

APPENDIX 3

The Economic Theory of Predatory Pricing

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Predatory pricing theory has advanced substantially in the past quarter century, utilizing general advances in game theory and asymmetric information to provide a more complete analysis of the opportunities for predatory pricing.¹ The more recent theoretical contributions develop a more comprehensive model of strategic firm interaction than the older theories and show that predation can be a rational strategy. The fact that predation can be a rational strategy of course does not mean that it is a common strategy or that price cutting by an incumbent should be presumed predatory. The policy challenge is to distinguish appropriate price cuts that are intrinsic to vigorous competition from predatory actions that tend to eliminate competition. As Bolton, Brodley, and Riordan (2000, p. 2241) characterize the problem: “On the one hand, history and economic theory teach that predatory pricing can be an instrument of abuse; on the other hand, price reductions are the hallmark of competition and the tangible benefit that consumers perhaps most desire from the economic system.”

I. The Skeptical View of Predatory Pricing

The skeptical view of predatory pricing was initiated by John McGee’s reexamination of the trial record in the 1911 Standard Oil case (McGee, 1958). McGee concluded, contrary to earlier interpretations, that Standard Oil had not engaged in predatory pricing in order to drive out its rivals. McGee’s analysis was based in part on a theoretical perspective that predatory pricing would have been irrational because Standard Oil would lose more than its competitors from a price war and because competitors could reenter the market when Standard Oil attempted to raise prices after eliminating rivals.² McGee’s critique of predatory pricing was elaborated by a number of additional theoretical and empirical studies that concluded that predatory pricing should not be expected because it is generally economically irrational and that allegations of predatory pricing should be treated with great skepticism.

The skeptical view of predatory pricing is based on a simple economic model. All participants are assumed to have full information and equal access to capital markets. Strategic choices are limited to setting the price on a single product, generally assumed to be produced at the same cost by all firms. Under those conditions, predatory pricing is not a credible strategy. A large firm incurs greater total losses during the predatory period of below-cost pricing than a small firm. Even if the large firm has greater internal financial

¹ A comprehensive non-technical review of the predatory pricing literature and possible legal applications is contained in Bolton, Brodley, and Riordan (2000). Elzinga and Mills (2001) provide a critical analysis of their proposals while Bolton, Brodley and Riordan (2001) respond to the Elzinga and Mills critique. An older and more technical survey of the predatory pricing literature is contained in Ordovery and Saloner (1989).

² A much later further reexamination of the Standard Oil case raised questions about McGee’s conclusions by taking a broader perspective on the potential strategic conduct. Granitz and Klein (1996) found that Standard Oil engaged in predation through its influence over the interaction of the refining and railroad industries rather than by simply cutting prices for refined petroleum products.

resources, the small firm can survive the price war either by shutting down and restarting when prices are raised, or by financing its short-term losses by obtaining capital from outsiders who expect the price to return to profitable levels when the dominant firm recognizes the futility of the price war. Even if the small firm goes bankrupt, its assets may be purchased by another potential competitor that will resume production when the dominant firm attempts to raise its prices to take advantage of its apparent success during the price war. Because both dominant firms and small firms understand the futility of a predatory price war, the threat of predation is not credible and predatory pricing will not occur.

II. Imperfect Information Makes Predatory Pricing Credible

Beginning with George Akerlof's "lemons model" (1970) dealing with differential information between buyers and sellers regarding the quality of a good, economists have devoted extensive attention to the role of information imperfections in market outcomes. The imperfect information literature is much broader than predatory pricing, but has been applied to predatory pricing along with a wide range of other economic issues. Incorporating information imperfections into economic models has led to much more substantial revision to earlier models than was expected. As Joseph Stiglitz (2001, p. 461) stated in his Nobel prize lecture:

For more than 100 years, formal modeling in economics had focused on models in which information was assumed to be perfect. Of course, everyone recognized that information was in fact imperfect, but the hope ...that economies in which information was not too imperfect would look very much like economies in which information was perfect. One of the main results of our research was to show that this was not true; that even a small amount of information imperfection could have a profound effect on the nature of the equilibrium.

One of the crucial developments in the imperfect information literature was to develop formally the critical importance of asymmetric information in which one market participant has relevant private information that is not shared with other market participants. That insight has been applied in a number of predatory pricing models to show that predatory pricing may be a rational strategy under asymmetric information. Three types of formal models that show a rational incentive to engage in predatory activities in the presence of asymmetric information have been developed: (1) financial market predation; (2) reputation effects predation; and (3) signaling models of predation.

A. Financial Market Predation

Financial market predation is a more sophisticated and rational version of the earlier "deep pocket" theory of predation. While the earlier "deep pocket" theory of predation assumed serious imperfections in the capital market in order to make predation rational, the financial market predation theories assume that financial markets are similar to the actual financial markets observed in Canada and other advanced countries. That is, financial markets are highly developed and generally provide capital efficiently to a wide

range of companies, but investors cannot observe all of the private information of managers and take reasonable steps to protect themselves against managerial opportunism. With full information and perfect capital markets, differential internal financial resources do not facilitate successful predation. However, investors have less information than the managers of a firm. Investors are concerned that the managers may utilize their private information for their private benefit to the detriment of the investors. Investors protect themselves by establishing observable performance benchmarks that the firm must meet in order to maintain existing capital commitments or to receive new capital commitments. Those performance benchmarks include lending agreements that require particular financial targets to be maintained in order to continue the loan and venture capital financing in stages with later stage financing dependent upon performance in the earlier stages. While those well-established practices are useful in guarding against the risk of self-serving optimistic forecasts by managers, they also create conditions conducive to predation. The standard objection to the “deep pocket” theory of predation is that the “prey” firm can always borrow from investors who understand that the predator firm will be unable to continue the predatory tactics over the long term and will therefore be willing to finance the “prey” firm in expectation of future profits after the price war ends. However, imperfectly informed investors will not be able to distinguish poor performance that is solely the result of predation from poor performance that is the result of managerial failures or a faulty business plan, and will consequently not extend additional capital to firms with poor financial performance.

The theory of financial market predation was first developed by Fudenberg and Tirole (1986) and then substantially extended by Bolton and Scharfstein (1990). Bolton and Scharfstein assume that all participants know that the entrant can be profitable under non-predatory competition (in contrast to uncertainty over potential profitability discussed below), and that both entrants and financiers are aware that predation may skew observed results. However, there is also private information possessed by the entrant firm’s managers that may be used to the detriment of the financiers if they agree to finance the firm regardless of the observed financial results in order to reduce the incentives for predation. Guaranteed financing independent of financial results eliminates the incentive to undertake financial market predation while exposing the financiers to managerial agency problems. Conversely, contingent financing protects against agency problems while creating an incentive for the incumbent firm to engage in predatory actions. Bolton and Scharfstein (1990, p.104) summarize their results as follows:

The central argument of this paper is that agency problems in financial contracting can give rise to rational predation. The financial contract that minimizes agency problems also maximizes rivals’ incentives to prey. As a result, there is a tradeoff between deterring predation and mitigating incentive problems: reducing the sensitivity of the refinancing decision to the firm’s performance discourages predation, but exacerbates the incentive problem. In equilibrium, whether financial contracts deter predation depends on the relative importance of these two effects.

A number of authors have developed further refinements to the Bolton and Scharfstein model, but have not changed the main conclusions from that model. For example, LeBlanc (1996) considers the case in which firms are identical except for their dependence on internally generated versus external capital sources. In the LeBlanc model there are substantial opportunities for the firm's managers to misallocate resources for their private benefit rather than the benefit of the investors. LeBlanc concludes that "price wars can arise in equilibrium" and that "Predation is more likely to occur when firms are likely to be financially vulnerable" (p. S297). Snyder (1996) extends the Bolton and Scharfstein framework by considering the possibility of renegotiating financial contracts. While the possibility of renegotiation changes the details of the bargaining process, Snyder finds that the incentive to undertake predatory behavior remains and in some cases is increased compared to the Bolton and Scharfstein case of constant contracts without renegotiation.

B. Reputation Effects Predation

The reputation theory of rational predatory pricing was initiated by Kreps and Wilson (1982) and extended by a number of other authors. The basic idea is that the characteristics of the incumbent are not fully known by potential entrants. There are a series of potential entrants. If the first company that attempts entry is met with a vigorous price war that eliminates its viability, then other potential entrants are less likely to attempt entry. Consequently there is an incentive for incumbents to fight the initial entrant in order to discourage further entrants even if accommodation would be more profitable in the specific case of the initial entrant in isolation.³ In the Kreps and Wilson (1982) model, potential entrants are uncertain whether the incumbent is "tough" or "weak". A tough incumbent will choose predation over accommodation, either because it expects predation to be more profitable or simply because it prefers that strategy whether or not it is profitable in the context of a single entrant. A weak incumbent will choose a rational strategy of accommodation when faced with a single entrant. In their formal model, the tough incumbents always engage in predatory action and even the weak incumbents often find it optimal to engage in predatory action against initial entrants in order to reduce the incentives for future entry. Under certain conditions, even a small probability that predation is profitable may still create an incentive to engage in predation because of the effect it has on the expectations of other potential entrants.

C. Signaling Models of Predation

In the information economics literature, "signaling" is a general method of taking costly actions that allow others to infer private information. Most signaling models assume that the person sending the signals is attempting to convey accurate information that would not be believed if simply asserted. For example, a store selling high quality

³ The conceptual idea behind the reputation effect is similar to that behind the common corporate strategy of strongly defending against nuisance lawsuits. In many cases payment to the plaintiff would cost less than the legal defense, but a reputation for paying weak claims invites further claims. Similarly, a reputation as an accommodating dominant firm invites further entry while a reputation for strongly defending market position discourages entry.

products may “signal” the quality level of its products by offering a generous return policy and/or a strong warranty, providing more customer assurance of high quality than the simple assertion that its products are the best. In the predatory signaling models, the predator firm sends false signals in the expectation that potential entrants or existing competitors will interpret those signals in a way that gives the signaling firm an advantage. Several different signaling models have been developed, with the common theme of explicitly choosing strategies during the early period that will convey a false impression of the firm’s private information and induce greater monopoly power in the later period. For example, in Saloner’s (1987) model, current market participants or potential entrants are uncertain about the costs incurred by the dominant firm. If the dominant firm is of the “high-cost” type, then competitors want to be in the market but if the dominant firm is of the “low-cost” type, then competitors will not find that market to be a profitable opportunity. Saloner shows that even a “high-cost” dominant firm will have an incentive to choose market actions that make it appear to actual or potential competitors that it is a “low-cost” type of firm. Those actions may discourage potential entrants from coming into the market. They may also cause existing competitors to merge with the dominant firm on terms more favorable to the dominant firm than would be reached if all participants had accurate information.

Saloner (1987, p. 182) notes that the signaling models are most relevant to rapidly changing industries and concludes that information issues should be analyzed in those cases:

In those cases involving rivalries between incumbents of long standing, where technological change is slow and where the technology used is fairly standard, information asymmetries are unlikely to be important, and no new complications are introduced. Where the industry is young or undergoing structural change, however, or where there is technological change (especially where there is an asymmetry in the technology available to different firms), blind application ...[of antitrust rules that ignore information issues] is likely to be misleading.

Standard textbook models generally assume that the costs of participating in a market are clearly known by existing participants and potential entrants. That is a reasonable assumption in stable industries with well established production patterns. However, in technologically progressive industries such as telecommunication, it is not a reasonable assumption. Even if the costs incurred by incumbent firms are known at one point in time, potential entrants cannot know how those costs for the incumbent may change over time. A potential entrant that has developed an innovative product or production process may be able to observe that it can profitably enter the industry if prices remain at the current level. However, if the incumbent responds to the attempted entry with a price below the cost of the entrant, the entrant cannot be sure whether the incumbent’s new prices are a temporary reduction that is likely to be rescinded or whether the incumbent has low enough costs to make it profitable to sustain the low price in order to limit entry. If the entrant believes the skeptical theory of predatory pricing and therefore assumes that it would be irrational for the incumbent to price below cost, then the entrant will infer that the incumbent has lower costs than the entrant by observing the post-entry price, and will exit the market or

merge with the incumbent on terms favorable to the incumbent. However, if the incumbent knows that the entrant will infer a low cost incumbent by observing a substantial price cut, then the incumbent has an incentive to cut prices severely upon entry even if the post-entry prices are below its own cost and create temporary losses.

III. U.S. Airlines and Predatory Pricing

Under the skeptical theories of predatory pricing, the airline industry is immune to predatory concerns. Airlines are the ultimate example of mobile capital because the primary capital asset (airplanes) can be almost instantly redeployed from one geographical market to another. At first impression, the airline market would appear to be an example of a contestable market with easy entry and exit in any geographical market regardless of the market share of currently operating firms. However, there have been numerous cases in which the dominant incumbent airline responded aggressively to the entry of a new airline, causing both the U.S. Departments of Justice and of Transportation to undertake inquiries regarding possible predatory pricing in the airline industry. After extensive inquiry, the U.S. Department of Transportation concluded in 2001 that predatory pricing in airline service was likely and that enforcement actions should be taken to combat predatory pricing (DOT, 2001). The DOT analysis concluded that contestability was inapplicable to the airline industry (p. 22):

Contestability has proven inapplicable in the airline industry. ... First, an airline entering a market incurs certain sunk costs that cannot be recovered if it exits, for example, advertising costs and the cost of setting up facilities at the new airport. Travelers will be reluctant to book an airline that exits and reenters a market, moreover, given the significant possibility that the airline may again leave the market before the date of their planned trips. As a result, airlines cannot freely enter routes.

Furthermore, the DOT concluded that capital mobility may actually increase the opportunities for predatory pricing (pp. 35, 36):

Predatory-type behavior may be effective in the airline industry precisely because aircraft are so mobile and can be moved from one route to another. The mobility of aircraft was originally thought to be a guarantee that airline markets would be competitive. However, as shown, airlines incur significant sunk costs in entering a new airport, a factor which can discourage entry. On the other hand, when entry occurs, the incumbent hub airline can easily shift aircraft from other markets to increase capacity in the market served by the new competitor. An airline that dominates a market thus can quickly expand its capacity on a route without making an irretrievable investment, since it can easily redeploy the aircraft to other markets when the entrant has been forced to exit or reduce service. ...As a result, this Administration has concluded that the potential for predatory-type behavior by incumbent airlines is great enough that the Department should implement strategies, such as enforcement action, that will effectively prevent such conduct (and other conduct intended to eliminate or reduce competition).

Airline markets are often defined on a narrow geographical basis because the relevant consumer choice is the airlines serving a particular city pair or substitute airports in close proximity to the desired city pair. In that context, switching aircraft from one city pair to another is classified as entry into a new geographic market by a company that was already participating in other geographic markets. The DOT's essential concern is that incumbent airlines (especially those who dominate a particular hub airport) have an incentive to cut prices and increase capacity precisely on the routes where entry is attempted. They can consequently eliminate the possibility of profitable entry without incurring losses on their entire route structure. The U.S. DOT concern about the opportunity for predatory pricing is analogous to the concern in telecommunication markets about targeting specific customers.

IV. Conclusion

The extensive development of the economics of information over the past thirty-five years has revolutionized the understanding a wide variety of economics issues, including the theory of predatory pricing. The skeptical theory of predatory pricing that concludes predatory pricing is almost always irrational is based on a world of perfect information and simple across-the-board price responses to attempted entry.

Newer theories have rigorously demonstrated a variety of conditions under which predatory pricing can be rational when asymmetric information is taken into account. Those conditions include the ability to exploit the asymmetric information between the managers of entrant firm and its financial backers (financial market predation) and the ability to exploit the asymmetric information between an entrant firm and an incumbent firm (reputation effects predation and signaling models of predation).

Furthermore, the ability to target narrow groups of customers increases the rational incentive to engage in predatory pricing. With targeting, the incumbent firm does not have to incur losses across its entire market while it attempts to discourage competitors, but only incurs losses on the narrowly targeted customers. In a world of easy entry to all segments of the market, targeting is ineffective because the competitor simply shifts to serving the more profitable non-targeted segment of the market. However, in telecommunication and other real-world markets, entrants must incur substantial customer-specific costs (such as marketing, order entry, and costs of service hook-up). If the incumbent convinces those customers to switch back to its service, the customer-specific sunk costs cannot be recouped by the entrant and therefore the entrant cannot easily shift from serving the targeted customers to serving the non-targeted customers.

It is important for policy makers to distinguish between reduced prices resulting from increased competition and predatory prices designed to eliminate competition from the market. In a world of asymmetric information and/or the ability to target price cuts to specific groups of customers, predatory pricing can be a rational long-run profit maximizing strategy.

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EXPERIENCE

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1986-1987: Chief, Accounting and Audits Division, Common Carrier Bureau, FCC; responsible to the Bureau Chief for the administration of accounting and separations rules, the development of cost allocation methodologies, and the auditing of telephone company compliance with FCC financial rules; supervised staff of 65 economists, accountants, auditors, and support personnel; promoted into the career Senior Executive Service in December 1986.

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