussed in Part (a) of this section as evidence that 'there is a consensus that predatory pricing schemes are rarely tried, and even more rarely successful'.[2] The Court repeated this passage in its decision in *Brooke Group*.[3]

Part (b) examines the post-1980 theoretical literature that responded to the literature discussed in Part (a). Part (c) examines the post-1980s empirical literature on predation. In sum, the models of rational predation and the empirical papers reviewed in this section demonstrate that the academic conclusions reached in the early 1980s regarding the rationality and rarity of predatory pricing, and accepted by the Supreme Court in its *Matsushita* and *Brooke Group* decisions may not tell the whole story. Many have noted and criticized the Court's failure to date to incorporate this new learning into the antitrust treatment of predation (*see, for example*, Hemphill (2001), Bolton, et al. (2000), Klevorick (1993)). However, it is far from clear that this is a mistake. The models showing rational predation can exist and the evidence consistent with episodes of predation does not demonstrate that predation is either ubiquitous or frequent. Moreover, many of these models do not consider the welfare effects of predation, and those that do generally find the welfare effects ambiguous. Furthermore, this line of research does not suggest easy to administer tests for predatory pricing. As a result, while the literature usefully questions one of the premises underlying the Court's recent predatory pricing holdings, it has not conclusively shown that the Court's approach to predatory pricing in *Brooke Group*, which stresses the costs of erroneous condemnations of price competition as well as the benefits of having an administrable predation rule, should be replaced.

a   Price theory and predation – 1958–1980

A natural starting point to review the economics of predation is John McGee's (1958) influential article on the *Standard Oil* case. In this article, McGee challenged the conventional wisdom that predatory price discrimination was used by John Rockefeller to create an oil refining monopoly. The *Standard Oil* case was long thought to be a classic case where predation was achieved through local price cutting. However, McGee's review of the record found that there was little or no evidence that Standard Oil systematically used local price cutting to monopolize the oil refining industry.[4]

In addition to analyzing the Standard Oil record, McGee examined the use of predatory price cutting as a method to monopolize. McGee criticized the logic of the standard predatory pricing theory, noting that the usual argument involves a firm with existing monopoly power using its monopoly profits to outlast its less capitalized rivals. McGee noted that such an argument presupposes market power without explaining how market power is obtained. He also questioned whether predation would be successful. Any limits on internal financing would be made irrelevant by infusions of outside capital which would allow the rival firm to either survive until or re-enter the market when prices rose above predatory levels.

Moreover, McGee noted that unless there are legal constraints, it would be more profitable and permanent for a potential predator to acquire a rival than to incur losses in driving it from the market through price predation. Rather than dissipate profits through price cutting, the predator could instead offer the rival a premium to induce him to sell his assets. McGee also found it unlikely that predatory pricing could be used to depress the price of the acquisition. He questioned whether the purchase price would be significantly affected by price cutting that was not permanent. Because the predatory firm must expand output in order to depress the price, the losses incurred by the prey, which can limit its losses by limiting sales at predatory prices or even temporarily shutting down, are likely to be smaller than those incurred by the predator. This would make it unlikely that the savings from a lower acquisition price would outweigh the direct losses incurred by the predator.

McGee's article was followed by numerous articles that also cast doubt on both the theoretical and empirical relevance of price predation. McGee (1980) revisited his earlier work, and noted in particular that his skepticism regarding the viability of predatory pricing was not based on the absence of antimerger laws. Easterbrook (1981a) extended McGee's theoretical arguments. In the single market predation case, Easterbrook notes that many factors, including the ability of potential

victims and their customers to respond to predation, make successful predatory pricing uncertain and unattractive. Easterbrook also examines multi-market theories of predation and the use of credible commitments to support predation. He notes that models showing how credible commitments are used to support predation do not take into account the fact that credible commitments also can be used to defeat predation. With respect to multi-market predation, Easterbrook notes that the success of such strategies could be thwarted through the use of counterstrategies by the entrant. Easterbrook also observes that under the logic of backwards induction, multi-market predation in the finitely repeated setting suffers from the same problems as single market predation. This is the 'chain store paradox' (Selten (1978)). If there are a finite number of markets, predation in the final market would not be rational for the same reasons it is not rational in the single market setting. Knowing this, predation would not be rational in the period proceeding the last period, and given this, the period before.

In addition to addressing the theoretical arguments, scholars also re-examined other cases where predation was alleged. As with McGee's findings with respect to Standard Oil, scholars found little evidence of profitable predation. Koller (1971), in an influential and often cited work, examined 31 alleged incidents of predation, and found few instances of successful predation. Following McGee's methodology, Elzinga (1970) reexamined the history of the gunpowder trust, and found that many of the alleged victims were not victims of predatory pricing, and that there was no conclusive evidence that any of the victims were subjected to predatory pricing. Adelman (1966) found little evidence of predatory pricing by A&P despite the government's successful prosecution for predatory pricing. McGee (1964) examined the Spanish sugar industry, and found that predatory threats failed even in the absence of antitrust laws

b   Predation and strategic theory

One reason for the widespread skepticism of the rationality of predatory pricing was the absence of a coherent theory of rational predation prior to the 1980s (Ordover (1988)). The absence of a coherent theory of predatory pricing spurred work by economists challenging the McGee hypothesis that predation was irrational. Their work generally concentrated on examining theoretical conditions under which predation is a rational and profitable strategy. Ordover and Saloner (1989) usefully categorize this literature into three primary classes of models of predation based upon asymmetric information: asymmetric financial constraints, reputation based models, and signaling models. There are also recent models of rational predation not based on asymmetric information. This section

briefly reviews these articles (see Ordover and Saloner (1989) for a more in-depth description of these models).

i   Financial predation and the long purse   The first category of asymmetric information models, those with asymmetric financial constraints, was addressed early on by Telser (1966). Telser set out a model of the 'long purse' in which predation occurs because the predator, with superior resources, can outlast the prey. In Telser's model the interest rate at which a firm can borrow increases as the firm's reserves decrease, which in turn constrains the amount a firm can borrow. In order to remain viable, firms must incur per period fixed costs even if they do not produce any output. Because this is common knowledge, the predatory firm can calculate the number of periods its prey could last given predatory prices. Under these conditions, a firm with greater resources can successfully deplete the reserves of the less capitalized victim, thus limiting the victim's ability to borrow and eventually driving him from the market. If the additional monopoly profits outweigh the predator's reduced profits that result from predatory pricing, predation is a rational strategy vis-à-vis a policy of entry accommodation.

However, because all information is common knowledge, predation would not be observed in equilibrium. Because predation is costly to both firms, Telser suggests that the threat of predation should either deter entry in the first place or result in the parties agreeing to merge, with the terms determined by the relative costs of predation in the absence of an agreement. Moreover, if potential victims anticipate this, they can alter their capital structure to increase the cost of successful predation, and thus favorably alter the buyout price.

Beniot (1984) also modeled predation with a financially constrained entrant. Beniot first presents an infinitely repeated extensive form game where the entrant has resources to survive a finite number of price wars. Under complete and perfect information, Beniot derives a 'reverse chain store paradox' result, where entry is deterred as long as the entrant's ability to survive is finite. He then examines a game with incomplete information where the predator knows the maximum number of periods the entrant can stay in, but only knows with probability $1 - p$ whether the entrant is committed to stay in the industry until bankrupt. Beniot derives a mixed strategy equilibrium where entry occurs, with entry being an increasing function of the entrant's financial staying power.

These models do not explain why the firms are financially constrained, and thus are subject to the criticism noted above that predation will be thwarted in well-functioning capital markets. Indeed, in Beniot's complete information model, the *incumbent* will be driven from the market if the

entrant can acquire capital sufficient to outlast it. More generally, greater resources increase the probability of entry in the incomplete information model, and favorably alter the buyout price in Telser's model.

This critique was addressed through models of financial constraints based on asymmetric information. Fudenberg and Tirole (1986) created a model where the entrant is uncertain about his per period fixed costs and uses current profits to decide whether to remain in the market. Given this, the incumbent has an incentive to use predation to reduce the entrant's profits in order to cause the entrant to infer that he has high costs and should exit. Their 'signal jamming' model can also be applied to lenders' decisions to make or limit outside financing. Bolton and Scharfstein (1990) derive financial constraints based on firms' attempts to control agency costs. In their model, lenders' decisions regarding external financing are sensitive to a firm's short term performance. This gives managers incentives and addresses manager/shareholder agency costs. However, a predator knowing this relationship between a firm and its lender can take advantage of it by using price predation to lower current profits, which in turn reduces external financing and induces exit. If these contracts between firm and lender are observable, firms that are potential victims of predation will choose to make their contracts less sensitive to current performance, thus trading off higher agency costs for a lower threat of predation. The use of financial contracting by potential victims to reduce the threat of predation, and the effect of renegotiation on its effectiveness is further examined by Snyder (1996).

The deep pocket theory is also addressed by Poitevin (1989) and in a similar model by LeBlanc (1996). In the Poitevin model, there is incomplete information about the viability of the entrant. The entrant's susceptibility to predation is explained by endogenously determined financial structures, with viable entrants having to signal their high value by taking on debt rather than using equity financing. This leverage in turn provides an incentive for the equity financed incumbent to drive the leveraged entrant into bankruptcy.

ii   Multiple markets and reputation   The second set of asymmetric information models are reputational models of predation where the predator faces entry in multiple markets. These models attempt to demonstrate the rationality of predation by addressing the backwards induction logic of the chain store paradox in several ways. Some models examined reputation in the setting of an infinitely repeated game (Milgrom and Roberts (1982b)), where predation is a Nash equilibrium. However, use of infinitely repeated games as a response to the chain store paradox is unattractive for several reasons (Ordover and Saloner (1989: 553)), including the fact that such

games have multiple equilibria, including one where accommodated entry occurs each period.

Another set of studies examined reputational models where the assumption of perfect information was relaxed as a way to avoid the logic and result of the chain store paradox. Milgrom and Roberts (1982b), Kreps and Wilson (1982) and Kreps, Milgrom, Roberts and Wilson (1982) developed models where some incumbents prefer to engage in predation rather than accommodating entry. Such preferences can result from the fact that predation is more profitable than accommodation in the single market setting, or alternatively from a narrowly irrational preference for predation when it is not. The entrant in these models does not know ex-ante what type of incumbent he is facing, strong (those with a preference for predation) or weak (those that would prefer to accommodate entry in a single market game). However, the entrant knows p, the probability the incumbent is strong.

To see how the probable existence of irrationality affects the chain store paradox result, consider a two period model where, based on expected profits, the entrant in the first market will enter. In such a game, there is no pure strategy equilibrium.[5] Kreps and Wilson (1982) examine a mixed strategy equilibrium in which the strong incumbent fights, the weak incumbent randomizes over his strategy to fight, and the second period entrant randomizes over his strategy to enter. In the mixed strategy equilibrium, the probability that the first entrant will face predation will be greater than the probability the incumbent is strong, p, as both strong incumbents and some weak incumbents will choose to predate. Kreps and Wilson show that in a model with many, but finite periods, predation can occur with a high probability as the weak incumbent will fight with a high probability even when strong or irrational incumbents are rare so that p is low. The basic predation for reputation result can be extended to the case where there are multiple types of incumbents, where an entrant is in more than one market, and where the assumption of incomplete information is not limited to the incumbent's cost (Milgrom and Roberts (1982b)). Easley, Masson and Reynolds (1985) extend the reputational model to consider multiple market entries by entrants, multiple entrants, and dynamic elements such as delaying rather than completely deterring entry.

iii.   Signaling   The third major set of asymmetric information models are signaling models of predation. In these models, the entrant is unsure about either the incumbent's costs (Salop and Shapiro (1980), Milgrom and Roberts (1982a), Saloner (1987)) or market demand (Roberts (1986)). Entrants facing unfavorable market conditions (i.e., either a low cost incumbent or low demand conditions) are better off exiting the market

than staying in. As a result, informed incumbents will want to transmit information to these entrants, through low prices, that they are facing unfavorable conditions. In a separating equilibrium, incumbent firms competing in a market with conditions unfavorable to the entrant will use low prices to signal these conditions, which results in the exit of the entrant and monopoly profits in the following period. Low prices serve as a separating signal when they are set at a level where the marginal increase in profits in the second period is greater than the profit sacrifice in the first for the strong (low cost or high demand) firm's profits but not for the weak (high cost or low demand) firm's profits.

Signaling models include models of limit pricing where lowered prices are used to deter entry. In Milgrom and Roberts' (1982a) basic model, both the incumbent and entrant can be either a high or low cost firm. Each firm knows its own costs, but not the costs of the other firm. Entrant and incumbent firms are high cost with probability p and q respectively. Moreover, both types of entrants would prefer to enter if the incumbent is a high cost type, and would prefer not to enter against a low cost entrant. Thus, with complete information, the probability of entry would be q. With incomplete information, Milgrom and Roberts show that both separating and pooling equilibria exist. In the separating limit pricing equilibrium, low cost incumbents separate themselves from high cost incumbents and deter entry. However, there is no marginal entry deterrence relative to the full information equilibrium, as the probability of entry is the probability that the incumbent is high cost, q. In the pooling equilibrium, only the low cost entrant enters. The probability of entry equals $(1 - p)$, which can be greater than, equal to, or less than q. Thus, in their model, limit pricing does not necessarily deter entry relative to the full information equilibrium.

Saloner (1987) adapted the Milgrom and Roberts limit pricing model to consider how predatory pricing can be used to induce the exit of an existing competitor. The model has three stages. In the first stage, two incumbent firms compete as Cournot duopolists. In this model Firm A has known costs, but Firm B does not know if Firm A has high or low costs. At the end of the first stage, Firm B updates its beliefs about Firm A's costs. Firm A then makes an offer to buy Firm B. In the third stage, Firm A either competes as a merged firm that faces potential entry, or competes with Firm B as a duopolist. Saloner demonstrates three effects of Firm A expanding output beyond the single period equilibrium output. First, like the Milgrom and Roberts limit pricing model, this expanded output can serve as a separating signal that the firm is a low cost firm. Under the assumptions of the model, this results in entry deterrence in the third period. In addition, even when entry is not deterred, the expansion of

output will induce Firm B to reduce its output in equilibrium, and will also favorably alter the buyout price of Firm B at stage two. Thus, the output signal serves both as a limit price and as a predatory signal.

As noted above, Roberts (1986) examines a similar model where information is incomplete as to demand rather than cost. In addition, there is earlier literature on 'test market predation' (Scharfstein (1984), describing an earlier model by Salop and Shapiro (1980)) in which there could be signaling in a local or 'test' market competition that occurs prior to competition at the national level.

While these models demonstrate that rational predation can occur, both Saloner (1987) and Milgrom and Roberts (1982a) note that the welfare consequences of the limit pricing and predation outcomes are ambiguous. Thus, while these papers provide a counterargument to the assertion that predation is not rational, the fact that rational predation can increase welfare complicates the inferences one can draw for antitrust policy.

iv   Other theories   The theories of predation discussed in Parts i to iii all rely on asymmetric information to generate rational equilibrium predation. However, asymmetric information is not a necessary condition to generate predation in equilibrium. Cabral and Riordan (1994, 1997) have a learning curve model of equilibrium predation, in which firms' current period production costs are a function of the cumulative production. In such a learning curve environment, Cabral and Riordan show that rational predation occurs in equilibrium, where the predator expands output and lowers price in order to take further advantage of the learning curve cost reductions and to induce its rival's exit. This predation can involve, but does not require, below-cost pricing. The welfare consequences of such learning curve predation are ambiguous.

Marx and Shaffer (1999) have a complete information model of predation in intermediate goods markets. In their model, a manufacturer makes sequential purchases from two suppliers of differentiated inputs. They show that below-cost pricing of marginal units by the first supplier can facilitate rent extraction from the second, resulting in a higher joint surplus between the buyer and the first supplier. In their model, below-cost pricing does not result in exclusion, and welfare may increase or decrease.

c   Empirical studies of predation
As noted in Part (a), empirical studies showing little evidence of price predation were influential in producing the consensus that predatory pricing was not an important phenomenon. Recent empirical studies have challenged the findings of this early literature and produced evidence consistent with the newer models of predation. This part reviews these empirical

studies that were largely undertaken to counter the earlier literature that cast doubt on the frequency of successful predation in practice.

A study by Zerbe and Cooper (1982) reexamined and updated the litigated predatory pricing cases included in the influential Koller (1971) study. In contrast to the low rate of successful predation reported by Koller, Zerbe and Cooper found that the predator was successful, or would have been successful but for a lawsuit, in raising prices in 27 out of 40 cases. Unfortunately, neither of the articles precisely defines or describes the methodology through which a litigated case was categorized as a 'success'. Compounding the difficulties analyzing the studies, neither the Zerbe and Cooper article, nor a later retrospective article by Zerbe and Mumford (1996) explain precisely how their methodology differs from that used by Koller.[6]

Zerbe and Mumford (1996) also cited and reexamined other episodes of predation. For example, they reexamined the gunpowder trust studied by Elzinga (1970). While Elzinga looked for below marginal cost pricing to classify cases as predation, Zerbe and Mumford used a broader criterion of predation that includes strategic pricing to drive a rival from business or to induce a rival to join a cartel. Using this broader definition, they found that five of eleven cases in which a determination could be made from the record resulted in predation. Other examples of successful predation cited include Zerbe's (1969) examination of the case of the American Sugar Refining Company, and Yamey's (1972) study of Ocean Shipping Cartels. Yamey described indirect evidence of below-cost pricing by a steamship conference in the 1880s to exclude the Mogul Steamship Company from the England/China trade. According to contemporaneous statements, the conference successfully excluded Mogul, an independent company, using loyalty rebates and below-cost pricing.[7] However, the conference was not able to exclude the larger China Shippers Mutual Steam Navigation Company, which was eventually admitted to the conference.

Other discussions of litigated cases and their frequency include Easterbrook (1981a) (examining cases and finding absence of preda-tion); Elzinga and Mills (2001) (reexamining three cases in which the courts or the agencies failed to find firms' pricing to be predatory and concluding these cases were correctly decided); Bolton et al. (2000, 2001) (finding plaintiff success rate of 17 per cent in the ten years before the Supreme Court's *Brooke Group* decision, discussing post *Brooke* cases, and disputing evidence that recent cases show absence of predation).

One drawback of empirical studies of litigated cases is that it is unclear what inferences can be made from the results. In general, litigated cases are a highly selected sample of cases, and may not be representative, in either frequency or substance, of the larger universe of cases, including settled or

dropped cases and cases never filed (see generally, Priest and Klein (1984)). Easterbrook (1981a: 316) argued that near absence of proof of predation in litigated cases i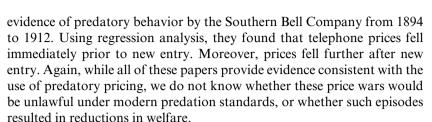s significant, as episodes of predation would be unlikely to escape detection given the existence of treble damages and competitive incentives for harmed plaintiffs to bring such cases. In contrast, Bolton et al. (2000: 2254) argue that proof of predation in litigation cases is not rare, and may be considerably higher if settled cases were taken into account.

Several studies have used regression analysis to attempt to test models of predation or their assumptions. The incentive to use predatory pricing to lower the acquisition cost of competitors was examined by Burns (1986, 1989). In the earlier article, Burns used regression analysis to examine how the acquisition prices of firms acquired by the American Tobacco Company from 1891-1906 were affected by the number of prior predatory episodes (the reputation effect) and how price wars directly affected the acquisition price of the prey. Burns found statistically significant coefficients consistent with predation reducing the cost of acquiring competitors through both reputation and direct effects. Burns estimated the effect of reputation was to reduce the acquisition costs by 25 per cent, with an additional discount of 56 per cent resulting from preying on the relatively smaller, fine cut tobacco, snuff, and smoking tobacco firms. Burns (1986: 290) noted that the estimated savings attributed to predation are also consistent merely with intensified, but lawful, price competition. Moreover, such a pattern of decline in the costs of acquiring competitors is also consistent with American Tobacco achieving scale economies or other efficiencies that result from the mergers (Lott (1999:6)). Burns (1989) examined direct evidence of predatory intent and suggested that litigation documents from the government's antitrust case against American Tobacco support the predation interpretation.

Scott Morton (1997) used regression analysis to examine pricing by ocean shipping conferences in response to entry, and found evidence consistent with the long purse theory. She examined British shipping conferences' reactions to entry over a 50-year period. Her dataset contained 47 cases, in which there were 14 price wars, resulting in 6 cases in which the entrant was driven out. Her main result was that new and smaller entrants were more likely to experience price wars, an observation consistent with the long purse theory of predation. Podolny and Scott Morton (1999) expanded this analysis to examine social characteristics of the entrants, which may serve as a proxy for the probability of future cooperativeness of the entrant. Lerner (1995) found similar evidence regarding prices of computer disk drives. Using a hedonic price regression, he found prices were relatively lower when the closest substitutes for that product were produced by thinly capitalized rivals. Weiman and Levin (1994) examined

evidence of predatory behavior by the Southern Bell Company from 1894 to 1912. Using regression analysis, they found that telephone prices fell immediately prior to new entry. Moreover, prices fell further after new entry. Again, while all of these papers provide evidence consistent with the use of predatory pricing, we do not know whether these price wars would be unlawful under modern predation standards, or whether such episodes resulted in reductions in welfare.

An exception is Genesove and Mullin (2006), who provided direct evidence of predation through below-cost pricing in the sugar industry at the beginning of the twentieth century by comparing sugar prices to a direct measurement of marginal cost. Direct calculation of marginal cost is made possible in this case by the simple technology involved, and the existence of relevant testimony and contemporary audits. They found episodes of prices that were below marginal cost. In addition, they constructed competitive price-cost margins, and showed that actual margins were lower than these constructed margins. They also found that predation occurred when the cost of predation was relatively small (e.g., the episodes of predation were suspended during high demand periods), and that the episodes of predatory pricing were followed by acquisitions of competitors at lower prices.

Several authors have examined whether regulation or public ownership have an effect on the likelihood of predation. Hazlett (1995) found evidence of predation in cable television markets. Such markets are characterized by the existence of network effects and are subject to regulation by local jurisdictions. Hazlett argues that these special characteristics lower the predator's costs and raise those of the prey, making such regulated markets especially susceptible to predation. This point was made more generally by Miller and Pautler (1985). Lott (1990, 1995, 1999) presents theory and evidence on differences in the likelihood of predation by public and private firms. Lott (1990) notes that unlike private firms, public enterprises can have institutional incentives to expand output, thus making predation by such firms plausible. Lott (1995) presents evidence on below-cost dumping, showing that dumping cases predominately involve state run firms.

Lott and Opler (1996) and Lott (1999) provide a specific test of the reputational models of predation discussed in Part iii. They argue that reputational models of predation require that private firms be able to credibly commit to engage in predation. To do this, they argue that managers' compensation should not be tied to short run profits. This gives managers the incentive to expand output past the level that maximizes short run profits during the predatory episode. Further, such firms also need to prevent managers from being easily removed by shareholders during the

predatory episode. Lott and Opler test these two hypotheses, and find that managers of firms accused of predation were rewarded more than managers of other firms. Moreover, they found that managers of predatory firms were not more entrenched than managers of non-predatory firms. As is the case with the evidence on predation generally, critics have noted shortcomings of the tests and evidence, and have noted that this evidence has other interpretations (Sappington and Sidak (2000)).

i Experimental evidence Experimental methods have been applied to antitrust law (see Plott (1989), Normann (2007)), and to predatory pricing in particular. Isaac and Smith (1985) examined predation in an experimental setting designed to be conducive to the observation of predatory pricing. In their experiments, predatory pricing was defined to be a price that is 'lower than would be optimal in a simple myopic (short-run) pricing strategy' and had 'the effect of preventing entry, or driving out and preventing reentry, of the prey'. Their experimental markets tailored to predatory pricing contained two firms, one large and one small. The larger firm was given a cost and 'deep pocket' resource advantage. In addition, there were sunk cost entry and reentry barriers. Variants of the experiments were conducted where the subjects did not know the demand conditions or the other seller's costs, and also where they had complete information regarding demand and cost. Despite conditions set up to be favorable to the emergence of predatory pricing, it was not observed. Harrison (1988) extended the Isaac and Smith experiments to a setting where the monopolist faced a single entrant in multiple markets. In this setting, Harrison found some evidence of predatory pricing, but the evidence is weak given that only one trial looked at multiple markets. Gomez et al. (2008) report that predation was not observed in three replications of the Harrison experiments. However, in a setting where prices were chosen after entry decisions were made and announced, predation did emerge.

A more specific experimental test of the incomplete information models of predation was performed by Jung et al. (1994). They conducted an experiment testing the incomplete information reputational equilibrium of Kreps and Wilson (1982). As noted above, entrants would prefer to enter if the monopolist is weak but not if the monopolist is strong. Marginal entry deterrence occurs when weak incumbents mimic strong ones and fight entry. In their results, Jung et al. found evidence that weak incumbents frequently fought and successfully deterred entry. Thus, while some evidence was not consistent with the particular sequential equilibrium of the Kreps and Wilson model (for example, the rate of entry increased when the experimental subjects were closer to the final period and the

entrants' rate of entry was not consistent with Bayesian updating), their experiments produced strong reputational effects.

III   Antitrust regulation of predation

a   An economic analysis of legal rules
Economists and legal scholars have argued that the goal of legal rules, including the regulation of business conduct through the antitrust laws, is to minimize the sum of direct costs and error costs (see, e.g., Posner (2002: 563), Evans and Padilla (2005), Joskow and Klevorick (1979)). Applying this analysis to predatory pricing, error costs include the costs of false negatives or type II errors (allowing anticompetitive predatory pricing) and the costs of false positives or type I errors (wrongly condemning welfare increasing price cuts or deterring efficient price competition from occurring in the first place). Direct costs include the costs imposed on society (including litigants, consumers, and the courts) associated with the enforcement of the antitrust laws to regulate predatory pricing.
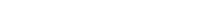
Under this framework, the optimal form and substance of a legal rule is determined by the frequency and size of the two types of error costs, as well as the costs of administering the rule. For example, if the relative cost and frequency of false positives to false negatives is high, then the optimal rule should contain both procedural and substantive safeguards that reduce the costs of false positives. As noted above,[8] the Supreme Court, in setting out a permissive rule to regulate predatory pricing, asserted that 'there is a consensus that predatory pricing schemes are rarely tried, and even more rarely successful'. More generally, Easterbrook (1984) argues that the self correcting nature of markets makes the expected costs of false positives greater than the expected costs of false negatives.

The nature of the error costs and direct costs also determines whether the optimal legal rule takes the form of an easily administered bright line rule, or a more nuanced and more difficult to administer standard. Uncertainty in the application of a nuanced standard can dramatically increase both the direct costs associated with it, raising both the frequency and cost of litigation, and the total error costs involved in enforcing such a standard. As a result, it is often the case that optimal legal rules ignore potential or speculative harms because any attempt to address them would result in an increase of direct costs far in excess of any benefit from the reduction in error costs. As Justice (then Judge) Breyer has explained in a case involving near-exclusive volume discounts:[9]

> [U]nlike economics, law is an administrative system the effects of which depend upon the content of rules and precedents only as they are applied by judges and

juries in courts and by lawyers advising their clients. Rules that seek to embody every economic complexity and qualification may well, through the vagaries of administration, prove counterproductive, undercutting the very economic ends they seek to serve.[10]

Under these conditions, use of simple to administer rules can be preferable to a more complex standard that, in theory, would better discern between welfare increasing and welfare decreasing price cuts. This is especially true when the cost of one type of error is *de minimis.* For example, use of a rule of *per se* illegality would be rational if the conduct in question involved behavior that was almost certain to be socially undesirable, and if such conduct could be easily distinguished from other types of conduct. Naked horizontal price fixing is often argued to possess such attributes. Similarly, rules of *per se* legality or the use of safe harbors would be optimal if the relative costs of type I errors are high (Boudreaux et al. (1995), Easterbrook (1981a)). Such concerns are magnified when imperfect antitrust enforcement combined with the threat of treble damages may deter procompetitive price reductions (Crane (2005)). Indeed, the Supreme Court's concerns over the administrability of a more nuanced predation standard, in addition to concerns over the high relative costs of falsely condemning pro-competitive pricing behavior and the Court's assumption that predatory pricing is rare, led to the creation of a broad safe harbor for 'above-cost' pricing conduct in *Brooke Group*.[11]

b   *Predation and optimal antitrust rules*

Predatory behavior can be broadly defined as behavior that excludes a rival and reduces the appropriate measure of welfare relative to the level that would be attained if such conduct was prohibited. While some have advocated using general welfare criteria (Scherer (1976) and Brodley and Hay (1981)), such a definition does not produce a workable or easily administrable test for predation. The impracticability of directly observing the welfare effects of a firm's behavior has led to a search for alternative definitions and tests for predatory behavior. This section reviews these tests for predatory pricing, which have been widely examined in detail elsewhere (McGee (1980), Zerbe and Cooper (1982), Ordover and Saloner (1992)).

i   The Areeda-Turner test and cost based rules   Perhaps the most influential test of predation is the cost-based test of Areeda and Turner (1975) (AT). In their seminal article, AT defined predation as selling below cost. If costs were measurable, AT would find prices above short run marginal cost lawful, and prices below short run marginal cost unlawful. Because prices would be driven to marginal cost (MC) in competitive equilibrium,

AT did not want a rule that would prevent competitive pricing by making prices above marginal cost unlawful. In contrast, prices below marginal cost are not consistent with a competitive equilibrium, and such prices would require that the predatory firm incur a profit sacrifice. Because of the difficulties of observing and measuring marginal cost, AT would use average variable cost (AVC) as a more easily observable proxy. Under the AT test, prices below AVC would be presumptively unlawful. The AT test weights heavily both the potential costs of deterring competitive price cutting, and the benefits of having a well defined, administrable standard.

Critics of the AT rule have noted that use of AVC as a proxy can be an overly permissive test, especially at output levels above q^0, the point where AVC is at its minimum. At such output levels, AVC is well below MC. As a result, such a standard allows prices that can be significantly below marginal costs. Zerbe and Cooper (1982) suggest a modified AT test where prices below average total cost (ATC) would be used for high output levels, and prices below AVC for lower output levels (see also Areeda and Turner (1978), accepting a variant of the modified AT test).

Baumol (1996) defends the use of a variant of the AVC test as the correct price floor, though he notes that AVC is not well defined. Baumol would use average avoidable costs (AAC) as the price floor, where AAC are defined to include variable costs and all fixed costs that are not sunk. Because a firm can minimize its losses by exiting whenever prices are below AAC, prices below AAC necessarily involve a profit sacrifice. AAC, and not MC, will also define the shut down point for an equally efficient rival. Thus, prices above AAC will not exclude an equally efficient rival, while prices below AAC will be exclusionary.

Others suggest modifications of the AT test that require the existence of structural preconditions as a first-stage filter (Joskow and Klevorick (1979)). The first set of factors to be examined include proxies for market power, such as the predator's market share, the size of other firms in the market, the stability of market shares, the predatory firm's profit history, and the residual elasticity of demand. The second set of factors to be examined are proxies regarding conditions of entry into the market. The third step would be to examine generally the dynamic effects of entrants on the market conditions. If the structural analysis suggests little danger of successful predation, Joskow and Klevorick would preclude plaintiffs from pursuing such cases. In cases where the first stage analysis suggests that predatory harm is possible, a price below AVC would be a sufficient but not necessary to find predation. In general, Joskow and Klevorick advocate a presumption of illegality for prices below ATC. Prices above ATC would be presumed legal unless the price cut was reversed within a reasonable period of time (for example, two years).
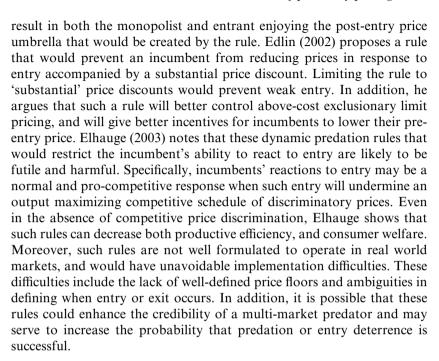
Bolton et al. (2000) also suggest a two tier test which would examine five elements. In the first tier, the plaintiff must prove: (1) a facilitating market structure; (2) a scheme of predation and supporting evidence; and (3) probable recoupment. Only if the plaintiff proves these three elements would the inquiry proceed to examine (4) whether price exceeded cost and (5) the absence of a business justification or efficiencies defense. While arguing that these elements are consistent with the traditional antitrust analysis of predatory pricing under *Brooke Group* (see discussion in Section IVa below), Bolton et al. would augment each stage of the traditional analysis to account for modern strategic analysis of the type reviewed in Section II(b) above. For example, the first stage analysis could incorporate reputational models of predation by creating a presumption of high entry and reentry barriers based on an incumbent's past reputation as a predator. Strategic theory would also allow the plaintiff a menu of alternatives as a basis for proving a scheme of predation. In addition, a coherent strategic theory supported by evidence would allow courts to apply a less demanding standard when assessing the probability of recoupment. With respect to the cost test, Bolton et al. would adopt Baumol's AAC benchmark, or use long run average incremental costs (see discussion of Ordover and Willig (1981) in Part iii of the Section, below).

ii   'Dynamic' predation rules   Others have attempted to devise tests that would go beyond the cost based rules in an attempt to detect above-cost, but strategic, pricing. Instead of relying on the static relationship between price and cost to define predation, these authors use the intertemporal price pattern of a firm engaged in strategic pricing to devise a rule against predation. Baumol (1979) would condemn prices below average incremental cost, but also would condemn price cuts above average total cost if they were quickly reversed. This test would allow aggressive pricing by the incumbent firm, but would seek to punish attempts to recoup the sacrifice of profits by making any price cuts 'quasi permanent'. Because the potential predatory firm would be required to suffer the losses of non-compensatory price cuts or output expansions over the longer period defined by the rule, such a rule would increase the costs of predation.

Williamson (1977) also examines the intertemporal implications of predatory pricing to devise his predatory pricing rule. Williamson would condemn as predatory prices below average variable costs, but would also enjoin above-cost demand-adjusted increases in output by the incumbent in response to entry. Williamson posits that his rule, which restricts the incumbent's ability to respond to entry, would induce the incumbent to increase output and lower prices prior to entry. On the other hand, critics note that such a rule of forced accommodation may

result in both the monopolist and entrant enjoying the post-entry price umbrella that would be created by the rule. Edlin (2002) proposes a rule that would prevent an incumbent from reducing prices in response to entry accompanied by a substantial price discount. Limiting the rule to 'substantial' price discounts would prevent weak entry. In addition, he argues that such a rule will better control above-cost exclusionary limit pricing, and will give better incentives for incumbents to lower their pre-entry price. Elhauge (2003) notes that these dynamic predation rules that would restrict the incumbent's ability to react to entry are likely to be futile and harmful. Specifically, incumbents' reactions to entry may be a normal and pro-competitive response when such entry will undermine an output maximizing competitive schedule of discriminatory prices. Even in the absence of competitive price discrimination, Elhauge shows that such rules can decrease both productive efficiency, and consumer welfare. Moreover, such rules are not well formulated to operate in real world markets, and would have unavoidable implementation difficulties. These difficulties include the lack of well-defined price floors and ambiguities in defining when entry or exit occurs. In addition, it is possible that these rules could enhance the credibility of a multi-market predator and may serve to increase the probability that predation or entry deterrence is successful.

iii   Predation as profit sacrifice   A broad definition of predatory behavior has been offered by Ordover and Willig (1981) (OW) based upon the observation of a profit sacrifice. The test is broader than the AT rule in that it considers as predatory non-compensatory output increases even if price is above costs. Specifically, under the OW definition of predation, an action is predatory if it would not be optimal but for its effect on inducing the exit of a rival. The OW rule requires that a predatory action satisfy two necessary conditions (Ordover and Saloner (1989)). The first is that the predatory firm has a profit motive in excluding the entrant – that is, the exit inducing strategy is more profitable than the optimal strategy with a viable entrant. The second is the requirement of profit sacrifice. That is, the exit inducing strategy is optimal if and only if exit is induced. Both conditions are necessary because the first condition without the second would require the incumbent to accommodate entry and ensure the viability of the rival. The second condition alone would result in competitive strategies being condemned because a more profitable strategy was viable.

OW apply this definition to the case of price predation by considering the effect of a strategy resulting in an incremental change in a firm's output from q_0 to $q_0 - \delta$. The increment of output δ involves a profit sacrifice if the reduction in output increases profits:

$$p_0 q_0 - c(q_0) < p'(q_0 - \delta) - c(q_0 - \delta) \qquad (6.1)$$

where p' is the price in the absence of the output increment. Equation (6.1) can be rewritten as:

$$p' \delta - (p' - p_0)q_0 < c(q_0) - c(q_0 - \delta) \qquad (6.1')$$

Assuming $p_0 = p' = p$ yields:

$$p\delta < (c(q_0) - c(q_0 - \delta)) \qquad (6.2)$$

Under Equation (6.2), an incremental increase in output δ is predatory if the incremental revenues $p\delta$ are less than the incremental costs of producing that increment of output. Equation (6.2) can be rewritten as:

$$p < (c(q_0) - c(q_0 - \delta))/\delta \qquad (6.2')$$

Since $p' > p_0$, $p\delta$ is an upper bound for the change in revenues, condition (6.2') yields a lower bound for a predatory price. For an arbitrary change in output, condition (6.2') would condemn prices that are less than the average cost of producing the incremental output, or average incremental cost (AIC). Condition (6.2') can be satisfied when the price of the good is greater than the AVC or marginal costs (MC).

OW also note that condition (6.2') can be used to derive conditions under which other traditional cost based predatory pricing rules would be used. If $\delta = 1$, then condition (6.2') becomes $p < $ MC, the preferred theoretical AT rule. Note that if price is less than the marginal cost of producing unit q_0, the firm can increase profits by not producing that unit. Thus, producing that marginal unit involves a profit sacrifice. If $\delta = q_0$, condition (6.2) becomes $p < $ Average Avoidable Costs (AAC) (Baumol (1996)). That is, if the price is below the firm's AAC, the firm can increase profits by shutting down. Thus, prices below MC and AAC are sufficient, but not necessary conditions to show a profit sacrifice.

Critics have questioned whether the OW standard would be administrable in practice (Easterbrook (1981b)). Moreover, the OW standard can result in the condemnation of welfare increasing conduct, as well as allowing welfare decreasing conduct. (Schwartz (1989), Scheffman (1981)) To illustrate the general implications of the OW standard for predatory behavior, consider a two period model where there are two firms, an incumbent I and an entrant E, competing in a market with stable demand that will last two periods. Market demand in each period is given by:

$$P = M - kQ \tag{6.3}$$

where $Q = \sum_f q_f$, where $f = \{I, E\}$.

Firm f's profits in period j are given by:

$$\pi_f^j = Pq_f^j - c_f q_f^j - F_f^j, \tag{6.4}$$

where c_f are Firm f's constant marginal costs, and F_f are Firm f's per-period fixed costs.

Under these conditions, action a_0^p by the incumbent firm I in period 0 is predatory under the OW standard if (a) the exit inducing action a_0^p is more profitable than the optimal strategy with a viable entrant, and (b) when there is a profit sacrifice, so that action a_0^p is optimal if and only if exit is induced. This implies that the following necessary conditions must be satisfied (Ordover and Saloner (1989; 587):

$$\pi_0^I(a_0^p) + \pi_1^I(a_1^*|a_0^p, E\,out) > \pi_0^I(a_0^*) + \pi_1^I(a_1^*|a_0^*, E\,in) \tag{6.5}$$

$$\pi_0^I(a_0^p) + \pi_1^I(a_1^*|a_0^p, E\,viable) < \pi_0^I(a_0^*) + \pi_1^I(a_1^*|a_0^*, E\,in) \tag{6.6}$$

where a_1^* is the incumbent's optimal action in period 1 conditional upon its actions in period 0 and the entrant's viability, and a_0^* is the incumbent's optimal non-predatory strategy in period 0.

Table 6.1 lists equilibrium outcomes under different assumptions regarding the nature of the firms' interaction, as well as demand and cost parameters. Example 1 lists the equilibrium outcomes assuming that the firms are identical, and that $M = 100$, $k = 0.5$, $c_I = c_E = 10$, and $F_I = F_E = 750$. Example 2 considers a setting where Firm E has higher fixed costs. Finally, example 3 considers a setting where Firm E has higher marginal costs, but lower fixed costs than Firm I.

Example 1 shows a case where the OW definition and test correctly condemns a welfare decreasing output expansion. In the example, Firm I's optimal non-exclusionary strategy in each period is to produce 90 units in each period. This is the relevant payoff for the right hand side of both condition (6.5) and condition (6.6). Firm E's best response is to produce 45 units in both periods, which results in the entrant's profits being 262.5. The total number of units equal 135, which results in a market price of 32.5. Firm I's net profits will equal 1275 in each period, for an undiscounted two period total of 2550. Total and consumer welfare equals 9112.5 and 12,187.5 respectively.

Suppose that Firm I instead pursues an exclusionary strategy where it commits to producing 103 units in periods 1 and 2. If Firm E has already

Table 6.1 Duopoly equilibrium outcomes

	cI, cE	FI, FE		Mono-poly	Cournot	Optimal First Mover (Firm E viable)	Exclusionary Output Expansion	
							First Period	Second Period
1.	10,10	750,750	P	55	40	32.5	29.25	48.5
			qI	90	60	90	103	103
			qE		60	45	38.5	0
			πI	3300	1050	1275	1232.75	3215.5
			πE		1050	262.5	-8.875	0
			AVCI	18.3	22.5	18.3	17.28	17.28
			AVCE		22.5	26.7	29.48	
			CW	2025	3600	4556.25	5005.6	2662.25
			TW	5325	5700	6093.75	6229.4	5867.75
2.	10,10	750,1050	P		40	33	32.5	55
			qI		60	88	90	90
			qE		60	46	45	0
			πI		1050	1274	1275	3300
			πE		1050	8	−37.5	0
			AVCI		22.5	18.52	18.33	18.33
			AVCE		27.5	32.82	33.33	
			CW		3600	4489	4556.25	2025
			TW		5400	5571	5793.75	5325
3.	10,14	750,300	P		44	33.5	26	38
			qI		57.33	94	124	124
			qE		54.67	39	24	0
			πI		1199.33	1459	1234	2722
			πE		1340	460.5	−12	0
			AVCI		23.08	17.98	16.05	16.05
			AVCE		19.49	21.69	26.5	
			CW		3136	4422.25	5476	3844
			TW		5675.33	6341.75	6698	6566

incurred its fixed costs F_E of 750, it will respond optimally by producing 38.5 units in the first period. This will result in negative net profits for Firm *E*. In the second period, Firm *E* will choose not to incur its fixed costs and would exit the market. Price falls to 29.25 in the first period, and rises to 48.5 in the second. Compared to the non-exclusionary first mover strategy, the incumbent's profits under the exclusionary commitment are 3215.5 in the first period, a profit sacrifice of 42.25 relative to the non-exclusionary first mover payoffs. However, due to the exit of Firm *E*, profits in the second period rise to 3215.5, for a two period net increase of

1898.25 over the non-exclusionary first mover payoff. Thus condition (6.5) is satisfied. Moreover, condition (6.6) is also satisfied, as the production of 103 units in the first period results in a profit sacrifice. Thus, the commitment to produce 103 units would be predatory under OW criteria (6.5) and (6.6). In addition, such a commitment would be condemned under a welfare standard, as both consumer and total welfare falls relative to the non-exclusionary first mover equilibrium.

However, the OW standard can result in the erroneous condemnation of welfare increasing output expansions (type I error), as well as the erroneous failure to condemn welfare decreasing output expansions (type II error). Row 2 of Table 6.1 illustrates a type II error. In this case, Firm *I* excludes Firm *E*, which has higher per period fixed costs, with a commitment to produce 90 units in both periods. However, this commitment is not predatory under the OW test. Here, the incumbent's commitment to produce 90 units in both periods results in higher exclusionary profits than if Firm *E* were not excluded. Thus condition (6.5) is satisfied. However, there is no profit sacrifice associated with the commitment to produce 90 units, as the best non-exclusionary output level (88 units) results in lower profits for Firm *I*. Thus, this exclusionary level of output would not be condemned as predatory under the OW test. However, relative to an equilibrium where Firm *E* is viable, both consumer and total welfare fall.

Row 3 illustrates a type I error. In this example, Firm *I* uses an output commitment to produce 124 units in each period, which would be predatory under conditions (6.1) and (6.2). Relative to the optimal first mover payoffs where 90 units are produced in both periods, a profit sacrifice is incurred in period 1, and overall profits for Firm *I* increase. However, the output expansion from 90 to 124 units results in an increase in both consumer and total welfare. Table 6.2 summarizes the outcome of the OW test, a Consumer Welfare (CW) or Total Welfare (TW) test in each of the examples listed in Table 6.1.

Note that in all cases, the equilibrium price is above the AVC of Firm *I*, and indeed is above MC. Thus an AT cost based test would not condemn any of the examples presented here. However, one advantage of the cost based tests is that they would be easier to administer than the OW test. Consider example 1, where Firm *I* and Firm *E* have equal costs. As noted above, the correct application of the OW test would find that the output expansion to 103 units was both predatory and welfare reducing relative to a non-exclusionary level of output where Firm *I* produces 90 units in each period.

An AT cost based test would only look at current prices and their relationship to the appropriate measure of cost. The OW test would also have to measure current price, cost and output. In addition, the OW test

Table 6.2   Summary

Example	Exclusion Profitable	Profit Sacrifice	Predatory Under OW Test	Consumer Welfare	Total Welfare	Price > AVCI
1	Yes	Yes	Yes	Falls	Falls	Y
2	Yes	No	No	Falls	Falls	Y
3	Yes	Yes	Yes	Rises	Rises	Y

would require the measurement of these variables for the correct but-for equilibrium output. In practice, use of the OW test will be feasible when the correct but-for output can be observed directly from historical data, e.g., when it equalled the historical non-exclusionary equilibrium output levels. However, the but-for level of non-exclusionary output may not be readily observable. Suppose, for example that in period 0, firms I and E are Cournot duopolists. Under the Cournot equilibrium, each firm would produce 60 units, and the market price per unit would be 40. Now suppose that Firm I commits to producing the exclusionary level of output (103 units) in periods 1 and 2. Relative to the period 0 Cournot equilibrium, we observe an exclusionary output expansion of 43 units, an increase in Firm I's profits in both period 1 and period 2, and increases in both consumer and total welfare.[12] Thus, measured relative to the observed past output levels of Firm I, the erroneously applied OW test would not find the expansion to be predatory because of the absence of a profit sacrifice relative to historical output levels. Moreover, because both measured total and consumer welfare rise, the erroneously applied test apparently achieves the correct result. The problems of observing the correct but-for output level will be even more acute when antitrust regulators are faced with data from real markets in which the optimal strategies are not precisely defined.

IV   Antitrust law and predation

a   The courts and predation
As a matter of antitrust regulation, predatory pricing is examined under Section 2 of the Sherman Act,[13] as well as under Section 13 of the Robinson-Patman Act.[14] While predatory pricing cases were not common after the passage of the Sherman Act in 1890, the number of cases increased after the passage of the Robinson-Patman Act in 1936, with the plaintiff winning the majority of cases (Koller (1971)). Early cases often focused on harm to competitors, predatory intent, and vague notions of below-cost pricing or ruinous competition, with little concern for consumer welfare,

the benefits of lower prices, or protection of vigorous competition (Areeda and Hovenkamp (2002: 276), Bolton et al. (2000: 2250)). For example, in *Utah Pie*,[15] a predation case brought under the Robinson-Patman Act, the Supreme Court held that predatory intent could be inferred from the defendant's internal memoranda or from the observation of a declining price structure. The Court did not require that the plaintiff show that the predatory scheme was likely to succeed. Nor did the Court provide any coherent basis for distinguishing predatory pricing from procompetitive price competition (Boudreaux et al. (1995)).

These shortcomings were quickly addressed by the courts after the publication of the Areeda and Turner article in 1975. The lower courts rapidly adopted an average variable cost approach to defining predation. Some courts also expanded the analysis beyond the AT cost based test to include other factors, including market structure and proof of intent (see Brodley and Hay (1981), Hurwicz and Kovacic (1982), Areeda and Hovenkamp (2002: 278–9) for a listing of cases). However, even those courts that consider these other factors overwhelmingly use price-cost comparisons as the presumptive test for predation (Areeda and Hovenkamp (2002: 279)).The vast majority of the circuit courts adopt a test where prices above average total cost are lawful, those below average variable cost are presumptively illegal, and prices between ATC and AVC are presumptively legal, although the plaintiff may rebut the presumption of legality with evidence of intent or by proving that the market had structural characteristics conducive to successful predation.[16] While the AT cost based test provided a more predictable standard for separating predation than prior rules based on intent, the rule spawned litigation over both the appropriate measure of cost to be used as the price floor and whether certain costs should be included in calculating a given price floor. For example, in circuits adopting the AVC rule, much of the litigation centered on litigants' attempts to categorize certain costs as variable versus fixed.

The lower courts' evolution to cost based rules was quickly followed by Supreme Court cases in which the Court placed heavy weight on avoiding type I errors in predatory pricing cases. In *Matsushita*, the Court dismissed claims by two US television manufacturers against a group of 21 Japanese producers of televisions. The complaint alleged the defendants conspired to raise prices in Japan in order to subsidize below-cost pricing in the US. The Court concluded that summary judgment for the defendants was appropriate, noting the speculative nature of predatory pricing schemes, the structural characteristics of the market, including the absence of barriers to entry, which made successful predation unlikely, and the absence of evidence relevant to the predatory pricing conspiracy. The Court noted, citing McGee (1958, 1980), Easterbrook (1981a), and Koller (1971), that

there is a 'consensus among commentators that predatory pricing schemes are rarely tried, and even more rarely successful'. Noting that these observations applied to predation by a single firm, the Court observed that this would apply *a fortiori* to a predatory pricing conspiracy of the type alleged by the plaintiffs in *Matsushita*. In addition, the Court noted the high costs of false positives, commenting that such errors 'are especially costly, because they chill the very conduct the antitrust laws are designed to protect'.[17] The Court did not find it necessary to address the price-cost issue, but in a footnote noted that there would be no antitrust injury unless the firms conspired to drive the victims out of the markets by (i) pricing below the level necessary to sell their products, or (ii) some appropriate measure of cost.

The Supreme Court's decision in *Brooke Group* further advanced a predatory pricing rule that would minimize type I errors. *Brooke Group* involved an antitrust challenge to volume discounts on generic cigarettes brought under the primary line price discrimination provision of the Robinson-Patman Act. The plaintiff filed a suit, alleging among other things, that the defendant's 'discriminatory volume rebates to wholesalers violated the Robinson-Patman Act by furthering a predatory pricing scheme designed to purge competition from the economy segment of the cigarette market'.[18] After a lengthy trial, the jury returned a verdict for the plaintiff on the primary-line Robinson Patman claim and awarded the plaintiff $49.6 million in damages, which was trebled to $148.8 million. However, the district court judge granted the defendant's motion for judgment as a matter of law and set aside the jury verdict. The Fourth Circuit Court of Appeals affirmed. The US Supreme Court granted certiorari, and also affirmed.

In its opinion, the Court held that plaintiffs who allege predatory pricing under Section 2 of the Sherman Act or under the Robinson Patman Act must satisfy two 'not easy to establish' requirements. First, the plaintiff must prove that the alleged predatory prices are below an appropriate measure of the defendant's costs.[19] While the Court did not specify which threshold of cost applied, it rejected 'the notion that above-cost prices that are below general market levels or the costs of a firm's competitors inflict injury to competition cognizable under the antitrust laws', and stated unequivocally that 'a plaintiff seeking to establish competitive injury resulting from a rival's low prices must prove that the prices complained of are below an appropriate measure of its rival's costs'.[20]

Second, the Court held that the plaintiff must also demonstrate that the defendant had a reasonable prospect or, under Section 2 a dangerous probability, of recouping its investment in below-cost prices. The mere fact of below-cost pricing, even if combined with the (nearly always

present) theoretical possibility of recovery, was insufficient, and the Court held that a case should be summarily dismissed without proof of the likelihood of 'sustained supracompetitive pricing' and recoupment. This second requirement would allow the courts, in some cases, to screen out cases without having to perform the fact intensive and costly Areeda Turner cost test (Hemphill (2001), Boudreaux et al. (1995) and Elzinga and Mills (1984)).

Applying the two requirements to the facts of the case, the Court found that, despite evidence of anticompetitive intent and evidence that the defendant's prices net of the volume discounts were below the appropriate measure of costs, the defendant was entitled judgment as a matter of law because the plaintiff failed to demonstrate competitive injury. The Court found that the defendant faced substantial competition from rivals, and thus stood to gain only a fraction of any potential benefits that would have resulted from a predatory episode. The Court held that the evidence in the case was 'inadequate to show that in pursuing this scheme, [the defendant] had a reasonable prospect of recovering its losses from below-cost pricing through slowing the growth of generics'.[21] The Court rejected the theoretical possibility of harm as a basis for liability, noting that '[w]hen an expert opinion is not supported by sufficient facts to validate it in the eyes of the law, or when indisputable record facts contradict or otherwise render the opinion unreasonable, it cannot support a jury's verdict'.[22]

The Court adopted this test in large part to provide an administrable test for predatory pricing that would avoid the high cost of type I errors. As the Court explained:

> Low prices benefit consumers regardless of how those prices are set, and so long as they are above predatory levels, they do not threaten competition . . . We have adhered to this principle regardless of the type of antitrust claim involved. As a general rule, the exclusionary effect of prices above a relevant measure of cost either reflects the lower cost structure of the alleged predator, and so represents competition on the merits, or is beyond the practical ability of a judicial tribunal to control without courting intolerable risks of chilling legitimate price cutting. To hold that the antitrust laws protect competitors from the loss of profits due to such price competition would, in effect, render illegal any decision by a firm to cut prices in order to increase market share. The antitrust laws require no such perverse result. (citations and internal quotations omitted)[23]

The Court's skepticism of predatory pricing claims expressed in its *Brooke Group* decision quickly filtered down to the lower courts. Bolton et al. (2000), Zerbe and Mumford (1996), Denger and Herfort (1994), Hemphill (2001) and Areeda and Hovenkamp (2002) all report that plaintiff success rates, low in years just prior to the Court's *Brooke Group* decision, dropped to near zero after the Court's decision.
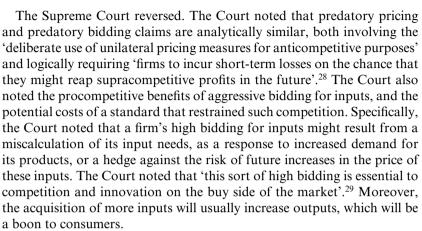
b   Challenges to the Brooke Group rule

The Court's *Brooke Group* 'hard to satisfy' rule has limited the viability of conventional, single product predatory pricing claims. However, exclusionary pricing behavior has not gone unchallenged in the courts. Litigation continues over the appropriate measure of cost. In addition, plaintiffs have shifted from conventional predatory pricing claims to claims based on market share discounts, bundled pricing of multiple products, and predatory buying (Hovenkamp (2006)). The Supreme Court has addressed the predatory buying issue, applying the *Brooke Group* rule to this activity. However, litigation over the other three issues continues in the lower courts.

i   Weyerhaeuser and predatory buying   The Supreme Court recently examined a case of predatory buying in *Weyerhaeuser v. Ross-Simmons Hardwood Lumber Co*.[24] Both companies operated hardwood lumber sawmills in the Pacific Northwest and purchased alder logs, the dominant species of hardwood lumber in this geographic region, as inputs. The logs were processed into hardwood finished lumber. Weyerhaeuser had become a dominant purchaser of alder logs, acquiring approximately 65 per cent of the alder logs available in the region by 2001. Because there was not a separate market for finished alder lumber, Weyerhaeuser did not have market power in the output market, having a 3 per cent market share in a national hardwood lumber market. The plaintiff/respondent Ross-Simons shut down its mill in 2001 as a result of increasing prices of alder logs and lower prices for hardwood finished lumber. Ross-Simons sued Weyerhaeuser under Section 2 of the Sherman Act, alleging that Weyerhaeuser had engaged in predatory buying, driving up the prices of alder logs in order to exclude it from the market.

At trial, a jury found Weyerhaeuser guilty of monopolization. The district court rejected Weyerhaeuser's attempts to have the court apply the *Brooke Group* test to the case. Instead, the court instructed the jury that the standard for monopolization was if Weyerhaeuser 'purchased more logs than it needed, or paid a higher price for logs than necessary, in order to prevent [Ross-Simons] from obtaining the logs they needed at a fair price'.[25] The Ninth Circuit affirmed the verdict. It also rejected the application of the *Brooke Group* test, noting that predatory buying was analytically distinct from sell-side predatory pricing because predatory buying 'does not necessarily benefit consumers or stimulate competition in the way that predatory pricing does'.[26] As a result, the Ninth Circuit concluded that 'the concerns that led the *Brooke Group* Court to establish a high standard of liability in the predatory pricing context do not carry over to this predatory bidding context with the same force'.[27]

The Supreme Court reversed. The Court noted that predatory pricing and predatory bidding claims are analytically similar, both involving the 'deliberate use of unilateral pricing measures for anticompetitive purposes' and logically requiring 'firms to incur short-term losses on the chance that they might reap supracompetitive profits in the future'.[28] The Court also noted the procompetitive benefits of aggressive bidding for inputs, and the potential costs of a standard that restrained such competition. Specifically, the Court noted that a firm's high bidding for inputs might result from a miscalculation of its input needs, as a response to increased demand for its products, or a hedge against the risk of future increases in the price of these inputs. The Court noted that 'this sort of high bidding is essential to competition and innovation on the buy side of the market'.[29] Moreover, the acquisition of more inputs will usually increase outputs, which will be a boon to consumers.

Based on the analytical similarity, and noting that 'successful monopsony predation is probably as unlikely as successful monopoly predation', the Court held that the 'two-pronged *Brooke Group* test should apply to predatory bidding'. Specifically, a predatory bidding plaintiff must prove that the predatory bidding led to a below-cost pricing of the predator's outputs. A plaintiff must also prove that the defendant has a dangerous probability of recouping the losses incurred in bidding up input prices through the exercise of monopsony power. In adopting the *Brooke Group* test, the Court rejected the open ended standard given to the jury, a standard that Hovenkamp (2006) called 'an antitrust disaster of enormous proportions'. It also rejected use of more general tests of monopolization (Lambert (2007)). In doing so, the Court again adopted an administrable standard that would avoid type I errors. The Court held that:

> As with predatory pricing, the exclusionary effect of higher bidding that does not result in below-cost pricing 'is beyond the practical ability of a judicial tribunal to control without courting intolerable risks of chilling legitimate' procompetitive conduct. Given the multitude of procompetitive ends served by higher bidding for inputs, the risk of chilling procompetitive behavior with too lax a liability standard is as serious here as it was in *Brooke Group*. Consequently, only higher bidding that leads to below-cost pricing in the relevant output market will suffice as a basis for liability for predatory bidding.[30]

Some have criticized the Court's symmetry analysis. A proper test under the Court's symmetry analysis would compare the price paid for the logs to the derived demand for the input. Instead, the Court's test compares the price and cost of the output. Moreover, the symmetry argument requires that the welfare of input suppliers be equated to the welfare of output purchasers, versus a narrower approach based on consumer welfare that
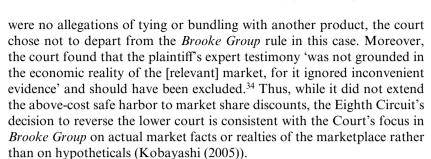
the Court seems to invoke (Werden (2007), Blair and Lopatka (2008)). Moreover, the *Weyerhaeuser* case involved only monopsony in the input market and not the danger of monopoly in the relevant output market. In cases where the latter is present, predatory bidding may result in a greater incentive to engage in predation (Blair and Lopatka (2008), Hylton (2008)). This has led some to question whether the permissive rule in *Weyerhaeuser* will or should be applied to cases involving both input market monopsony and output market monopoly. Others have noted that the permissive rule should not apply in cases where excess inputs purchased are not used to expand output, as this will not result in increased output and lower prices to consumers (Blair and Lopatka (2008)). Salop (2005) proposes a similar rule, but would also not apply the permissive *Brooke Group* standard to predatory bidding that serves to raise rivals costs.

ii   Loyalty discounts, market share discounts   Lower courts recently have carved out several potential exceptions to the *Brooke Group* safe harbor for above-cost pricing conduct. For example, in *Concord Boat*, the Eighth Circuit suggested that an exception to the *Brooke Group* safe harbor might be appropriate when above-cost pricing is combined with an additional element or 'plus factor'.[31] In the case of *Concord Boat*, the potential plus factor was the use of market share based discounts rather than the traditional volume discounts at issue in the *Brooke Group* case. That is, instead of discount thresholds based on absolute volume, the discount triggers in *Concord Boat* were based upon the percentage share of a buyer's total purchases of products (in this case, boat engines) purchased from the defendant Brunswick. Specifically, buyers were given a 3 per cent discount for purchasing 80 per cent or more of their engines from Brunswick, a 2 per cent discount for shares between 70 and 80 per cent, and a 1 per cent discount for shares between 60 and 70 per cent. Purchasers that met these thresholds received discounts on all units purchased from Brunswick.

While the court noted that no one had argued that the defendant's market share discounts drove its prices below costs, and that the 'the decisions of the Supreme Court in *Brooke Group* and *Matsushita* illustrate the general rule that above cost discounting is not anticompetitive', it stopped short of endorsing the defendant's argument that any pricing practice that leads to above-cost prices is *per se* lawful under the antitrust laws.[32] Despite rejecting the defendant's *per se* legality argument, the Eighth Circuit reversed a jury verdict for the plaintiff. The court noted that cases in which courts previously had explicitly rejected a rule of *per se* legality for above-cost pricing all involve bundling or tying, which 'cannot exist unless two separate product markets have been linked'.[33] Because only one product, stern drive engines, was at issue here, and because there

were no allegations of tying or bundling with another product, the court chose not to depart from the *Brooke Group* rule in this case. Moreover, the court found that the plaintiff's expert testimony 'was not grounded in the economic reality of the [relevant] market, for it ignored inconvenient evidence' and should have been excluded.[34] Thus, while it did not extend the above-cost safe harbor to market share discounts, the Eighth Circuit's decision to reverse the lower court is consistent with the Court's focus in *Brooke Group* on actual market facts or realties of the marketplace rather than on hypotheticals (Kobayashi (2005)).

iii   The airline cases and opportunity cost   A serious challenge to the *Brooke Group* rule's above-cost safe harbor is contained in the Sixth Circuit's holding in *Spirit Airlines*.[35] The Sixth Circuit held that an expansion of capacity in response to a rival's entry might be unlawful even if the price exceeded all relevant measures of cost.[36] Citing the testimony of the plaintiff's expert witness, the court reasoned that the incumbent's optimal response based on static price theory should be to lower price and output in response to entry. Thus, the observed addition of capacity was not consistent with the maximization of short term profits by the incumbent. Moreover, the court treated the addition of capacity as separate non-price conduct and, as a result, argued that there may be grounds to depart from the *Brooke Group* safe harbor. In effect, the Court adopted a 'dynamic' test of predation similar to that proposed by Williamson (1977, discussed in Section III(b)(ii)). The Sixth Circuit's creation of a potential exception to the *Brooke Group* rule based on an expansion of capacity is a significant departure from the *Brooke Group* rule. *Spirit* did not involve multiple products that were tied or bundled, and thus does not seem to fall within the existing exceptions to the *Brooke Group* rule identified by the Eighth Circuit in *Concord Boat*. Moreover, the lowering of price and the expansion of capacity in response to entry can be consistent with a rational dynamic response to entry and does not seem to rise to the level of a sufficient plus factor that would create an economically rational reason to deviate from *Brooke Group* (see Elhauge (2003) (criticizing dynamic predation tests), Areeda and Hovenkamp (2006: 312) (discussing the court's confusion on this issue)). In contrast, the Tenth Circuit in *US v. AMR Corp.*[37] applied the *Brooke Group* rule despite the Justice Department's position that the *Brooke Group* rule should not govern predatory capacity expansions (Werden (2003), Areeda and Hovenkamp (2006: 304–13)).

The recent airline cases illustrate other complications that can occur under a *Brooke Group* analysis. In both *Spirit* and *AMR,* the courts considered an 'incremental' version of the *Brooke Group* cost test. Specifically, in addition to considering a test based on whether total

revenues exceeded total variable costs for all flights on a given route, the courts also considered a test that compared whether the incremental profits that resulted from the addition of capacity to certain routes exceeded the incremental costs of adding this capacity (see generally, Ordover and Willig (1981), discussed in Section III(b)(iii)). Moreover, in both of these cases the courts considered measures of opportunity cost instead of accounting based measures of cost. One of the proposed cost measures used the forgone profits that resulted from the diversion of capacity (an aircraft) from another, more profitable, route as the appropriate measure of the opportunity costs of the aircraft rather than using leasing costs or other accounting measures of cost. While the *AMR* court rejected the use of such a measure of opportunity cost, the *Spirit* court accepted forgone revenues as part of the incremental costs of expanding output (Areeda and Hovenkamp (2006: 304–11)). Areeda and Hovenkamp note that use of opportunity cost can in theory send courts on 'ill-defined fishing expeditions in search of hypothetical, more profitable investments that a firm might have made'.[38] However, they argue that this criticism does not apply to the airline cases, as the shift of capacity in these cases involves identifiable shifts of aircraft from one market to another that makes calculation of the opportunity cost of forgone revenues feasible.

The airline cases also illustrate many other complications in applying the *Brooke Group*/AT cost-based test. Incremental revenue calculations must account for the fact that many passengers in hub and spoke systems will generate revenue by flying connecting segments (Elhauge (2003)). In addition, the court in *Spirit* accepted the plaintiff's analysis that separated out leisure from business travel as separate sub-markets for purposes of the incremental price-cost calculation. But use of sub-markets requires that the courts address the difficult issue of how joint and common costs are to be allocated (see Ordover and Willig (1981), Baumol (1996) for discussion of approaches to this issue generally, Werden (2003) for a discussion of the Justice Department's approach to this issue in *AMR*). Both the attempt to allocate joint and common costs between sub-markets and the attempt to use forgone profits as a measure of opportunity costs added to the number and complexity of the issues litigated in these cases. And while these developments improve the economic analysis by considering marginal revenues and costs as well as concepts such as opportunity costs, they also reduce the benefits of the *Brooke Group* rule related to the administrability of the rule and the ability to reduce the direct costs of predatory pricing litigation.

iv   Multiproduct firms and bundling   Another area in which the lower courts have departed from the *Brooke Group* rule is multiproduct bundling.

As noted in Part ii of this Section above, the Eighth Circuit remarked in *Concord Boat* that the *Brooke Group* safe harbor for above-cost pricing has not been applied to pricing conduct when bundling or tying is involved. An early, pre *Brooke Group* example of this is the Third Circuit's decision in *SmithKline Corp. v. Eli Lilly & Co.*[39] In that case, the Third Circuit upheld a district court's decision that Lilly violated Section 2 of the Sherman Act by offering multiproduct bundled discounts (in the form of rebates) when selling cephalosporin antibiotics to hospitals. The district court explained its holding by noting that:

> a monopolist does not receive immunity merely because it has priced the product at issue above its average cost. For the immunity is lost when it uses a pricing scheme linking the monopolistic products (Keflin and Keflex) with another competitive product (Kefzol) to deter SmithKline from entering or effectively competing in the cephalosporin market. We should be ever mindful that the gravamen of this complaint and my holding are not that the prices which Lilly separately charges for Keflin or Keflex are unreasonable from an antitrust standpoint; the nub of this case is the linkage of these latter products in a pricing scheme to deter competition in Kefzol.[40]

The lower courts also rejected application of the *Brooke Group* above-cost safe harbor in several other cases involving bundling. However, in contrast to the outcome in *SmithKline*, the courts rejected the plaintiffs' claims in these cases, largely because the plaintiffs failed to present sufficient evidence in support of their legal and economic theories (see Kobayashi (2005) for a discussion of these cases).[41] While the lower federal courts have generally followed the Supreme Court's general focus on market realities over hypotheticals, the Third Circuit's en banc holding in *LePage's v. 3M* is a notable exception. In this case, the Third Circuit upheld a jury verdict that found 3M's use of bundled rebates violated Section 2 of the Sherman Act.[42] As was the case in *Brooke Group,* the generic competitor alleged that the brand name incumbent used pricing behavior to exclude the generic competitor from the market, in part so that the brand name incumbent could diminish the effect generic competition was having on its branded product. However, in contrast to the traditional volume discounts used by the defendant in *Brooke Group,* 3M used bundled rebates. 3M's bundled rebates gave large retailers (such as Wal-Mart, K-Mart, and Target) discounts if they purchased certain volumes of various 3M products. The size of the bundled rebates increased when retailers met volume goals across six product categories, with the largest rebates going to retailers that met the volume targets in all six categories. The use of bundled rebates was challenged by LePage's, the leading manufacturer of unbranded transparent tape. LePage's alleged that the 3M's use of bundled rebates caused retailers to drop LePage's as a supplier not because of competition on the

merits, but rather because of the possibility that they might fail to qualify for the largest bundled rebates.

A jury found that 3M's practices violated Section 2 of the Sherman Act. A Third Circuit panel reversed,[43] but the Third Circuit, sitting en banc, upheld the jury's verdict on the Section 2 bundling claims. As was the case in its earlier decision in *SmithKline*, the en banc Third Circuit explicitly rejected the defendant's arguments that its bundled rebates were lawful under a modified *Brooke Group* safe harbor, because the plaintiff failed to show that any of the bundle prices were below the cost of the bundle. The Third Circuit then concluded that it was sufficient for LePage's to prove that it could not compete with 3M's bundled rebates because 'they may foreclose portions of the market to a potential competitor who does not manufacture an equally diverse group of products and who therefore cannot make a comparable offer'.[44] Although the Third Circuit suggested that 3M's bundled rebates could exclude an equally efficient competitor, it did not cite any evidence that the bundled rebates would exclude such a competitor. Thus, the Third Circuit would allow a jury to find a dominant firm liable under the antitrust laws based on *the possibility* that bundled rebates, including those that yield customers discounts, could exclude an equally efficient competitor that produces a less diverse set of products. The plaintiff would not have to show that it was an equally efficient competitor, nor would it have to prove that the bundled rebates in question would have, in fact, excluded a hypothetical equally efficient competitor.

As a result, *LePage's* generated much uncertainty over the legality of using a ubiquitous practice. The Third Circuit exposed to potential antitrust liability any firm found to possess sufficient market power that chooses to offer discounts on a bundle of products that are also sold separately by firms that sell only a subset of these products. The potential for liability will result in such firms being deterred from using bundling that would have led to reduced prices for consumers and higher welfare. Thus, this decision is likely to impose the high type I error costs that led the Court to its hard-to-satisfy *Brooke Group* rule.

The Ninth Circuit recently addressed the issue of multi product price discounts in *Cascade Health Solutions v. PeaceHealth*.[45] In that case, the Ninth Circuit vacated a jury verdict for the plaintiff, explicitly rejecting the Third Circuit's approach to bundled discounts contained in *LePage's*. In *Cascade Health Solutions,* the plaintiff, which operated a hospital that offered only primary and secondary health services, successfully argued that a contract between PeaceHealth, a firm operating hospitals that provided primary, secondary, and tertiary services, and two Preferred Provider Organizations (PPOs) contained an unlawful bundled discount.[46] The bundled discounts were held to violate Section 2 of the Sherman Act

despite being solicited by the PPOs. Moreover, the two affected PPOs insured approximately 15 per cent of commercial insurance patients, and the challenged discounts covered only two of 45 plans offered by 28 commercial health insurance companies in the relevant antitrust market. In a stark example of the type of result made possible by the Third Circuit's standard-free ruling in *LePage's*, the district court instructed the jury that:

> [b]undled pricing occurs when price discounts are offered for purchasing an entire line of services exclusively from one supplier. Bundled price discounts may be anti-competitive if they are offered by a monopolist and substantially foreclose portions of the market to a competitor who does not provide an equally diverse group of service and who therefore cannot make a comparable offer.[47]

The Ninth Circuit reversed, and remanded the case, holding instead that the plaintiff must prove that the bundled discount would exclude a hypothetically equally efficient competitor (HEEC).[48] The court held that:

> the primary anticompetitive danger posed by a multi-product bundled discount is that such a discount can exclude a rival is who is equally efficient at producing the competitive product simply because the rival does not sell as many products as the bundled discounter. Thus, a plaintiff who challenges a package discount as anticompetitive must prove that, when the full amount of the discounts given by the defendant is allocated to the competitive product or products, the resulting price of the competitive product or products is below the defendant's incremental cost to produce them. This requirement ensures that the only bundled discounts condemned as exclusionary are those that would exclude an equally efficient producer of the competitive product or products.[49]

However, the HEEC or 'attribution' test does not successfully differentiate between pro competitive and anticompetitive bundled discounts, and may pose a significant risk to procompetitive behavior (Kobayashi (2007), Carlton and Waldman (2008)). Because of this, academic proponents of the HEEC test would place strict limits on the use of this test by requiring that the plaintiff prove harm to competition, a probability of recoupment and an absence of competitive substitutes for the bundle (see Lambert (2005), Areeda and Hovenkamp (2006: 322)). Because the Ninth Circuit's approach in *PeaceHealth* fails to incorporate adequate limits, including a recoupment requirement, it, like the Third Circuit's approach in *LePage's*, poses a significant risk to procompetitive behavior.

V Conclusion

Areeda and Hovenkamp (2006: 323) noted that other areas of the law of monopolization are 'in much the same position as the theory of predatory pricing was in the 1970s: no shortage of theories, but a frightening

inability of courts to assess them'. In the past two decades, scholarship on the economics of predatory pricing has evolved from the relatively settled consensus in which predatory pricing was thought to be irrational, rarely tried, and even more rarely successful, to a point where much less is settled. Recent theoretical work emphasizing strategic theory has shown that predation can be rational, and empirical studies have presented evidence consistent with successful predation. In this sense, the economics of predatory pricing has moved closer to other areas of monopolization.
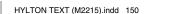
However, the legal response to predatory pricing, a relatively administrable and permissive rule based in part on the assumption that successful predation was rare, has remained relatively intact. While the recent economic literature may have eroded this basis for the adoption of permissive standards for predatory pricing, other reasons for adopting such a rule, based on the benefits of bright line rules that would be administrable by courts, still remain. That is, the purpose of the Supreme Court's approach to predatory pricing in *Brooke Group* is not to provide an accurate and economically sophisticated measure of profit sacrifice or to accurately gauge intent. As Areeda and Hovenkamp (2006: 324) note:

> [t]he reason these tests for predatory pricing were adopted was *not* because there is widespread consensus that above-cost pricing strategies can never be anticompetitive in the long run. Rather, it is because our measurement tools are too imprecise to evaluate such strategies without creating an intolerable risk of chilling competitive behavior.
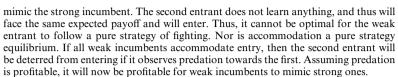
Thus, even considering the recent advances in economic theory, it is unwise to minimize or ignore this underlying purpose of the *Brooke Group* rule, or to ignore the cautionary words of then Judge Breyer from *Barry Wright*. That is, as the *Brooke Group* tests 'seek to embody every economic complexity and qualification', the risk grows that such rules 'may well, through the vagaries of administration, prove counterproductive, undercutting the very economic ends they seek to serve'.[50]

Notes

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2. *Matsushita Electric Industrial Co. v. Zenith Radio Corp.*, 475 US 574, 589 (1986).
3. *Brooke Group Ltd. v. Brown &Williamson Tobacco Corp.,* 509 US 209, 226 (1993).
4. *Standard Oil Co. v. United States*, 221 US 1 (1911). McGee does not dispute that Standard Oil obtained a monopoly in refining. The article focuses on the absence of evidence that predatory prices were used. Indeed, McGee notes that he would have preferred that predatory pricing was used, as this would have allowed consumers to benefit from the low prices. Granitz and Klein (1996) argue that Standard Oil created market power by cartelizing the transportation of oil.
5. See Kreps, Milgrom, Roberts and Wilson (1982). Suppose the weak firm fights entry to

mimic the strong incumbent. The second entrant does not learn anything, and thus will face the same expected payoff and will enter. Thus, it cannot be optimal for the weak entrant to follow a pure strategy of fighting. Nor is accommodation a pure strategy equilibrium. If all weak incumbents accommodate entry, then the second entrant will be deterred from entering if it observes predation towards the first. Assuming predation is profitable, it will now be profitable for weak incumbents to mimic strong ones.

6. As noted by Zerbe and Mumford, both the Koller study and the Zerbe and Cooper studies 'ultimately rely on subjective interpretations' (Zerbe and Mumford (1996: 958)). In the Zerbe and Cooper article, cases were coded as a 'Success' or a 'Failure' in their table of cases (Table 3 in the article) depending upon whether 'the price cut succeeds in compromising competition'. Zerbe and Cooper (1982: 655). Zerbe and Mumford classify the 27 cases coded as a 'success' in their original paper as cases where the predator 'was successful in raising prices, or would have been successful but for the lawsuit'. See Zerbe and Mumford (1996: 958).

7. McGee (1960) also examined ocean shipping cartels and noted the exclusionary effect of the deferred rebates.

8. See the discussion accompanying notes 2 and 3 *supra*.

9. *Barry Wright Corp. v. ITT Grinnell Corp.*, 724 F.2d 227, 234 (1st Cir. 1983). For a similar view, see Hovenkamp (2005: 47, noting that 'there is relatively little disagreement about the basic proposition that often our general judicial system is not competent to apply the economic theory necessary for identifying strategic behavior as anticompetitive. This makes the development of simple antitrust rules critical. Antitrust decision making cannot consider every complexity that the market presents.')

10. See *Matsushita*, cited in note 2, at 589.

11. *Brooke Group v. Brown & Williamson Tobacco Corp.*, 509 US 209 (1993).

12. Under a two period Cournot equilibrium, undiscounted consumer and total surplus equals 7200 and 114,000 respectively. Under the exclusionary equilibrium, two period undiscounted consumer and total welfare rises to 7658 and 12,097 respectively.

13. 15 U.S.C. §2.

14. 15 U.S.C. §13.

15. *Utah Pie Co. v Continental Baking Co*., 386 US 685 (1967).

16. Only one circuit, the Eleventh, adopted an ATC benchmark. *See* Areeda and Hovenkamp (2002) (citing *McGahee v. Northern Propane Gas Co.*, 858 F.2d. 1487 (11th Cir. 1988)). In addition, the Ninth Circuit adopted a non-cost test for predation, but allocated the burden of proving this standard based on whether prices were above average cost. *See* Areeda and Hovenkamp (2002) (citing *William Inglis & Sons Baking Co. v. ITT Continental Baking Co*, 686 F.2d 1014 (9th Cir. 1981)).

17. *Matsushita*, 475 US at 594.

18. *Brooke Group*, 509 US at 220.

19. In *Brooke Group*, the parties agreed that the appropriate measure of costs was average variable costs.

20. *Brooke Group*, 509 US at 210.

21. *Id*. at 231.

22. *Id*. at 208.

23. *Id*. at 223.

24. *Weyerhaeuser v. Ross-Simmons Hardwood Lumber Co*., 127 S. Ct. 1069 (2007).

25. *Id*. at 1073.

26. *Id*.

27. *Id*. at 1073–4.

28. *Id*. at 1076.

29. *Id*. at 1077.

30. *Id*. at 1078, citation omitted.

31. *Concord Boat v. Brunswick Corp.*, 207 F.3d 1039 (8th Cir. 2000).

32. *Id*. at 1061–2.

33. *Id*. at 1062.

34.   *Id.* at 1056.
35.   *Spirit Airlines v. Northwest Airlines, Inc.*, 431 F.3d 917 (6th Cir. 2005).
36.   *Id.* at 952.
37.   *US v. AMR Corp.,* 355 F.3d 1109 (10th Cir. 2003).
38.   Areeda and Hovenkamp (2006: 309).
39.   *SmithKline Corp. v. Eli Lilly & Co.*, 575 F.2d 1056 (3d Cir. 1978).
40.   *SmithKline Corp. v. Eli Lilly & Co.*, 427 F. Supp. 1089, 1129 (E.D. Pa. 1976).
41.   *See Ortho Diagnostic Systems, Inc., v. Abbott Labs*, 920 F. Supp. 455 (S.D.N.Y 1996);
      Virgin Atlantic Airways, Ltd. v. British Airways plc, 69 F. Supp. 2d 571 (S.D.N.Y 1999);
      Information Resources, Inc. v. Dun & Bradstreet Corp, 359 F. Supp. 2d. 307 (S.D.N.Y.
      2004).
42.   *LePage's v. 3M*, 324 F.3d 141 (3d Cir. 2003).
43.   *LePage's v. 3M*, 200 F.3d 365 (3d Cir. 2002).
44.   *LePage's*, 324 F.3d at 177.
45.   *Cascade Health Solutions v. PeaceHealth*, 502 F.3d 895 (9th Cir. 2007).
46.   *McKenzie-Willamette Hospital v. PeaceHealth*, D. Or., Case No. 02-6032-HA, 2004
      WL 3168282 (2004) (denial of renewed motion for directed verdict).
47.   502 F.3d at 909.
48.   *Id.* at 919.
49.   *Id.*
50.   *Barry Wright*, 724 F.2d at 234.

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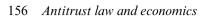
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Statutes

15 U.S.C. §2.
15 U.S.C. §13.