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Testing Whether Predatory Commitments are Credible

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**Testing Whether Predatory
Commitments are Credible**

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Tim C. Opler

George J. Stigler Center
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Testing Whether Predatory Commitments are Credible

Abstract

A number of recent game-theoretic models suggest that with asymmetric information it can be profitable for firms to acquire a reputation for toughness to discourage later entry. We identify institutional arrangements which firms must undertake if predatory commitments are to be credible. Simply hiring managers who value market share or output maximization is not sufficient if the manager can be removed whenever it actually becomes necessary to engage in predation. It is also necessary that the firms make removing the manager difficult. In addition, the incumbent manager should be rewarded for increasing output as opposed to increasing short-term profits. After studying a set of firms that were charged with predation, we find no evidence that allegedly predatory firms are organized as these game-theoretic models imply. If anything, the reverse seems to be frequently true.

JEL #: L1, L4, K2

Key words: Testing game theory models of predation,
credible commitments, antitrust court decisions

I. Introduction

In 1980, the predominant view among economists was that predatory price cutting would rarely if ever be profitable (see Bork (1979), Easterbrook (1981), and McGee (1958 and 1980)). This position was adopted by the U.S. Supreme Court in its 1986 *Matsushita* decision which has since made prosecution of predation cases very difficult (Liebeler (1986)). In the last decade, however, many game-theoretic papers have tried to reverse this presumption and show that predation can be a profitable strategy. These papers show that with asymmetric information it pays for an incumbent firm to manipulate potential entrant beliefs about the returns to entry, even when cost and demand conditions remain unchanged (see Milgrom and Roberts (1982b), Kreps and Wilson (1982), Rasmusen (1991), and Roberts (1986)). A prominent method of altering beliefs involves acquiring a “reputation for toughness” through predation to discourage later entry.¹ Initial losses from predatory price cuts serve as a reputational investment in convincing outsiders that entry is costly. The payoff from this investment comes later when firms earn rents in the absence of entry.

While these recent models show that predation is theoretically possible, whether predation is in practice profitable depends on many explicit and implicit assumptions about the real world.² It is important that the key assumptions underlying these models be examined and validated before these models are used for policy purposes. Yet, despite a large and growing theoretical literature, there have been few empirical studies of predation and no systematic evidence substantiating the predictions made by game-theoretic models of predation.³

¹ For a general survey of this literature see Rasmusen (1989). Rasmusen (1988) and Hansen and Lott (1995) discuss how retaliatory threats against potential entrants can backfire.

² We are not suggesting that all assumptions of game-theoretic models should be taken literally. Rather, if *key* assumptions of these models are unrealistic, it would be difficult to argue that they apply to real world situations.

³ Burns' (1986) paper is an exception which provides empirical evidence on the reputations that firms garner from past predatory actions. He states that previous predatory pricing by the Tobacco Trust between 1891 and 1906 lowered the price necessary to acquire rivals by about 25 percent. However, as Burns himself notes, one difficulty is that his results are also consistent with perfectly competitive behavior. If the lower prices during these previously claimed predatory instances were evidence of lower cost production, it is not surprising that the value of less efficient rival firms would decline. Burns' (1989) again acknowledges the difficulty in distinguishing between predatory behavior and perfect competition in explaining his earlier results and turns to anecdotal evidence from executive testimony to argue that predation was indeed occurring. Weiman and Levin (1994) also provide evidence of predatory behavior by the Southern Bell Telephone Company between 1894 and 1912. However, it is important to note that the authors acknowledge (p. 114) that the empirical evidence is equally consistent with competitive and predatory explanations. Southern Bell Telephone exchanges may have earned lower profits immediately prior to new entrants entering the market and seen those profits decline still further once actual entry occurred because they were engaged in predatory pricing. Yet, it could also mean the promise of future entry convinced many potential customers to defer obtaining

Making predation strategies credible (in recent terminology "renegotiation proof") requires that firms ensure that managers who proceed with costly predatory acts are not penalized financially or ousted from office for doing so. Thus, if firms neither provide financial incentives to increase output when entrants attempt to enter nor guarantee executive job security, predators will not be able to credibly deter entry. Otherwise, entrants will recognize that it will not be rational for the incumbent to fulfill predatory threats. In this paper we investigate the plausibility of reputational theories of predation by carrying out two tests of whether firms actually accused of predation could have made credible predatory threats. Our tests examine managerial compensation and entrenchment in firms which have been accused or convicted of predation.

The remainder of this paper proceeds as follows. Section II discusses what is required to make predatory commitments credible. We discuss how management salary structures and job security should vary across firms in an industry with a predatory firm. Section III uses this theoretical discussion to empirically study whether those firms actually accused or convicted of predation have the characteristics predicted by the reputational theory of predatory pricing.

II. An Overview of the Game-Theoretic Models of Predation and Their Testable Implications

Following Ordover and Saloner's (1989) and Klevorick's (1993) surveys, there are three general classes of game-theoretic models of predation: predation for reputation (e.g., Milgrom and Roberts (1982b) and Kreps and Wilson (1982), signaling (Milgrom and Roberts (1982a) and Roberts (1986)), and the "long purse" strategies (Sharfstein and Bolton (1990)). While all three discussions will be reviewed, we primarily develop testable implications for only the first two types of models.

service until entry occurred or until Southern Bell simply could no longer obtain monopoly profits. Again like Burns, Weiman and Levin also have to rely upon anecdotal evidence to try to argue that the behavior was predatory. The practical usefulness of this evidence in the Burns and Weiman and Levin papers is becoming increasingly limited as some courts have begun arguing that "intent is not a basis for liability . . . in a predatory pricing case" (A.A. Poultry Farms, Inc. v. Rose Acre Farms, Inc., 881 F.2d 1396 (7th Cir. 1989)). Granitz and Klein (1993) provide possibly the most persuasive anecdotal evidence of predatory behavior in their review of the Standard Oil Case. Building on theoretical work by Lott (1990) that public enterprises pose a greater predatory threat than private firms, Lott (1995) provides systematic evidence from international anti-dumping cases showing that government enforcement agencies view foreign public enterprises as a much greater predatory threat than are foreign private firms.

II.A. Creating a Reputation for Toughness: Credible Commitments, Compensation, and Entrenchment

What incentive do managers have to create a reputation for retaliating against potential entrants?

While shareholders may enjoy the rewards of future rents when establishing a reputation for predation, managers may suffer if their compensation depends on the firm's short-run profitability. The most likely solution to this problem would simply be to align the manager's interests with those of the stockholders by appropriately structuring the manager's compensation contract. In particular, if creating a predatory reputation is a profit maximizing strategy, stockholders will find it in their interest to reward managers based upon the long-term profitability of the firm. The most obvious method of doing this would be to vary the manager's compensation so that it increases when the manager's actions increase the value of the firm's stock. This would give the manager the correct incentives whether the market had the same or better information than potential competitors about the true commitment the predator was making to engage in future retaliation.

Alternatively, firms might also hire managers without value maximizing preferences. For example, managers who maximize output or market share would reduce prices to meet any new entrant.⁴ This approach follows some theoretical models where predatory behavior depends on the competitors believing that the predatory firm has a particular type of manager. However, because incentive based pay is nearly universal among managers it is implausible that firms use only managers' preferences to ensure outcomes. Otherwise, we should observe the widespread use of flat salaries for managers.

More concretely, predatory firms should provide managers with more incentive to expand output and less incentive to raise accounting profits during predatory periods than do nonpredatory firms. If entry occurs, the ability to greatly increase output and maintain it at a higher level is central to any firm's predatory strategy. It is important that potential entrants believe that there is some probability of the incumbent managers maximizing market share. Managers who increase output in the face of entry should be rewarded for doing so. Thus, relating salaries to short-term swings in profits is particularly costly to predatory firms because of the large short run losses they can incur when driving entrants from

⁴ For discussions of models which examine the role of nonvalue maximizing agents see Milgrom and Roberts (1982b) and Lott (1990 and 1995).

the market. Evidence that firms accused of being predatory either paid their managers less for increasing output or decreasing short-term profits would cast doubt on whether those managers could credibly commit to predation.

Yet, we wonder how credible is the solution provided either by giving the managers financial incentives to predate or by hiring a manager who intrinsically values market share when the potential predator is subject to a hostile takeover. Making credible commitments is profitable if the firm will not have to carry out its threat. However, if entry occurs despite a predatory firm's reputation for retaliation, shareholders will want to renege on the firm's promise to predate. Simply promising to pay a manager so that he has an incentive to predate should the circumstance call for it or hiring a manager with the proper values is unlikely to be enough to make predatory threats credible. Predatory threats may not deter new entry if a firm either alters the manager's compensation scheme at the last moment or fires the manager and replaces him with someone who has different preferences. Even if the predatory firm maintains current management and its compensation scheme, there is still the threat that the firm will be a victim of a takeover after which the changes would then occur.

Given that manager selection and compensation is necessary but not sufficient to make predation credible, firms must also make it difficult for either themselves or for those who might launch a takeover to change these arrangements. This can be done if firms can commit not to alter incentives for managers to predate and adopt rules which prevent takeover. A more sophisticated model of predation might assume that potential predators hire managers who intrinsically value predation but are very difficult to fire. Firms may make it costly to fire managers by allowing large severance payments (e.g. golden parachutes). The greater the costs of firing a manager, the more likely it is that predators will bear the large costs they face when they attempt to fulfill their predatory threats.

It is important to understand that assumptions on the length of the time horizon or the number of potential entrants are crucial to game theoretic models of predation and we will accept these assumptions in attempting to test the assumptions behind these models.⁵ For predation to be a rational strategy when

⁵ As Milgrom and Roberts (1982b) note it is the difficulties posed by facing a limited time horizon or less than infinite number of potential competitors which motivated their paper to begin with. Their paper was an attempt to solve the unraveling problem.

the time horizon is short or the number of potential entrants small, the probability that the incumbent is following a nonvalue maximizing strategy must be relatively large. Conversely, as the time horizon or number of potential entrants approaches infinity, this probability can be quite small. This discussion also helps explain why it may pay for a firm to make initial investments in convincing other competitors that its managers value something other than profit maximization during early periods and then not be willing to make such investments towards the end of the time horizon. As the end of the time horizon approaches, it will not pay to create a reputation for predation. During the initial periods it can be worthwhile to create such a reputation, but this depends on the unraveling problem (or chain-store paradox problem) being solved through this reliance on preferences. For the intermediate periods predation will only continue because of commitments for nonprofit maximizing managers to respond to new entry. As the preceding discussion notes, these commitments cannot be made credible simply by hiring nonprofit maximizing managers, since these managers can be replaced unless there is something that makes their removal relatively costly.

Given that it pays for firms to make investments in reputation during the initial periods, there is no reason to expect these firms to differ initially from nonpredatory firms in terms of how costly it is to remove their managers. However, during the middle and end periods in the game, predatory firms will have a greater return to ensuring that potentially “tough” or “irrational” managers are not removed. In the empirical work that we examine later, we are not able to distinguish the period of time that a predatory firm is in, but we can say that as long as predatory firms are involved in each of time periods, on average predatory firms will have a greater return at the margin to preventing managers from being removed than will nonpredatory firms. To the extent that our sample is dominated by firms that are only in the initial periods of predation, the less likely we will be to find any difference between predatory and nonpredatory firms.

While the Milgrom and Roberts and Kreps and Wilson models assume that there is only some probability that a manager is irrational, we extend their discussion by pointing out that all firms deterring potential entry through the mechanism they describe will find it necessary to prevent managers from being easily removed. This is as true for firms without “irrational” managers as it is for those with them.

If potential competitors observe that a predatory firm can easily remove its manager and that the predatory firm is in the middle or end periods of the game, potential entrants will always enter.

Our discussion fits into an important literature which views management entrenchment devices as efficient because they prevent firms from opportunistically holding up managers (see Knoeber (1986)).⁶ Firms may frequently find it efficient to compensate managers with a delay because the quality of projects that they develop can only be evaluated later. However, this creates the problem that the firm has an incentive to remove the manager to save the cost of compensating him for a job well done just when projects that he oversaw are coming to fruition. In terms of the game-theoretic predation literature, both the manager and the predatory firm can gain from the firm credibly committing not to hold up the manager for the investment that he makes in reputation when predation becomes necessary.

Knoeber's argument also applies because managers of both predatory and nonpredatory firms make many similar types of investments that can only be evaluated with a lag. If predation increases the probability that the manager will lose his job, it implies that he may be opportunistically taken advantage of and thus predatory firms should be more likely to have management entrenchment devices than other firms in the same industry. The first column in Table 1 summarizes this section's conclusions.

Given existing evidence indicating that manager replacement rates range from 11 percent for firm's earning the market rate of return during the two preceding years to 17.5 percent for firms earning 50 percent less than that rate for two years (Jensen and Murphy, 1990, p. 239), it is hard to ignore the importance of entrenchment in motivating managers. Earning the average market return for 3.15 years (the average length of the alleged predatory behavior we will show in our sample) implies a 24 percent probability of dismissal, while earning 50 percent less than the average for 3.15 years raises the probability to 38 percent. Lower earnings are something one expects during predatory periods. Jensen and Murphy's (p. 241) estimates of the expected wealth loss 45 year old managers face from dismissal equals up to \$3.5 million in lost salary if they manage a firm earning 50 percent less than the market

⁶ Klein (1984) provides a discussion of hold-up problems in labor markets. For a discussion of hold-up problems in a variety of settings see Klein et. al. (1978).

return for 3.15 years. Their estimates imply that including lost compensation from stock ownership can easily quadruple the total expected wealth loss.⁷

II.B. Methods of Entrenching Management

While golden parachutes are one mechanism for protecting managers from removal, the practice of including them in management compensation contracts did not arise until the late 1970s and they were not widely used until the early 1980's — after which time few predation cases have gone to court. Other mechanisms, however, could have been used to entrench management and thus shore up predatory threats. Firm characteristics identified in the literature as related to entrenched management include: (1) incorporation in a state which makes corporate takeovers difficult, (2) antitakeover charter amendments, (3) firm size, (4) fraction of shares held by management or the board of directors, (5) concentration of share ownership, (6) R&D intensity, and (7) industry adjusted Tobin's q . The remainder of this section reviews the evidence that these firm characteristics increase managerial entrenchment and thus help ensure costly predatory commitments.

The case that state takeover laws and antitakeover charter amendments increase the cost of hostile corporate acquisitions and entrench incumbent managers seems quite strong. Karpoff and Malatesta (1989) found substantial evidence that the initial press announcements of state takeover legislation resulted in small but statistically significant decreases in the equity market value of firms incorporated or headquartered in those states. Their results confirmed earlier findings by DeAngelo and Rice (1983) and Linn and McConnell (1983) that antitakeover charter amendments were motivated by a similar desire to protect incumbent management.⁸

While Karpoff and Malatesta controlled for whether firms already had antitakeover charter amendments when state rules passed, the predation story of commitments suggests an additional way in which the data should be analyzed. If predation is more credible because management can bear large losses when new entry occurs without the threat of removal, firms intending to engage in predation

⁷ Khanna and Poulsen's (1994) finding of annual managerial turnover rates above 30 percent among financially distressed firms implies an even greater expected loss from dismissal.

⁸ Meulbroek et. al. (1990) and Malatesta and Walking (1988) provide additional evidence that antitakeover charter amendments entrench management.

should have experienced an increase in stock value since more credible commitments should help deter both current competitors and future entrants. We should also see potentially predatory firms, which would benefit from entrenching their management, reincorporating in those states that pass antitakeover legislation.

Demsetz and Lehn (1985) have pointed out it is more costly to acquire control of large firms because such purchases make the buyer less diversified. Likewise, larger firms should be more difficult to buy, because the greater borrowing required to take over larger firms creates incentives for managers to make riskier decisions which should raise borrowing costs (Jensen and Meckling (1976)). Both positions provide possible reasons for why the managements of larger firms are more entrenched.

Others have argued that research and development intensive firms have more entrenched management because of high informational asymmetry between insiders and outsiders over the outcomes of research projects. It may be difficult for outsiders even to know what current research is, let alone infer the likelihood of success when products reach the market. Investments in research and development, therefore, make it more costly to remove managers who have large specific human capital investments in evaluating research. Knoeber (1986) also suggests that research intensity makes it more difficult to remove management because of the need to protect managers from being held up for their sunk investments made in developing projects.

The fraction of shares held by management, or possibly by the Board of Directors, should also increase management entrenchment (see Knoeber (1986)). The larger this fraction, the greater is the proportion of the remaining shares which must be tendered for hostile takeovers to be successful. For similar reasons, if there are large shareholders who side with management, it will be more difficult to take over the firm. Concentrated shareholders are more likely to have the incentive to develop a reputation for protecting management of predatory firms in order to prevent entry by other firms. Diffuse shareholders not only may be less able to prevent takeovers, but they are more likely to free ride on actions which foster the creation of a predatory reputation as a "tough" manager. Sole proprietorships or closely held firms represent the other extreme and should thus be the most successful at engaging in predation.

Another proxy for management entrenchment is industry adjusted Tobin's q — the ratio of the market value of a firm's liabilities to the book value of its assets relative to the industry average.⁹ To the extent that poorly managed firms have a low q , then q provides a possible measure of the value created by a takeover. Consistent with this prediction, Morck, Shleifer, and Vishny (1989) found that the average target of a hostile takeover had a lower Tobin's q ratio than other firms. If they are correct, those firms facing the highest probability of hostile takeovers will find it the most difficult to make credible commitments to sustain their predatory threats.

While these barriers to management removal are obviously costly since they also protect inefficient management, the ability to credibly follow through on predatory threats is necessary if making those threats is to prove worthwhile. However, the actual costs of instituting entrenchment devices is unlikely to be very high. For example, instituting an anti-takeover charter amendment involves some time and routine legal costs which are fairly low. Other entrenchment methods can be much more costly (e.g., increasing firm size). Nor is it necessary to assume that firms invest in order to predate. It might simply be that firms which happen to be more entrenched for some historical reason engage in predation because it is more credible in doing so.

In general, however, one must be careful in interpreting the evidence provided in Section III that firms accused of predation neither provided accused predatory managers with additional protection from removal nor provided them with compensation that encourages predatory behavior. Two interpretations are possible: either that firms in our sample were not engaging in predation or that if predation was occurring, those theories which rely on firms hiring managers who value goals other than profit maximization cannot explain it.

⁹ Important problems exist with using Tobin's q and make us question the usefulness of using this measure. Since Tobin's q relies on the book value of firms, it often tells us more about accounting artifacts (e.g., the age of an industry's assets) than about how well industries have done over time. Demsetz (1982) provides a general criticism of the claim that different profit rates can exist in an industry when all assets are priced at current market values. When assets are priced in terms of their true opportunity costs, concepts like Tobin's q are rendered meaningless. Any variations in values then are a result of mistakes in properly valuing a firm's assets.

II.C. The “Signaling” Literature

Our discussion changes slightly when applied to the recent literature on signaling, which provides a limit on the predatory or limit pricing approaches (Rasmusen (1991)).¹⁰ In that type of model, the predatory firm conveys false information about industry demand leading potential entrants to mistakenly infer that they cannot profitably enter. When the predatory firm falsely signals that demand is low by competing "toughly," managers paid on the basis of stock value may not be successfully induced to act in the firm's long run interest. Falsely signaling low demand can increase the present value of firm profits, but it temporarily lowers stock value if the stock market has the same incorrect information as potential entrants. The manager then not only faces a temporary drop in income, but stockholders will be tempted to remove him from office. If a manager who is paid on the basis of stock value is to have the incentive to deceive his competitors, stockholders must not be able to remove him in the short-run. The discussion is less complicated when firms deceive potential competitors into believing that their costs are lower than they actually are. In that case, stock prices will rise and managers will be rewarded in the short term for conveying the incorrect information and there is not the same type of hold-up problem.

Given that the signaling approach assumes that predatory firm's managers know actual profitability, managers will rationally wish to purchase stock until its price reflects their knowledge. Tying managerial pay to the market value of equity will further induce them to truthfully reveal their profitability from predation. The dilemma that this poses for successful predation is that if the stock price rises, it will make potential entrants question false signals that demand is low. There may be a free-rider problem where it would be in the interests of each individual member of a firm's management to purchase the stock and try to reap additional private profits. Ironically, this free-rider is prevented in the United States by insider trading laws, though firms could also write contracts with executives forbidding trading on inside information. Insider trading rules may then work to make predatory commitments more credible.

¹⁰ Rasmusen (1991) surveys earlier signaling models, among the most prominent examples being Milgrom and Roberts (1982a) and Roberts (1986). His paper improves upon these earlier models by dropping the unrealistic assumption that potential entrants are unaware of their costs.

II.D. The “Long Purse” Literature

While our test will not apply, there is a final game theoretic literature that should at least be noted. Building upon Telser’s notion that there is a predatory “advantage of having ample funds,” Sharfstein and Bolton (1990) provide an incomplete information model where a predation equilibrium arises due to agency problems and asymmetric information that the prey faces in the financial market. In their two-period model, predation does not have to change rivals’ beliefs, but can adversely affect the prey’s relationship with its creditors (p. 94). Creditors commit to terminate funding if a firm’s performance is poor, creating an incentive for rivals to predate and damage the victim’s financial position.¹¹ In this respect, it differs from the reputational models. What is key for our discussion is that, as Ordover and Saloner (1989, p. 562) note, in a many-period setting “the long purse story must appeal to the reputation models for its explanation of why the incumbent is not faced with new entry when it attempts to raise its price post-exit” Because of this, the questions this paper raises concerning how unraveling problems (or chain-store paradox problem) are solved through reliance on preferences and its consequences for managerial entrenchment are not applicable to the “long purse” literature. However, the implications for managerial compensation from the long purse story are straightforward. If managers are to have the right incentives to expand output, their compensation during predatory periods must be more positively related to increased sales and more negatively related to the lower profits than would be true for nonpredatory firms. The prediction for tying compensation to changes in market value is less obvious. While the current losses are made to allow the firm to raise future prices and thus increase future profits, there is no indication that this relationship should differ relative to other nonpredatory firms.

III. Empirical Results

After describing the data, we present evidence on (1) whether managerial compensation is consistent with encouraging accused predatory firms’ managers to engage in predation and (2) whether accused predatory firms displayed characteristics that entrenched management.

¹¹ One problem with the long purse is that there is a market for undervalued assets, so that there is an incentive to take over credit constrained firms.

III.A. The Data

To investigate managerial compensation and entrenchment for firms accused of predatory pricing, we collected a sample of 38 Federal appellate cases where a firm was sued for predatory pricing from Liebeler (1986) and Austin (1990). This sample constitutes all the cases alleging predatory pricing that went to the appellate level between 1963 and 1988 and includes 18 additional district court cases which did not end in appeal.¹² Twenty one of the defendant firms were both publicly traded and also reported in the COMPUSTAT data set.¹³ Table 2 lists the defendant, plaintiff, appellate decision, the circuit or district court, and decision date with a brief description of the allegations in each of these 21 cases involving a total of 28 firms. While we were unable to obtain time series information on the prices predatory charged before and after the predatory periods, Table 2 indicates whether the court accepted the claim that the accused firm's price declined during the alleged predatory period. All the predatory acts are alleged to have occurred between 1958 and 1981, and lasted an average of 3.15 years. Predation was the primary allegation in most of these cases.

A second list of firms was constructed from district court data using Lexis. This was obtained from the district court sublibrary using the phrase "predatory pricing" for the period between 1963 and 1988. A total of 29 cases dealt with predation charges that were not included in the Liebeler and Austin sample cases.¹⁴ Of these cases, 12 involved publicly traded firms and all 12 involved district courts making summary judgments for the defendant. While we conducted all our empirical tests using both the appeals and district court data, we will emphasize only those regressions using the Liebeler and Austin court data

¹² Liebeler writes (p. 1052) that to his knowledge predatory pricing charges arose in "approximately fifty-five cases in the federal courts." The additional case noted above is due to the inclusion of Austin's sample which included a slightly longer time period. We used the case identified by Liebeler and Austin to ensure a consistent method of identifying all the predation cases that occurred within this time period. If we had expanded the sample past 1988, cases like *Brooke Group Ltd. v. Brown and Williamson* (61 U.S.L.W. 4699 (1993)) could have been included. However, this case shows how difficult it has been to bring predation cases after the Supreme Court's 1986 *Matsushita* decision. In fact, in this case, the Supreme Court said that even if Brown & Williamson had attempted predatory pricing, there was inadequate evidence to show "it had a reasonable prospect of recovering its losses from below-cost pricing."

¹³ The AT&T case with MCI (708 F.2d 1081 (7th Cir. 1983)) was the only observation which we lost because of the additional constraint of using the COMPUSTAT.

¹⁴ The initial search was performed on Lexis using the search command "predatory pricing and date aft 1957 and date bef 1992" in the "genfed" library and "dist" sublibrary. There were 277 citations that contained the phrase "predatory pricing" in the district court sublibrary. A majority of these cases had nothing to do with predation. A commonly found example of an irrelevant reference to predation is the citation of a previous case that involved predation, but was cited in the current case for other, non-predation, reasons. Some individual predation cases accounted for several of the 277 citations. A single case, for example, would have three or four citations due to various procedural motions throughout the district court level.

because of the concern that the remaining district court observations represent particularly weak accusations of predation. While Liebler does include two cases involving summary dismissal (because they dealt with “some unique legal point” (p. 1061)), removing them does not affect our results.

One concern about some of our cases is that the Ninth Circuit has adopted quite different standards for establishing predatory pricing than other Circuit courts. While all the other Circuit courts have relied on cost tests to varying degrees, “[t]he Ninth Circuit has adopted an ultimate noncost standard under which a price should be considered predatory ‘if its anticipated benefits depended on its tendency to eliminate competition’” (Austin, 1990, p. 905, see also Gifford, 1986). We will also thus be sensitive to how our results are affected by the inclusion of the six cases heard by the Ninth Circuit. In general, we find that either there are no differences between the Ninth and other Circuit courts or that when differences do arise they imply that the Ninth Circuit Court’s decisions are most likely to punish innocent firms.

We obtained data on the sales, R&D expenditures, operating income, firm employment, market value and asset value of the publicly traded predation defendants from the Standard and Poors COMPUSTAT II Primary/Secondary/Tertiary, FC and Research Files. When available, market share data is from obtained directly from the District or Appeals court decisions. Alternatively, when those court decisions we use data on the COMPUSTAT sales data to proxy for a firm's market share. We used the Forbes surveys from 1970 to 1989 for the compensation data to analyze the sensitivity of compensation to performance and to identify chief executive officers’ turnover rates.¹⁵ Their compensation data includes salary, bonuses, value of restricted stock grants, savings and thrift plans and benefits for 683 firms over 9,158 CEO-years of data. After 1978 total compensation also includes gains from stock options exercised (though not those granted) during the previous year.¹⁶ We identified firms in the COMPUSTAT data set which had antitakeover charter amendments using the data in DeAngelo and Rice (1983). We also determined whether firms were chartered in states with laws inhibiting hostile takeovers up until the 1982 *Edgar v. Mite* decision which invalidated state anti-takeover laws.¹⁷ Data on the

¹⁵ We thank Tom Harris for supplying us with data on chief executive officers’ turnover rates and on management compensation.

¹⁶ Controlling for this does not alter our results.

¹⁷ Jonathan Karpoff kindly provided this data.

concentration of shareholdings of managers and large outsiders are the same as analyzed by Demsetz and Lehn (1985). (All variables and their sources are listed in the appendix.)

We recognize that courts face many difficulties in evaluating whether predation has occurred and that they may be biased towards finding predation when none exists (Easterbrook, 1984 and 1986). One important bias is that judges tend to disapprove of efficiency explanations which they do not understand or are not persuaded by (Easterbrook, 1984, pp. 4-14). Another possible concern is that we are dealing with privately initiated suits. Since people sue when the gains exceed costs and since most cases settle when the outcome is known, we are not looking at a set of lawsuits where there is the highest presumption that predation occurred [Priest and Klein (1984) and Wittman (1985)].¹⁸ Thus relative to the group of cases where predation “truly” took place in the legal sense, we have a sample where there is less presumption that predation occurred. However, even if many obviously guilty firms come to agreement with their accusers so that they do not have to go to trial, our results will continue to hold as long as the set of firms which are charged or convicted has a greater percentage of guilty firms than the percentage of nondetected guilty firms which exists among the set of all noncharged firms that we use for comparison. Thus, our sample should allow a fair test of predation given that there is very little presumption that predation took place for the typical firm in our comparison group of publicly traded firms. To believe that the probabilities of guilt are the same or greater for the comparison sample than they are for those firms actually charged or convicted implies that the legal system is either random or perverse and brings into question whether there should be any penalties for predation.

Before preceding with our tests of whether the patterns of managerial compensation and the ease of replacing management differs between firms accused of predation and other firms, we wish to emphasize that the power of the tests presented in this paper are limited by the size of our sample. The sample size is small because relatively few firms have been accused or convicted of predation and because management compensation is available for only a subset of these firms. Nonetheless, these tests provide the most systematic evidence available on whether those firms accused or convicted of predation behaved

¹⁸ Interestingly, while plaintiffs won 6 out of the 21 appeals court cases, plaintiffs won only one of the 47 additional district court cases. Defendants appealed all but one of the cases that they lost at the district court level and the a possible reason for not appealing the one case was the relatively small size of the total monetary penalty (\$115,000).

consistently with the reputational models for tough managers and whether they encouraged their managers to engage in predation through their compensation schemes. Limiting the sample to publicly traded firms also prevents us from drawing conclusions about how these game-theoretic models apply to privately held firms. Since, as we note earlier, privately held firms are best able to prevent takeover threats, it is possible that evidence examining privately held firms might be more likely to support these models.

III.B. Did Firms Increase Sales and Decrease Profits During Predatory Periods?

Before proceeding with the tests outlined in Section II, a couple of simple regressions can provide some evidence for whether the cases were being filed and courts were punishing the correct firms. If a firm is engaging in predatory action (even if it is with the notion of creating a reputation for toughness), its output should increase and profits fall. To examine this, we pooled together two types of cross-sectional and time-series evidence for those firms shown in Table 2 using our 1956 to 1985 sample from the COMPUSTAT data set. We regressed the sales growth rate (the difference in sales between years one and two divided by sales in year one) for all firm's in the COMPUSTAT panel on dummy variables indicating whether the firm was either accused (PREDATION YEAR) or convicted and the court found evidence of a price drop (CONVICTED AND PRICE DROP YEAR) of having engaged in predation during a particular year. In an attempt to control for changing industry fortunes, we also included a third variable that controls for each industry's yearly average percent change in sales. The second regression examines the change in firm profits in a similar manner. We obtained the following results:

$$\begin{aligned} \text{SALES GROWTH} = & -.0067 \text{ PREDATION YEAR} + .0237 \text{ CONVICTED AND PRICE DROP YEAR} \\ & (0.101) \qquad \qquad \qquad (0.209) \\ & + 1.00 \text{ INDUSTRY YEARLY AVERAGE SALES GROWTH} - 1.09\text{E-5} \qquad (1) \\ & (52.437) \qquad \qquad \qquad (0.002) \\ N = 8009 \qquad \qquad \qquad & \text{F-statistic} = 916.55 \qquad \text{ADJ-R}^2 = .2554 \end{aligned}$$

$$\begin{aligned} \text{PROFIT GROWTH} = & -.011 \text{ PREDATION YEAR} + .009 \text{ CONVICTED AND PRICE DROP YEAR} \\ & (0.218) \qquad \qquad \qquad (0.104) \\ & + 1.00 \text{ INDUSTRY YEARLY AVERAGE PROFIT GROWTH} + 5.69\text{E-5} \qquad (2) \\ & (91.74) \qquad \qquad \qquad (0.016) \\ N = 7929 \qquad \qquad \qquad & \text{F-statistic} = 2805.5 \qquad \text{ADJ-R}^2 = .5148, \end{aligned}$$

where the absolute t-statistics are shown in parentheses.¹⁹ To determine the change in sales or profits for convicted firms with price drops, it is necessary to add the coefficients from accused and convicted firms together since all convicted firms are also classified as being accused of the crimes. The regressions indicate that accused and convicted firms decreased sales and profits and that those who were both convicted of predation and experienced price drops increased sales and decreased profits, though none of the coefficients measuring predation are statistically significant. The net effects for firms which were both convicted of predation and experienced price drops were also quite small economically, implying sales increase by 1.7 percent and profits decrease by 0.2 percent. In comparison, a one standard deviation in the percent change in sales is 47% and in profits is 45%. While the point estimates for convicted firms are consistent with predatory behavior, there is no real evidence that firms which were both convicted and experienced price drops behaved any differently than nonpredatory firms. The results remained virtually identical when these predation dummies are replaced with dummy variables which equal one only during the first year that our sample firms were accused or convicted of predation, when the dummy variable CONVICTED AND PRICE DROP YEAR is replaced with a dummy variable measuring only whether a firm has been convicted of predation, when the Log of sales is included to measure firm size, or when only the dummy variables for PREDATION YEAR and CONVICTED AND PRICE DROP YEAR are used.

III.C. Compensation, Predation, and Performance

As we have argued, credible predation by rationally "tough" managers requires that management compensation contracts reward market share expansion rather than short-term profitability in periods of entry. Predatory firms are also likely to have greater returns than other firms from aligning managers' interests with long term shareholders' interests through tying managerial compensation to the value of the

¹⁹ Besides the accused and convicted dummy variables, we also tried controlling for firm size (as measured by the log of total assets, sales, and employment) and year and industry dummies or simply the year and industry dummies and obtained similar results. Removal of the Ninth Circuit Court of Appeals cases leaves the signs of the coefficients unchanged but reduces their level of significance.

firm's stock. Managers need to persuade entrants that they are likely to be market share maximizers and that the firms will reward them for these actions.²⁰

Table 3 briefly describes the incentive compensation offered executives of the sample firms in the period when predation was alleged, and then compares them to competing, similarly sized firms not charged with predation.²¹ The information in the table was compiled from the financial footnotes in Annual Reports and U.S. Securities and Exchange Commission 10-K filings and Proxy Statements. While the initial comparisons are quite rough since compensation based upon options and profits has many restrictions, the table indicates no obvious differences between the two sets of firms. The salaries that managers of nonpredatory firms receive are based slightly more on their firm's short-term profits and slightly less on options. While both differences are consistent with credible predatory commitments, this table suggests that the predatory and nonpredatory firms are virtually identical — simply switching one-tenth of one firm in the options category and one-seventh of a firm in profits columns is enough to eliminate any differences between predatory and nonpredatory firms. Nor are the differences statistically significant: a t-test on the differences in means for the options dummy variable provides a $t = 0.07$ (p - value = 0.94) and for the profit dummy variable a $t = 0.05$ (p - value = .96).²²

²⁰ One possible objection is whether we are studying managerial incentives at the appropriate level of the firm's hierarchy. While data is only available for CEO compensation, the pricing and production decisions are probably made by divisional or geographic managers. This seems especially plausible for some of those firms in the same that deal with multiple products. Yet, we assume that the ultimate responsibility resides in the CEO, and the shareholders must provide appropriate incentives for the CEO to hire "aggressive" lower level managers. If predatory behavior by lower level managers reduces the CEO's compensation, the question is why CEO's would encourage those actions.

²¹ Firms with the same 4-digit SIC code were ranked by market share using TRINET data. The firms closest in size to the firm accused of predation were then chosen for inclusion in Table 3. The TRINET database provides information on over 700,000 establishments (i.e., plants, administrative offices or other separate geographic business locations) that employ 20 or more persons in United States. TRINET classifies each establishment according to primary four-digit SIC code and provides information on the establishment's number of employees and its estimated sales in current dollars.

²² We also used a logit regression to control more systematically for industry differences by regressing a dummy variable for whether a firm uses options on a dummy variable for whether a firm was accused of predation and a variable that measures the average rate at which the firms in each 2-digit industry classification use options. A similar logit regression was run using the information on compensation through short-term profits.

$$\begin{aligned} \text{Options} &= 0.09877 \text{ Accused} + 10.729 \text{ Industry Average Rate for Options} - 6.769 \\ &\quad (0.099) \quad (2.890) \quad (2.269) \\ \text{Log Likelihood} &= -15.641617 \end{aligned}$$

$$\begin{aligned} \text{Profits} &= -0.05287 \text{ Accused} + 5.042 \text{ Industry Average Rate for Using Profits in Determining Compensation} - 2.447 \\ &\quad (0.098) \quad (2.969) \quad (3.036) \\ \text{Log Likelihood} &= -43.457182 \end{aligned}$$

Obviously, however, management compensation frequently involves implicit agreements, and, even when they are explicit, firms often do not make all the rules used to determine compensation available. Previous authors (e.g. Murphy (1983)) have, nonetheless, examined compensation contracts by empirically regressing changes in total management pay on changes in firm performance. We also adopt this approach to determine whether managers of firms in our sample had compensation contracts (implicit or explicit) which rewarded predatory behavior.

We estimate a set of linear regressions over 437 firms to predict the percentage change in total executive pay. The independent variables in these regressions include growth in profit (operating income to sales), growth in sales revenues, and growth in the market value of equity. The growth variables are simply the current year's values divided by those in the previous year. We also include a vector of compensation shifters, which are suggested by previous studies. Included are the chief executive officer's age, that age squared, industry dummies, year dummies, and proxies for firm size measured by the log of sales and the log of assets.²³

The independent variables of greatest interest for this study are interactions of growth in sales, market value, and profits with dummy variables for firms accused of predation. We identify firms accused of predation in four ways: (1) with a dummy variable (PREDATION FIRM) which indicates whether they were ever sued for predation in cases that went to the appellate level between 1963 and 1985, (2) a dummy variable (PREDATION YEAR) which shows those years in which they were alleged to have engaged in predation, (3) a dummy variable (CONVICTED AND PRICE DROP FIRM) which indicates those firms which were *convicted* of predation at the appellate level and where the court concluded that there was evidence that the price had fallen during the predatory period, and (4) a dummy variable (CONVICTED AND PRICE DROP YEAR) which indicates years of alleged predation only for firms which were *convicted* of predation at the appellate level and where it was concluded that price had fallen. The coefficients on these interaction variables measure the incremental importance of a given operating performance measure in determining growth in executive pay.

Chi squared statistics are shown in parentheses. At least for this very rough first look at the data, these results confirm that firms accused of predation do not appear to base executive compensation on options or short-term profits any differently than firms that are not accused.

²³ The results are not sensitive to whether we use the log of sales and assets in the regressions.

We have argued that the reputational theory of predation requires that predatory managers are compensated more heavily for increasing sales and less heavily for increasing short-term profits especially in those periods when predation occurs. Thus this theory implies a significant negative coefficient on growth in profits times a predation dummy and a significant positive coefficient on sales growth times a predation dummy. Table 4 shows several regressions including these coefficients for the firms in our sample. The first specification focuses on whether there are any significant differences between predatory and nonpredatory firms. While the positive coefficient on the SALES GROWTH x PREDATION FIRM is consistent with the reputational theory of predation and the negative coefficient on the PROFIT GROWTH x PREDATION FIRM is not, only the profit growth interaction is statistically significant. The PROFIT GROWTH x PREDATION FIRM is also economically significant, implying that predatory firms increase executive compensation five times faster than nonpredatory firms when short-term profits increase. For predatory firms increasing short-term profits increases net executive compensation by about 10 times more than the same percentage increase in sales.

The second specification also allows us to consider whether these effects were different during the reported periods of predation using variables for SALES GROWTH x PREDATION YEAR, PROFIT GROWTH x PREDATION YEAR, and MARKET VALUE GROWTH x PREDATION YEAR. These variables identify sample firms in the years in which they were alleged to have been predatory. The dummies serve to pinpoint predatory periods and should be the most likely to have the significant coefficients predicted by the reputational theory of predation. The results indicate that managers of firms accused of predation were rewarded *more* for increasing short-term profits in predation years than other managers and the effect is economically large — larger in fact than the direct effect of profit growth; yet, the coefficient on the PROFIT GROWTH x PREDATION YEAR dummy is statistically insignificant. For example, if a firm accused of predation decreased profits by 10 percent when predation was supposedly occurring, managerial compensation actually decreased by 3.9 percent. The point estimates also imply that managers were *penalized* for increasing sales during those years that they were accused of engaging in predation, though the coefficient on SALES GROWTH x PREDATION YEAR is also statistically

insignificant. This pattern of coefficients is not consistent with the reputational theory of predation. We will deal with the possible objection of whether sales can serve as a proxy for output in Table 6.²⁴

The third specification combines the dummy variables employed in the first two specifications so that we can differentiate between predatory firms and how those firms' behavior changed during the years that the alleged violations occurred. The results are almost identical with our earlier ones as only the PROFIT GROWTH x PREDATION YEAR variable is significant, and it indicates that those firms which were supposedly predatory actually increase their manager's compensation by 3.9 percent for every 10 percent increase in profits. The coefficients for SALES GROWTH x PREDATION FIRM and SALES GROWTH x PREDATION YEAR are still insignificant, and the net effect is negative, though economically quite small — increasing sales by 10 percent reduces the managerial compensation for accused firms by 0.42 percent more than it does for other firms.

Specifications 4, 5, and 6 allow us to check if firms that were convicted of predatory pricing compensated their managers differently in the years that the predation allegedly occurred. We find a negative but statistically insignificant coefficients on SALES GROWTH x CONVICTED AND PRICE DROP YEAR and SALES GROWTH x CONVICTED AND PRICE DROP FIRM. Both of these coefficients are again inconsistent with the reputational theory of predation, and even if they are statistically insignificant they are quite large economically — 9 to 19 times larger than the direct affect of sales growth on managerial compensation. In addition, firms convicted of predation showed a greater propensity to compensate their managers on the basis of accounting profits than other firms and the point estimate was somewhat larger than that shown in column 3, though none of the variables are consistently statistically significant. Again, both the profit and sales growth results are at odds with the notion that firms are encouraging managers to engage in predation. The measures dealing with stock returns imply that differences for predatory firms are both small economically and statistically.

We also reestimated Table 4's regressions using only two measures of firm performance at a time (i.e., SALES GROWTH and MARKET VALUE GROWTH, PROFIT GROWTH and MARKET VALUE GROWTH,

²⁴ One possible explanation for this result is that there is a nonlinear relationship between compensation and sales and that as sales are increased the reward to managers increases at a progressively slower rate. However, adding a squared term for sales and interacting it by PREDATION YEAR does not alter our results.

and PROFIT GROWTH and MARKET VALUE GROWTH), but these results were even more frequently the opposite signs from that predicted by the predatory theory and they were often significant.

We also broke down Table 4's specifications by examining how accused or convicted firms behave during the first year in which the predation is said to have occurred or whether the Ninth Circuit Court cases differ from those in the other Circuits. While respecifying the regressions so that the dummy variables CONVICTED AND PRICE DROP YEAR and PREDATION YEAR are replaced by FIRST CONVICTED AND PRICE DROP YEAR and FIRST PREDATION YEAR does not alter our results, eliminating the six Ninth Circuit Court cases causes all the CONVICTED AND PRICE DROP FIRM and PREDATION FIRM coefficients to be insignificant. While these last results fail to support the reputational theory of predation, they also imply that the Ninth Circuit decisions involved a particularly perverse set of cases that seem to be inconsistent with predatory behavior. Specifically, our results imply that managers of defendants before the Ninth Circuit were paid more when they increased profits during supposedly predatory periods.

While one expects that managerial compensation must be positively tied to increasing profits if managers are to have the correct incentives to engage in predation, managerial compensation should be less closely tied at the margin to profits for those firms where predation is occurring in their primary product line. The coefficients on the predation dummy variables would thus be more likely to have the predicted signs if the empirical work only examined those firms which were accused of engaging in predation with their primary output. To test this possibility, we reran the specifications shown in Table 4, but only including those firms whose primary output involved items for which predation was said to have occurred. We chose six companies for these new regressions: the oil companies (Marathon, Shell, and Murphy), two of the soft drink companies (Coca-cola and Dr. Pepper), and Champion Spark Plug. The results are again very similar to those previously reported.

Table 5 reports the third specification used in Table 4 but by 2-digit SIC industry classification, though the other specifications produce similar results. We report industry regressions is to examine whether firms accused of predation differ from others in their primary 2-digit SIC industry. We find that none of the 24 coefficients which interact predation firm or predation year dummies is statistically significant in the table, suggesting that firms accused of predation differ little in their compensation structure from other firms. In addition, there is no clear pattern in this table: nine of the twelve

coefficients examining the effects during those years in which predation occurs and three of the twelve coefficients controlling for whether the firms were charged with predation have the opposite signs from what the predation theory predicts. The absence of systematic differences in pay structure between the two groups of firms is difficult to reconcile with the reputational theory of predation which presumes that predatory firms will have "tough" managers.

Earlier we interpreted the negative coefficient on SALES GROWTH x PREDATION YEAR to imply that managers were not rewarded for increasing sales. However, given that this variable measures total revenues as opposed to the quantity of output, it is possible that managers were rewarded for increasing output despite the negative coefficient on SALES GROWTH x PREDATION YEAR because revenue can fall as prices decline. To resolve this bias, we require knowledge of demand and supply elasticities of the products sold by the firms in our sample. Demand elasticity estimation is relatively imprecise. Nonetheless, Table 6 compiles estimates of demand elasticities and market shares for product classes for our sample's firms. We have used yearly demand elasticities since all our sales data are yearly.

Table 6 shows that four firms produce in industries whose products have elastic demand. For these firms increases in revenues imply increased output. Thirteen other firms produce in industries with demand elasticities less than one. For these firms, growth in sales does not necessarily imply increased output. However, industry demand elasticities will probably underestimate the true elasticity facing any individual firm. This occurs because as a predatory firm reduces price it must increase output not only to make up for the increased quantity demanded from the lower price, but also because the other firms in the industry will reduce their output. The greater the output reduction by other firms from the reduced price, the greater the effective demand elasticity facing the predatory firm. The last column of Table 6 reports the supply elasticity required of other firms in the industry for the predatory firm to face a unitary elastic demand curve. Even very low supply elasticities are sufficient to imply that predatory firms face elastic demands. In all except two cases the supply elasticity necessary to ensure that the predatory firm faces an elastic demand is less than 0.43 (the Borden case is the only case where there is a question of whether it is above or below this value). Running separate regressions that remove either the two firms whose required supply elasticities exceed 0.43, the one case where industry demand elasticities was clearly greater than one, or the thirteen firms where the maximum supply elasticities were greater than or

equal to zero does not alter our previous results reported in Table 4.²⁵ In fact, the PROFIT GROWTH x PREDATION FIRM variable always continues to be positive and significant. These results suggest that sales revenue serves as a reasonable proxy for firm output in our sample.

While this surprising positive, economically and statistically significant relationship concerning profits may simply mean that firms which encourage managers to increase short-run profits are more apt to be accused of predation, it at least provides strong evidence that accused firms are not rewarding managers for engaging in predatory behavior and it is at odds with all but one version of the signaling models. Yet, even when the short-run profits coefficients are consistent with the version of the signaling model that illustrates false information is being produced about a firm's demand curve, the other coefficients indicating how compensation is related to changes in sales and market value are frequently inconsistent. The coefficients on sales growth are usually the opposite sign of that predicted by the predation theories and the effect is often quite large economically, though the coefficients are never statistically significant.

III.D. Predation and Management Entrenchment

Aside from testing whether managers who appeared to engage in predation have compensation contracts that encourage sales maximization, we also investigate whether managers accused of predation are more difficult to remove through hostile takeover or Board of Directors mandate.

As discussed in Section II.C., managers can take deliberate actions such as having antitakeover charter amendments, chartering in states with anti-takeover statutes, and having golden parachutes that make it more difficult to remove them. Other firm characteristics that studies have found make it more difficult to remove managers include firm size (the log of real dollar sales), R&D intensity (R&D divided

²⁵ Assumptions concerning how rivals react to predatory actions are not central to our results since we are comparing predatory firms to all other firms in these regressions. In addition, while we generally assume that rivals react by "rolling over" and not by "fighting back" and expanding output, four of the rivals' supply elasticities reported in Table 5 are negative and thus imply that these results still hold even if "victim" firms fight back against predation. This case corresponds to the regressions described above where we reestimated the specifications after deleting the 13 cases where industry elasticities were less than 1.

These results again appear to be driven by the inclusion of the Ninth Circuit Court cases, some of which are still included in each of these three specifications.

by sales), the fraction of shares held by the top 4 owners, and Tobin's q .²⁶ We also investigated a possible proxy for manager entrenchment — the manager turnover rate — using data collected from *Forbes* magazine between 1970 and 1989. Of course, low turnover might simply imply that long serving managers are doing a good job. The turnover rate is defined as the annualize average rate at which chief executive officers lose their positions during the sample period. The greater the rate at which companies replace chief executive officers, the less entrenched we view these officers as being, and thus the less credible a firm's commitment not to remove the manager when predation becomes necessary.

Section II, however, concentrates only on the costs of making credible commitments and ignores the benefits from engaging in predation. While it is possible that the benefits from engaging in predation are the same across all industries, the return from making commitments may vary across industries because the same commitments may be more credible in some circumstances than in others. We reran the regressions with a new variable measuring the average rate at which predation is said to have occurred by firms with the same SIC code.²⁷

Using these variables, Table 7 shows three logit regressions predicting which firms in the COMPUSTAT data set faced predation charges.²⁸ The first two logits compare all the firms in the COMPUSTAT data set not accused of predation and those accused of predation but when they are outside the alleged predation period with the characteristics of those firms accused of predation during the years in which predation is said to have occurred. Two different logits were reported because ownership concentration estimates and managerial turnover rates were unavailable for many firms in the sample. Thus while previous articles on entrenchment have suggested the importance of concentrated share ownership, we faced a trade-off: the information on ownership concentration can only be obtained at the cost of losing the insights that can be derived from almost a quarter of the sample. The third logit compares whether a firm was ever accused of predation with that firm's sample averages of the

²⁶ Tobin's q is equal to the market value of equity plus the book values of debt and preferred stock all divided by the book value of a firm's assets adjust for inflation by the producer price index. See footnote 8 for a further discussion.

²⁷ Industry dummies are another method of controlling for these differences, but, unfortunately, the large number of dummies involved (whether we employed 2 or 4 digit SIC codes) prevented the logit estimates from converging.

²⁸ We earlier predicted that firms which wish to entrench their managements may reincorporate in other states with takeover laws. We found no firms in our sample which reincorporated between the time in which they were alleged to have engaged in predation and 1991.

exogenous variables shown. This analyzes whether firms accused or convicted of engaging in predation obtained greater benefits over this entire time period from restrictions which entrench management and help ensure credible commitments.

The results in Table 7 fail to support the hypothesis that firms charged with predation were more likely to have high R&D, anti-takeover charter amendments, high q 's, high ownership concentration, or low management turnover. The first specification even implies that anti-takeover laws significantly lower the probability that firms will be accused of predation, and the effect is economically very large — with the adoption of an anti-takeover law dropping the probability of accusation by 71 percent. The second specification, which controls for the fraction of shares held by the largest four owners, produces similar results and, again, the presence of anti-takeover laws implies a lower probability of firms being accused of predation.²⁹ Interestingly, after omitting cases heard before the Ninth Circuit Court of Appeals, we find that firms with high ownership concentration are significantly less likely to have been accused of predation. This further suggests that the Ninth circuit cases were more likely to involve firms which lacked the attributes expected of predators.

Firm size measured by total sales is also higher in predatory firms for all three specifications. While this result is also consistent with the tough manager theory of predation, it is difficult to give much credence to the theory based on this result alone because larger firms are also more likely to be sued. Simply by affecting more parties in the economy, large firms run greater hazards of being sued.

Table 8 reruns the regressions in Table 7, but removes the observations for predatory firms that are not convicted. Presumably, if the firms that actually committed predation have a higher probability of being convicted than do innocent firms, focusing only on convicted firms should be more likely to produce coefficients with the signs predicted by the tough manager predation theory. In keeping with the exclusion of those predation cases which did not result in conviction, the first two specifications now control for how the returns to predation vary across industries using the average annual rate that an industry's firms are convicted of predation, while the third one now uses the average rate that firms are

²⁹ An equivalent OLS coefficient would be slightly less than two thirds as large as the logit coefficient on ownership concentration (see Maddala (1983, p. 23)). In a separate unreported regression we find that management turnover is actually *higher* among firms with greater ownership concentration. Thus, ownership concentration rather than entrenching management may make it less costly for outsiders to remove an unwanted CEO.

convicted by industry. (The concentration of share ownership variable was no longer included in the third specification because that specification did not converge due to the small number of observations.)

The results in Table 8 fail to support the hypothesis that firms charged with predation were more likely to have high R&D, antitakeover charter amendments, high q 's, high ownership concentration, or low management turnover. The second specification provides some evidence consistent with the tough manager theory by showing that the fraction of shares held by the largest four owners is greatest for firms accused of predation. However, with firms accused of predation averaging ownership concentration rates of .24, the coefficient on the fraction of ownership is not economically significant. The large negative and significant coefficient for R&D intensity in the second specification and the large negative provides evidence against the tough manager theory. The firm size variable is again significant, but in only two of the three specifications.

As we did in Section III.C., we reran the specifications shown in Tables 7, but we limited the set of predation cases to those firms whose primary output involved items for which predation was said to have occurred. Only the coefficients on firm size are still consistent with the tough manager hypothesis and also statistically significant. We were unable to rerun the regressions shown in Table 8 with this smaller sample because none of these six firms were convicted of predation.

A potential problem with these logit regressions is that the coefficient estimates are not stable across specifications. To assess how serious this problem is, we report the range of coefficients and coefficient significance levels found after running all possible subsets of the logits in Table 7 using the global specification search method suggested by Leamer (1983). Panel A of Table 9 shows the range of coefficients and their chi-squares for 256 regressions. The results are generally consistent with those reported in Table 7. We find that the presence of state anti-takeover laws and the log of sales significantly related to the incidence of predation across all specifications. While the coefficients for anti-takeover provisions, state anti-takeover laws, and ownership concentration are usually the opposite of what the predation theory suggests, the coefficients for managerial turnover, R&D intensity, and sales provide some support for the theory. The coefficients on antitakeover charter amendments are almost always negative, and it is significantly negative in 82 percent of the specifications. The estimated coefficients for ownership concentration provide evidence against the predation theory in that they are

always negative, in a more than half of the specifications significantly so. By comparison, neither the significant negative coefficients for managerial turnover nor the significant positive coefficients for R&D intensity provide as consistent support for the reputational theory of predation, with neither variable being significant more than one-third of the time.

Panel B of Table 9 tests for differences in means of these management entrenchment proxies in years for which firms were charged with predation, years for which firms were not thought to have engaged in predation, and years for which firms were convicted of predation. Comparing the mean characteristics for firms in the nonaccused and accused categories produces three significant differences: firms accused of predation were much more likely to have larger sales, be more R&D intensive, and have lower managerial turnover rates than were firms never charged with predation. The section that compares the firms that were convicted and had a price drop with those that were never charged produces some evidence consistent with the tough manager theory. The means for sales, industry adjusted Tobin's q , and management turnover rates are consistent with the tough manager theory.

With the exception of the sales variable, the 262 regressions and the univariate results indicate: (1) the vast majority of characteristics thought to ensure management entrenchment are not associated with higher rates of accusations or convictions for predation and (2) even for those variables where significant results are obtained, they do not hold up consistently across specifications. On this last point, none of the variables which are significant in Table 7, other than the log of sales, are significant and of the predicted sign in Table 8, and the reverse is also true.³⁰

³⁰ Unfortunately, the data provided by DeAngelo and Rice (1983) on anti-takeover charter amendments does not identify the date on which those amendments were adopted. If the data had contained this information, it would have been possible to match the dates when those amendments were adopted with when the predatory behavior is said to have occurred when performing the event study.

III.E. Explaining Managerial Entrenchment

Finally, we sought to investigate further whether predatory firms were more likely to retain managers during those periods in which predation was said to have occurred.³¹ To do this we regressed the annual managerial turnover (a variable that equals one if there was a turnover during a given year) on the dummy variables for PREDATION FIRM and CONVICTED AND PRICE DROP FIRM and/or the dummy variables for PREDATION YEAR and CONVICTED AND PRICE DROP YEAR used earlier. We also attempted to control for the managers age and age squared, his years as CEO with the company and those years squared, measures of firm size as given by the log of sales and employment, and the other variables used in Tables 7, 8, and 9 which, as we discussed earlier, have been related to managerial entrenchment.

Table 10 indicates that few of the variables normally associated with managerial entrenchment seem to explain the rate at which CEO's leave office, but that neither firms accused or convicted of predation nor those firms during the years that predation is said to have occurred appear to have managers that leave office more frequently than to managers of nonpredatory firms. While five of the eight coefficients for dummy variables identifying predatory firms are negative as the reputational theory of predation would suggest, none of these dummy variables are statistically significant. Nor are the dummy variables identifying predatory firms statistically significant when the dummy variables are included with only the measures of age, years as CEO, and the measures of firm size or only the managerial entrenchment variables used in Tables 7 through 9.³² The only variables that are statistically significant at explaining managerial turnover are R&D intensity, years as CEO, and anti-takeover law dummy, though the coefficient on anti-takeover laws is surprising since it implies that these laws actually increase managerial turnover. The coefficients for R&D intensity fit the traditional managerial entrenchment story and indicate that higher R&D intensity is related to less managerial turnover. Managerial turnover also falls though at a decreasing rate with tenure.

³¹ We thank an anonymous referee for suggesting this section to us.

³² We ran this without including age and tenure since those are variables directly controlled by the firm and if they wanted to chose managers so that they had the desired ages and tenure when it became time to engage in predation.

IV. Conclusion

This paper makes a first attempt at determining whether the assumptions underlying several models of predatory pricing are empirically tenable. Before concluding that it is indeed “unfortunate” that the courts have not relied more upon these game-theoretic models in making their decisions (Klevorick, 1993, p. 166), it seems incumbent upon economists to argue persuasively that these models apply to the “real world.” Our evidence in fact helps justify the courts’ skepticism.

For tough managers’ predatory commitments to be credible, the firm’s contractual and non-contractual environment should make removing the manager difficult. Simply hiring the correct type of manager is not sufficient if the manager can be removed whenever it actually becomes necessary to engage in predation. In addition, the incumbent manager should be rewarded for increasing output as opposed to increasing short-term profits. Yet, managers of the 28 firms alleged to have engaged in predation in the 1963-1982 period were not rewarded more for increasing output than were managers of other firms. If anything the cases from the Ninth Circuit Court of Appeals imply that during those years that predation was allegedly taking place, increased output by the predator reduced the predator’s managerial compensation. We also have found little evidence that managers of firms involved in predatory pricing litigation were more entrenched than managers of other firms; for example, we found little difference in management turnover rates among predatory and non-predatory firms. Both sets of results provided no more evidence on predation even when the regressions were run with only those firms whose primary output was thought to have been involved in the predation. The results seriously challenge these game-theoretic predatory models’ relevance by showing that their assumptions are inconsistent with actual firm behavior. Another interpretation is that the legal system is unable to differentiate innocent from guilty firms when it makes its decisions on whom to prosecute and convict. Yet, this also brings the prosecution of predation cases into question. The evidence is consistent with the legal literature that the decisions handed down by the Ninth Circuit Appeals Court are particularly suspect.

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APPENDIX ON EXOGENOUS VARIABLES AND THEIR SOURCES

<u>VARIABLE NAME</u>	<u>DESCRIPTION AND SOURCE</u>
PREDATION FIRM	Dummy variable equalling one if the firm was charged with having engaged in predation during the period 1963 to 1988 (Source: Liebeler, 1986 and Austin, 1990)
PREDATION YEAR	Dummy variable equalling one if the firm was accused of having engaged in predation during a particular year (Source: Liebeler, 1986 and Austin, 1990)
CONVICTED AND PRICE DROP FIRM	Dummy variable equalling one if the firm was convicted of having engaged in predation and the court found evidence of a price drop during the period 1963 to 1988 (Source: Liebeler, 1986 and Austin, 1990 and the individual District and Appeals Court decisions).
CONVICTED AND PRICE DROP YEAR	Dummy variable equalling one if the firm was convicted of having engaged in predation and the court found evidence of a price drop during a particular year (Source: Liebeler, 1986 and Austin, 1990 and the individual District and Appeals Court decisions)
PROFIT GROWTH	The difference between the current year's operating income to sales and the previous year's operating income to sales divided by the firm's operating income to sales in the previous year (Source: COMPUSTAT).
SALES GROWTH	The difference between the current year's sales revenues and the previous year's sales revenues divided by the firm's sales revenues in the previous year (Source: COMPUSTAT).
MARKET VALUE GROWTH	The difference between the current year's market value of equity and the preceding year's value divided by the firm's market value of equity in the previous year (Source: COMPUSTAT).
INDUSTRY ADJUSTED TOBIN'S Q	The market value of equity plus the book values of debt and preferred stock all divided by the book value of a firm's assets adjust for inflation by the producer price index (Source: COMPUSTAT).
R&D INTENSITY	R&D divided by sales (Source: COMPUSTAT).
Fraction of shares held by the top 4 owners	The percentage of a firm's stock held by its four largest shareholders (Source: Demsetz and Lehn, 1985).

ANTI-TAKEOVER CHARTER AMENDMENTS	A dummy variable that equalled one for identified firms in the COMPUSTAT data set which had antitakeover charter amendments (Source: DeAngelo and Rice, 1983).
ANTI-TAKEOVER LAW	A dummy variable that equalled one for firms chartered in states with laws inhibiting hostile takeovers up until the 1982 <i>Edgar v. Mite</i> decision which invalidated state anti-takeover laws (Source: Karpoff and Malatesta, 1989).
MANAGER TURNOVER RATE	The turnover rate is defined as the annualize average rate at which chief executive officers lose their positions during the sample period (Source: <i>Forbes</i> magazine between 1970 and 1989).
ANNUAL MANAGERIAL TURNOVER RATE	A variable that equals one if there was a turnover during a given year (Source: <i>Forbes</i> magazine between 1970 and 1989).
CEO Compensation	The compensation data includes salary, bonuses, value of restricted stock grants, savings and thrift plans and benefits (Source: <i>Forbes</i> magazine between 1970 and 1989).
CEO AGE	(Source: <i>Forbes</i> magazine between 1970 and 1989)
Other variables on Firm Assets, Sales, and Employment	(Source: COMPUSTAT)

Table 1: Predictions for Managerial Entrenchment and Compensation During Predation Periods

	<u>Predation Theories</u>			
	<u>Reputation for Toughness</u>	<u>Signalling False Information Demand</u>	<u>Cost</u>	<u>Long Purse</u>
Managerial Entrenchment Important to Ensuring Strategies are “Renegotiation Proof”	YES	YES	NO	NO
If Preference are Sufficient and We Don't Want to Make it Costly for Manager to Engage in Predation		Compensation if Preferences are Not Sufficient to Motivate Manager		
Change in Managerial Compensation for “Predatory” Firms Relative to Nonpredatory Ones Based Upon Change In:				
Short-run Profit	NEGATIVE or NO RELATIONSHIP	NEGATIVE	POSITIVE	NEGATIVE
Sales	POSITIVE or NO RELATIONSHIP	POSITIVE	NEGATIVE	POSITIVE
Market Value	POSITIVE or NO RELATIONSHIP	POSITIVE	NEGATIVE	POSITIVE (?)

Table 2. Cases where predatory pricing was alleged with defendant, plaintiff, court, decision, decision date and matter.*

<i>Defendant (s)</i>	<i>Plaintiff</i>	<i>Years Alleged/</i>	<i>Decision/Year/ Appeals Court District</i>	<i>Matter / Did court accept claim that the accused firm's price declined during the alleged predatory period?</i>
Champion Spark Plug	Stitt Spark Plug	1979-81	Defendant/1988/ 5th	Champion charged lower prices to industrial users because of their hold over the consumer market / No
Procter & Gamble Co	Indian Coffee Corp	1973-74	Plaintiff/1980/ 3rd	Folgers gave discounts coupons in Pennsylvania / Yes
Airco Inc	Airweld, Inc	1969-76	Defendant/1985/ 4th	Airco entered market and charged predatory prices / Question not applicable, Airco just entered market
Dr Pepper Co	Bayou Bottling	1975	Defendant/1984/ 5th	Restraint of trade, contract dispute, and pricing below average variable costs / Yes
IBM	Transamerica Computer**	1970-78	Defendant/1983/ 9th	IBM lowered prices and changed its peripherals / Yes
MCA Inc, ABC Records, Polygram Distribution Inc, Warner /Elektra/Atlantic Co., Capitol Records Inc.	Marin Music Centre	1969-75	Defendant/1982/ 9th	MCA & others sold records to chains at lower prices than independent retailer / No
Coca-Cola	Allegheny Pepsi-Cola Bottling	1979-80	Defendant/1982/ 4th	Parent company transferred "war chest" funds to subsidiary allowing it to engage in predatory pricing / Yes
CPC International	Dimmitt Agri Industries	1970-73	Defendant/1982/ 5th	Below cost prices by CPC in wet corn milling? / Yes
Borden	Golden Crown	1969-71	Plaintiff/1982/ 6th	Promotional pricing of Reallemon juice / Yes
Monsanto Co	SuperTurf	1976-77	Defendant/1981/ 8th	Monsanto lowered price on AstroTurf / Yes
ITT Corp	William Inglis Baking**	1971-74	Plaintiff/1980/ 9th	Continental set low prices on private label bread / Yes
United Brands	Pierce Packing Corp	1972-75	Defendant/1980/ 9th	Sale of pork products below cost / Yes
Martin Marietta Corp	Chillicothe Sand & Gravel	1973-78	Defendant/1980/ 7th	Martin Marietta sold gravel cheaply / Yes
Kerr-McGee Corp	Pacific Engineering	1966-70	Defendant/1977/ 10th	Price cutting on solid fuel input for missiles / Yes
Shell Oil Co, Gulf Oil Co, Standard Oil Co	C. O. Hanson	1958-66	Defendant/1976/ 9th	Hanson claims was victimized in retail gas price wars in Tucson Arizona / Yes
Pepsico	Jays Foods	1974-80	Plaintiff/1985/ 7th	Frito Lay used promotional prices and ads to gain shelf space / Yes
Textron Inc	Flair Zipper Corp	1978-79	Defendant/1981/ SDNY	Price reduction in New York zipper assembly market / Yes
Murphy Oil Corp	Inter City Oil Co	1974-75	Defendant/1976/Minn	Selling home heating oil below cost / Yes
Raytheon Co	CVD	1980-81	Plaintiff/1985/ 1st	Dispute over whether CVD should pay royalty rate on manufacture of zinc sulfide and zinc selenide / No
North American Phillips	Energex Lighting	1979-80	Plaintiff/1987/ SDNY	Phillips set low prices to distributors, ignored Energex / Yes
Marathon Oil Co. Tenneco Oil Co.	Spar Oil Company	1971-72	Plaintiff/1981/ 5th	Set price below Spar's gas station costs in south Georgia / Yes

* The complete legal citations for these cases are in Liebel (1986) and Austin (1990).

** Three other predation cases were brought against IBM (two other 9th circuit and one 10th circuit) and one more against ITT (first circuit) during the same time period.

Table 3. Description of manager compensation contract in period of alleged predatory pricing.

<i>Defendant</i>	<i>Options</i>	<i>Profits</i>	<i>Other</i>	<i>Comparison I</i>	<i>Options</i>	<i>Profits</i>	<i>Other</i>	<i>Comparison II</i>	<i>Options</i>	<i>Profits</i>	<i>Other</i>
Dr Pepper Co	Yes	Yes	B	Norton Simon (Canada Dry)	Yes	No	G				
Coca-Cola	Yes	No		Consol. Foods (Shasta)	Yes	Yes	J				
Pepsico	No	Yes		IC Industries (Pepsi Bottlers)	Yes	No					
Marathon Oil Corp	Yes	Yes		Exxon	Yes	Yes		American Petrofina	Yes	No	
Shell Oil Co	Yes	Yes		Mobil	Yes	Yes		Superior Oil	Yes	No	
Gulf Oil Co	Yes	Yes	I	Texaco	Yes	No		Getty Oil	No	No	F
Standard Oil Co.	Yes	No		Phillips Pet.	No	No	K	Amoco	Yes	Yes	
Murphy Oil Corp	Yes	No	I	ARCO	Yes	No	C	Gulf Oil	Yes	No	
Champion Spark Plug	Yes	Yes	F	Eltra Corp	Yes	No		General Motors (AC Delco)	Yes	Yes	
Procter & Gamble Co	Yes	No	A	Standard Brands	Yes	Yes	A,E	General Foods	Yes	No	
Airco Inc	No	Yes		Union Carbide	Yes	Yes		Air Prods & Chems	Yes	Yes	
IBM	Yes	Yes	I	Sperry Rand	Yes	Yes		Burroughs	Yes	No	L
MCA Inc	Yes	No	C	CBS	Yes	Yes		RCA	Yes	Yes	H
Warner Communications	Yes	No		ABC	Yes	No		Columbia	Yes	No	
Capital Industries	Yes	Yes		MGM	Yes	No		Gulf + Western	Yes	No	
CPC International	Yes	Yes		AE Staley	Yes	No		Standard Brands	Yes	Yes	A,E
Borden	Yes	No		Beatrice	Yes	No		Carnation	Yes	Yes	
Monsanto Co	Yes	No		E I Dupont	Yes	Yes		Celanese	Yes	No	
ITT Corp	Yes	No	I	Amer. Bakeries	Yes	Yes		Ward Foods	Yes	No	A
United Brands	Yes	No		Iowa Beef Proc.	Yes	No		Esmark	Yes	No	
Martin Marietta Corp	Yes	No		Vulcan Materials	No	Yes	F,E	Florida Rock	No	Yes	F
Kerr-McGee Corp	Yes	No		American Cyanimid	Yes	No		Allied Chemical	Yes	Yes	
Ilextron Inc	Yes	No		Levi Strauss	Yes	Yes	E	West Point Pepperell	Yes	Yes	E
Raytheon Co	Yes	Yes		McDonnell Douglas	Yes	Yes		Lockheed	Yes	No	
North American Phillips	Yes	No		Natl Service Industries	Yes	No		General Electric	Yes	No	
Frequency of plan type	92%	44%						Comparison I and II	91.5%	44.7%	

Table 3 Notes:

- A Shares must be sold back to company when terminated.
- B Formula based on return relative to investment.
- C Executives guaranteed jobs in contracts.
- D Options offered with a exercise date more than seven years in the future
- E No share or cash bonuses paid unless earnings growth exceeds threshold
- F High stock ownership by executives
- G Cash bonus awards tied to stock price growth
- H Bonus pool tied to dividends
- I Basis for distributing bonuses not specified
- J Compensation triggered when earnings growth and return on investment targets met.
- K Option program terminated in 1963.
- L Stock options given when earnings target met.

Table 4. Regressions of annual growth rate in management compensation versus profit, sales, and market value growth and predation interaction terms during the 1970-85 period.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	0.696 (1.71)	0.730 (1.79)	0.695 (1.71)	0.728 (1.79)	0.729 (1.79)	0.730 (1.79)	0.683 (1.68)
Profit growth	0.080 (6.04)	0.082 (6.16)	0.081 (6.05)	0.083 (6.22)	0.083 (6.23)	0.083 (6.22)	0.080 (6.04)
Sales growth	-0.047 (4.05)	-0.048 (4.18)	-0.047 (4.05)	-0.049 (4.21)	-0.049 (4.20)	-0.049 (4.20)	-0.047 (4.05)
Market Value growth	0.122 (7.75)	0.126 (8.02)	0.122 (7.75)	0.127 (8.06)	0.126 (8.02)	0.126 (8.03)	0.123 (7.75)
Profit growth x predation firm dummy	0.406 (2.62)	----	0.393 (2.19)	----	----	----	0.465 (2.11)
Sales growth x predation firm dummy	0.105 (0.48)	----	0.177 (0.65)	----	----	----	0.437 (1.15)
Market Value growth x predation firm dummy	0.055 (0.78)	----	0.090 (1.00)	----	----	----	0.093 (0.87)
Profit growth x predation year dummy	----	0.393 (1.26)	0.003 (0.01)	----	----	----	-0.092 (0.23)
Sales growth x predation year dummy	----	-0.052 (0.14)	-0.219 (0.47)	----	----	----	-0.422 (0.77)
Market Value growth x predation year dummy	----	-0.029 (0.24)	-0.117 (0.78)	----	----	----	0.09 (0.87)
Profit growth x convicted and price drop firm dummy	----	----	----	0.554 (1.39)	----	1.032 (1.878)	1.105 (1.898)
Sales growth x convicted and price drop firm dummy	----	----	----	-0.955 (0.66)	----	-0.860 (0.58)	-0.435 (0.27)
Market Value growth x convicted and price drop firm dummy	----	----	----	0.020 (0.71)	----	-0.007 (0.02)	0.123 (0.33)
Profit growth x convicted and price drop year dummy	----	----	----	----	0.044 (1.41)	0.022 (0.07)	-0.48 (0.22)
Sales growth x convicted and price drop year dummy	----	----	----	----	-0.127 (0.34)	-0.094 (0.243)	-0.51 (0.95)
Market Value growth x convicted and price drop year dummy	----	----	----	----	0.018 (0.13)	0.027 (0.16)	-0.064 (0.32)
CEO age	0.0056 (0.86)	0.0050 (0.78)	0.006 (0.87)	0.0051 (0.80)	0.0053 (0.83)	0.0051 (0.80)	0.006 (0.93)
CEO age squared	-6.5E-5 (1.15)	-6.0E-5 (1.07)	-6.5E-5 (1.15)	-6.1E-5 (1.07)	-6.2E-5 (1.08)	-6.1E-5 (1.08)	-6.9E-5 (1.21)

(Table 4 Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total assets	-7.3E-5 (1.39)	-7.8E-5 (1.47)	-7.3E-5 (1.49)	-7.9E-5 (1.49)	-7.9E-5 (1.50)	-7.9E-5 (1.50)	-7.4E-5 (1.41)
Log of sales	0.032 (2.70)	0.034 (2.92)	0.032 (2.66)	0.035 (2.94)	0.035 (2.94)	0.035 (2.95)	0.032 (2.67)
Log of employment	-0.030 (2.86)	-0.032 (3.07)	-0.030 (2.82)	-0.032 (3.06)	-0.032 (3.07)	-0.032 (3.07)	-0.30 (2.82)
Observations	7514	7514	7514	7514	7514	7514	7514
Adjusted R ²	0.062	0.061	0.062	0.060	0.061	0.060	0.062

Note: Convicted firm-years represent periods when a firm was alleged to have engaged in predation and was convicted at the appellate court level. Price decline firm-years represent periods when a firm was alleged to have engaged in predation and court documents confirm that a product price decline took place. Year and industry dummies are not shown. Management compensation equals base pay plus bonus.

Table 5. Industry level regressions of change in compensation on determinants of compensation with interactions for firms accused of predation.

Variable	Chemicals (SIC=28)		Electronics (SIC=36)		Food (SIC=20)		Petroleum (SIC=29)	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Intercept	-0.746	-0.72	-0.986	-0.52	0.088	0.12	-0.146	-0.15
Profit growth	0.491	5.21	-0.011	-0.16	0.131	1.26	0.149	1.31
Sales growth	-0.151	-0.87	0.314	1.37	-0.109	-0.68	0.237	1.24
Market Value growth	0.208	3.00	0.250	1.02	0.112	1.33	0.129	1.32
Profit growth x predation year	0.014	0.01	-1.15	-0.46	0.240	0.16	-0.083	-0.17
Sales growth x predation year	-1.39	-0.46	-0.028	-0.01	-0.091	-0.05	-0.519	-0.40
Market Value growth x predation year	0.401	0.43	-0.460	-1.16	-0.054	-0.12	-0.083	-0.17
Profit growth x predation firm	-0.043	-0.08	0.600	1.24	-0.293	-0.42	-0.539	-1.12
Sales growth x predation firm	0.305	0.29	0.134	0.19	0.534	0.67	0.221	0.42
Market Value growth x predation firm	-0.175	-0.61	0.250	1.02	0.186	0.85	-0.021	-0.09
CEO age	0.031	0.86	0.047	0.69	-0.003	-0.12	0.017	0.54
CEO age squared	-2.9E-4	-0.90	-4.1E-4	-0.68	2.3E-5	0.10	-1.7E-4	-0.66
Total assets	3.8E-4	-0.90	7.2E-5	0.08	-5.3E-4	-0.40	1.2E-4	0.41
Log of sales	0.004	0.06	0.027	0.30	0.069	1.51	-0.023	-0.41
Log of employess	0.007	0.15	-0.036	-0.47	-0.027	-0.88	0.021	0.44
Observations	685		292		424		295	
Adjusted R2	0.11		0.11		0.01		0.10	

Table 6. Estimated demand elasticities and market shares in industries where predatory pricing was alleged. The industry supply elasticity values that are required for firm revenue coefficients to primarily reflect the impact of quantity changes.

<i>Defendant</i>	<i>SIC</i>	<i>SIC Industry</i>	<i>Market Share at beginning of predatory Period</i>	<i>Industry</i>	<i>Demand Elasticity</i>	<i>The maximum industry supply elasticity which implies the coefficient on firm revenue still reflects quantity changes.</i>
Champion Spark Plug	3694	Automotive parts	** 50%	Tires, tubes & parts	1.93A	< 0
Procter & Gamble Co	2095	Roasted coffee	0%***	Coffee	0.25A	0.75
Aico Inc	2813	Industrial gases	0%***	N/A		
Dr Pepper Co	2086	Soft drinks	2.9%**	Soft drinks	0.90B	0.10
IBM	3573	Computers&office equipment	32.3%*	N/A		
MCA Inc	3652	Photographic records	5.6%*	Radio, TV, records	3.00A	< 0
Coca-Cola	2087	Soft drinks	39.3%*	Soft drinks	0.90B	0.165
CPC International	2046	Wet corn milling	25%***	Food	0.71A	0.38
Borden	5141	Grocery products, general	10 to 90%**	Food	0.71A	0.32 to 2.9
Monsanto Co	2824	Mannmade organic fiber	78%***	N/A		
ITT Corp	2051	Bread & bakery products	17%***	Bread	0.06C	1.13
United Brands	2011	Meat packing plants	21%***	Beef	0.92D	0.10
Martin Marietta Corp	1423	Crushed & broken limestone	70%***	N/A		
Kerr-McGee Corp	2865	Cyclic organic crudes	54%***	Gasoline	0.80E	0.43
Shell Oil Co	5541	Gasoline service stations	10%***	Gasoline	0.80E	0.22 for Combined Market Share: 0.25
Standard Oil Co			9%***			0.22
Pepsico	2099	Snack foods	25%***	Food	0.71A	0.38
Textron Inc	3964	Needles, pins & fasteners	30.6%*	Clothing	0.51A	0.70
Murphy Oil Corp	1311	Petroleum extraction	25%***	Gasoline	0.80E	0.26
Raytheon Co	3761	Guided missile & space products	90%***	optical material for high speed Jet aircraft	1.69F	< 0
North American Phillips	3646	Commercial lighting fixtures	25%***	Electricity	1.94A	< 0
Marathon Oil Co.	5541	Gasoline service stations	<10%***	Gasoline	0.80E	0.22 for Combined Market Share: 0.25
Tenneco Oil Co.			<10%***			0.22

Table 6 notes:

- * Market share estimate from Compustat data set.
- ** Market share primarily obtained from either the District or Appeals court decisions. When that information was not available we contacted the lawyers who represented the firms. We greatly appreciate the help of Ken Bode of Jenner & Block (Chicago, Ill.) with the *Chillicothe v. Martin Marietta* case; Kenneth Letzler of Arnold & Porter (Washington, D.C.) for the *Allegheny Pepsi-cola Bottling Co. v. Mid-Atlantic Coca-cola Bottling Co.* case; Wayne Paris (Houston, Texas) and Rufus Oliver of Baker & Borts (Houston, Texas) with the *Sitt Spark Plug v. Champion Spark Plug Co.* case; Charles E. Buffon of Washington, D.C. for the *Flair Zipper Corp v. Textron Inc* case; Trammell Newton of Jones & Day (Atlanta, Ga.) for the *Spar Oil Co. v. Marathon Oil Co. et al.* case; and Robert F. Finke of Mayer, Brown & Platt (Chicago, Illinois) for the *Pierce Packing Co. v. John Morrell Co.* case.
- *** U.S. Congress, Senate, Select Committee on Nutrition and Human Needs, 1975 Food Price Study, Part IV: Economic Organization of the Milling and Bread Industry, 94th Congress, 1st Session, December 1975, pp. 56-61. This estimate is the only one that is not for the beginning of alleged predatory period.
- **** The plaintiff claimed that the merger between LCC and the Wilcox Dr. Pepper franchise was made at the instigation of Dr. Pepper.
- A From H. S. Houthakker and Lester D. Taylor, *Consumer Demand in the United States: Analyses and Projections* (Cambridge, MA: Harvard University Press), 1970.
- B From Noel D. Uri, The Demand for Beverages and Interbeverage Substitution in the United States, *Bulletin of Economic Research* 38, 1986, 77-85.
- C From Kenneth W. Meinken, *The Demand and Price Structure for Wheat*, Technical Bulletin No. 1136, U.S. Dept. of Agriculture, (Washington, D.C., 1955).
- D From Elmer Working, *The Demand for Meat*, Chicago: University of Chicago Press, 1951.
- E From J. L. Sweeney, The Response of Energy Demand to Higher Prices: What Have We Learned?, *American Economic Review* 74, May 1984, 31-37.
- F From Gerald S. McDougall and Dong W. Cho, Demand Estimates for New General Aviation Aircraft: A User-cost Approach, *Applied Economics* 20, 1988, 315-324.

Table 7. Logit regressions predicting years accused of predation from NBER Manufacturing Panel.

<i>Exogenous Variables</i>	<i>In predation years Without ownership concentration rates</i>		<i>In predation years With ownership concentration rates</i>		<i>In all years (using period averages)</i>	
	<i>Coefficient</i>	χ^2	<i>Coefficient</i>	χ^2	<i>Coefficient</i>	χ^2
Anti-takeover charter amendment	-0.4896	1.638	-0.632	2.289	-0.3519	0.202
Anti-takeover law dummy	-0.7052	4.3699*	-0.640	3.194*	-3.567	0.545
Management turnover rate	...	...	-2.918	0.882	...	...
Industry Adjusted Tobin's q	-0.2547	0.881	-0.049	0.029	-0.1516	0.126
R&D intensity	6.1325	0.9196	0.894	0.0179	-11.44	0.351
Log of Sales	0.915	44.337*	0.715	16.66*	1.098	15.19*
Fraction of shares held by top 4 owners	...	...	-0.055	0.202	...	...
Average annual rate that predation charges are brought by industry	29.925	157.4*	22.209	143.06*	...	...
Average rate that predation charges are brought against an industry's firms	...	...	...	...	9.224	22.58*
Intercept	-12.785	113.27*	-10.257	43.225*	-8.163	43.20*
Non-predation years Predation years		6312 68		3004 57		
Non-predation firms Predation firms						664 19
2*Log-likelihood		-386.85*		-317.33*		-78.004*

* Means the value is statistically significant at least at the .10 level.

Table 8. Logit regressions predicting predation years for those cases where the firms were convicted from NBER Manufacturing Panel.

Exogenous Variables	In predation years for convicted firms Without ownership		In predation years for convicted firms With ownership		In all years for convicted firms (using period averages)	
	Coefficient	χ^2	Coefficient	χ^2	Coefficient	χ^2
Anti-takeover charter amendment	-1.1065	1.7994	-1.688	2.054	-2.8054	2.2269
Anti-takeover law dummy	-0.2270	0.1737	0.6418	0.843	-1.4112	0.2971
Management turnover rate	...	...	-6.7951	0.437	...	...
Industry Adjusted Tobin's q	-0.7945	2.3298	-0.746	0.930	-0.8803	1.6477
R&D intensity	-18.259	0.6929	-89.590	3.2799*	-34.8405	1.0363
Log of Sales	1.0351	15.131*	1.1145	2.2871	1.3085	8.9716*
Fraction of shares held by top 4 owners	...	...	0.0431	3.438*	...	...
Average annual rate that firms are convicted for predation by industry	38.473	89.151*	46.729	29.446*	...	...
Average rate that firms are convicted by industry	...	...	...	...	8.3316	15.26*
Intercept	-14.58	40.78*	-16.395	6.8849*	-9.4726	22.995
Non-predation years	6344		3036			
Predation years	19		13			
Non-predation firms					676	
Predation firms					7	
Log-likelihood	148.2*		74.68*		39.84*	

* Means the value is statistically significant at least at the .10 level.

Table 9. Panel A: Range of Coefficients and coefficient chi-squares in first two logit regressions in Table 6 using all possible subsets of the variables. Panel B: T-tests of differences in means of proxies for management entrenchment in predation and non-predation years. Sample sizes shown in parentheses. Starred variables are statistically significant at the .05 level or better.

Panel A. Range of Coefficients in All Subset Logit Regressions

<i>Endogenous Variable</i>	<i>Minimum Value</i>	χ^2	<i>Maximum Value</i>	χ^2
Anti-takeover Provision	-.871	4.03***	.097	0.06
State Anti-takeover Law	-.711	3.74**	-.578	3.02*
Management Turnover Rate	-5.71	3.60*	0.85	0.18
Industry Adjusted Tobin's q	-.292	1.40	0.231	0.91
R&D Intensity	0.18	0.01	9.70	3.92**
Log of Sales	.60	10.0***	0.97	53.8***
Ownership Concentration	-0.040	6.08**	-0.0028	0.06
Average annual rate that predation charges are brought by industry	26.2	138.5***	35.7	160.2***

* Statistically significant at least at the .10 level.

** Statistically significant at least at the .05 level.

*** Statistically significant at least at the .01 level.

Panel B. Univariate Comparisons

<i>Variable</i>	<i>Mean Non-predation years</i> (1)	<i>Mean Predation years</i> (2)	<i>Comparing (1) and (2) t-statistic</i> (3)	<i>Mean Predation years for convicted firms</i> (4)	<i>Comparing (1) and (4) t-statistic</i> (5)
Anti-takeover charter amendment	22.2% (7953)	26.3% (68)	0.70	10.5% (19)	1.23
State Anti-takeover Law	38.9% (6166)	29.4% (68)	1.47	42.1% (19)	0.28
Management Turnover Rate	11.0% (7953)	9.2% (57)	2.67***	8.6% (19)	3.788***
Industry Adjusted Tobin's q	0.0002% (6811)	-.026 (68)	0.34	0.059% (19)	7.38***
R&D Intensity	0.8% (7953)	1.3% (68)	2.06**	1.3% (19)	1.00
Log of Sales	6.31% (7953)	7.16% (68)	6.23***	7.43% (19)	2.88**
Ownership Concentration	24.1% (3573)	21.0% (57)	1.06	22.9% (13)	0.14

* Statistically significant at least at the .10 level for a two-tailed t-test.

*** Statistically significant at least at the .01 level for a two-tailed t-test.

Table 10. Logit regressions predicting whether managers will leave during a particular year from NBER Manufacturing Panel.

Exogenous Variables	Endogenous Variable: Whether a Firm's Manager Was Removed in a Particular Year			
	Controlling for Dummy Variables Identifying Which Firms were Accused of Predation	Controlling for Dummy Variables Identifying Years During Which Predation Occurred	Controlling for Dummy Variables Identifying which Firms were Committing Predation and the Years During which Predation is said to have Occurred, plus Industry dummy variables	
	Coefficient	χ^2	Coefficient	χ^2
Predation Firm Dummy	0.1101	0.1691	...	0.1924
Convicted and Price Drop Firm Dummy	-0.4531	0.6749	...	-0.5930
Predation Year Dummy	...	...	...	0.8809
Convicted and Price Drop Year Dummy	...	...	0.2549	-0.5668
Anti-takeover charter amendment	-0.0061	0.0019	-0.0743	0.0037
Anti-takeover law dummy	0.2317	3.0111*	-0.0006	0.4303
Industry Adjusted Tobin's q	0.0945	0.4618	0.2251	-0.0761
Tobin's q	...	...	0.1074	2.8478*
R&D intensity	-7.6784	5.5001*	...	0.6027
Age	-0.0453	0.1100	-7.4556	5.2098*
Age Squared	-0.00055	0.1913	-0.0476	0.1215
Years as CEO	-0.0340	4.3246*	-0.00053	0.1787
Years as CEO Squared	0.000558	2.9492*	-0.0336	4.2183*
Log of Sales	0.00301	0.0002	0.00055	2.9058*
Log of Employment	0.1964	2.5164	0.00646	0.0010
Fraction of shares held by top 4 owners	-0.00034	0.0072	0.1894	2.3501
Intercept	2.2456	0.3606	-0.00067	0.0288*
			2.2834	0.3734
			2.5546	0.3809
Non-CEO Removal Years	2020		2020	
CEO Removal Years	305		305	
Log-likelihood	1688.3*		1688.6*	1660.88*

* Means the value is statistically significant at least at the .10 level.