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Corporate Control, Portfolio Choice, and the Decline of Banking

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ABSTRACT

In the 1980s, U.S. banks became systematically less profitable and riskier as non-bank competition eroded the profitability of banks' traditional activities. Bank failures rose exponentially during this decade. The leading explanation for the persistence of these trends centers on fixed-rate deposit insurance: the insurance gives bank equityholders an incentive to take on risk when the value of bank charters falls. We propose and test an alternative explanation based on corporate control considerations. We show that managerial entrenchment played a more important role than did the moral hazard associated with deposit insurance in explaining the recent behavior of the banking industry.

THE 1980S WAS NOT a good decade for U.S. banks. Gerald Corrigan (1992), the head of the New York Federal Reserve Bank during the period, observed that: ". . . we would all accept the fact that the decade of the 1980s was surely the most difficult interval faced by the U.S. banking system since the 1930s." Indeed, during the 1980s, bank profitability declined steadily, whether measured by accounting return on equity, return on assets, or market value. Figure 1 shows the accounting return on assets.[1] Not only did banking become less profitable, it became riskier. The ratio of charge-offs to total loans, a measure of risk, rose almost monotonically in the last decade. (See Figure 1.)

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[1] Controlling for the effects in 1987 and 1988 of large bank write-downs of LDC loans in 1987, the decline in profits shown in Figure 1 is statistically significant. The increase in charge-offs is also significant. Market value data on the return to bank equity is consistent with the book value data shown in Figure 1. Over the 1980s the S&P 500 outperformed the Salomon Brothers index of bank stocks by 38 percent. Also, see Table II, discussed later in the text, for data on the return on loans.

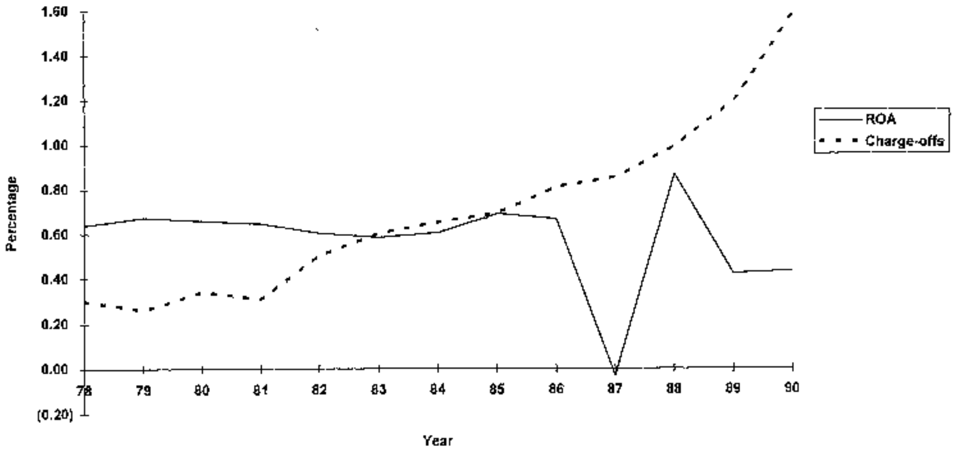

Figure 1. Bank return on assets and bank charge-offs (for banks larger than $300 million in assets, 1978–1990). The data source is the *Call Reports of Income and Condition.*

Not surprisingly, bank failures, which averaged six (mostly small banks) per year from 1946 to 1980, rose exponentially, averaging 104 banks per year during the 1980s.[2] Unlike the 1930s, however, it is not obvious what caused the recent decade of malaise in the industry.

The 1990s have seen a turnaround in bank prospects. But the increased profits appear to largely be due to short-term phenomena that may not affect the long-term decline in banking.[3] Declining interest rates in 1991 and 1992 allowed banks to profit from the sale of investment securities. See *Federal Reserve Bulletin* (July 1993). Interest margins also increased during the same period. If interest rates rise from their current levels, banking may return to 1980s profit levels. As Corrigan (1992) observes, rebuilding the U.S. banking system is likely to be a long and difficult process.

Our concern is with the low bank profits during the 1980s (we discuss the 1990s further in the conclusion). The decline of U.S. bank profitability in the 1980s coincided with significant changes in corporate finance. Banks, in particular, lost market share in financing corporations, one of their core lending areas. In the past, banks had been the dominant providers of short-term (nonfinancial) corporate debt. But their share of this market has been declining, from about 70 percent in the late 1970s to less than 60 percent by the late 1980s. Theoretical work suggests that bank loans are the most efficient method of supplying capital in the presence of information or monitoring

[2] Bank failure figures are from the FDIC *Annual Report.* FDIC payouts show a similar trend.

[3] It is important to be clear about what we mean by "banking" being in decline. The term "banking" has traditionally corresponded to a particular set of activities, namely, financing loans by issuing deposits. The combination of these activities has, historically, been the source of public policymakers' concerns. As we discuss, there has been a decline in corporate lending by banks and, because of money market mutual funds, a smaller decline in demand deposits.

problems.[4] Historically, corporations have been prone to these sorts of problems. Technological change or changes in market structures may have reduced the information and monitoring problems for many corporations, meaning there is less need for bank loans to finance these borrowers.[5] These changes have allowed many large and medium-sized firms to access nonbank capital markets.[6]

Banks should have responded to the changes in the corporate debt market by reducing the volume of corporate loans while seeking new profit opportunities to replace lost opportunities. In fact, there has been a shift in bank portfolios, to off-balance sheet activity, such as loan commitments and standby letters of credit for corporations.[7] Banks also significantly increased commercial real estate lending in recent years. Commercial real estate more than doubled, as a percentage of total bank assets, between 1980 (when the percentage was 5.36) and 1990 (when it was 11.13). But, these changes were not enough to replace lost bank profit.

Why did banking become unprofitable, and bank failures increase, in the 1980s? A large literature in banking, following Merton (1977), concentrates on the incentives of shareholders to maximize the value of the (fixed rate) deposit insurance subsidy provided by the government by taking on risk inefficiently, so-called "moral hazard" risk.[8] As refined by Marcus (1984) and Keeley (1990), bank shareholders have an incentive to take on risk when the value of the bank charter falls sufficiently (Keeley claims that charter values have fallen recently; this is consistent with the decline in bank profitability).

In this paper we take issue with the view that moral hazard emanating from fixed rate deposit insurance explains the recent behavior of the U.S. banking industry. The moral hazard view of banks assumes that shareholders make the lending decisions and can take on risk to maximize the value of insurance if they desire. Rather than assume that shareholders directly control bank actions, we assume bank managers, who may own a fraction of the bank, make the lending decisions. If managers have different objectives than outside

[4] Theoretical work on banking argues that commercial banks can produce information about potential borrowers and monitor the managements of borrowing firms, by enforcing loan covenants, in ways which cannot easily be replicated by marketable, corporate securities. See Boyd and Prescott (1986) and Diamond (1984). Bhattacharya and Thakor (1993) provide a review. The empirical evidence that bank loans are unique includes James (1987) and Lummer and McConnell (1989). Also, see Hoshi, Kashyap, and Scharfstein (1990), Gilson, John, and Lang (1990), James and Weir (1991), and Fama (1985).

[5] Gorton and Pennacchi (1990), studying the loan sales market, provide some evidence for this proposition.

[6] However, small firms and retail customers are relatively unaffected by the technological changes. Thus, banks that lend primarily to smaller firms, particularly small banks, might not be subject to many of the problems we discuss here.

[7] Standby letters of credit, letters of credit, foreign exchange commitments, commitments to make loans, futures and forward contracts, options, and swaps, all show significant upward time trends over the 1980s. Some of these categories have increased dramatically.

[8] It should be stressed that empirical research has not reached a consensus on whether deposit insurance is underpriced (see Marcus and Shaked (1984), Ronn and Verma (1986), and Pennacchi (1987)).

shareholders and disciplining managers is costly, then managerial decisions may be at odds with the decisions outside shareholders would like them to take.[9] We explore the effect of this conflict on the risk-taking behavior of banks.

The agency relationship between managers and outside shareholders has been widely studied in corporate finance. Jensen and Meckling (1976) and others argue that managers benefit from control of the firm in many ways, including the ability to consume nonmarketable perquisites. To protect future private benefits, and because managers have a large undiversifiable stake in the firm that employs their human capital, managers of nonfinancial firms avoid risk. Private managerial benefits of control, however, can be mitigated if managers' objectives are aligned with the objectives of outside shareholders. One way in which alignment of interests may occur is through managerial ownership of the firm's stock.

The trade-off between private benefits and ownership rewards is complicated since stockholding by managers who are not majority owners may actually increase their ability to resist monitoring, rather than serve to align the interests of outside equity owners and managers. Several studies of nonfinancial firms predict (Stulz (1988)) or find a nonlinear relationship between insider ownership and firm value reflecting this trade-off. Morck, Shleifer, and Vishny (1988) examine the effect of insider concentration on nonfinancial firms, as measured by Tobin's q. They impose a piecewise linear relationship and find that as insider ownership rises up to 5%, q increases; then q falls as the insider concentration grows to 25 percent; finally, it again rises at higher ownership levels. They interpret these results as showing the balance of three factors. For small insider holdings, the incentives of insiders become more aligned with those of the outsiders, but management does not have enough power to be entrenched. As insider concentration continues to rise, management becomes entrenched. Equity shares are large enough to stave off effective outside disciplining, but not so large that management interests are the same as those of outside shareholders. A further increase in concentration aligns management interests with outsiders; managers essentially become the sole owners.

McConnell and Servaes (1990), examining nonfinancial firms, impose a quadratic relationship between Tobin's q and the concentration of both insider and outsider holdings. They find that q initially rises, and then falls as interests between the inside managers and outside shareholders become aligned. Finally, Saunders, Strock, and Travlos (1990) estimate a linear relationship between insider ownership and portfolio choice for a sample of 38

[9] If a bank's (market-value) capital ratio is sufficiently low, then both managers and outside shareholders may agree that the bank should maximize the value of deposit insurance. We do not dispute this argument. Our focus is on the prior question of how the bank came to have a low capital ratio. Consequently, we study banks which satisfy regulatory capital requirements. For the banks we study, the interests of managers and outside shareholders may be in conflict and it is not obvious that outside shareholders are able to induce managers to increase risk at the expense of the government, even if they want to.

bank holding companies. They find that "stockholder controlled" banks took on more risk than "managerially controlled" banks.[10]

The varying specifications of the relationship between insider stockholding and firm performance motivates the model and the empirical tests we develop in this paper. We propose a model of corporate control in banking which has the crucial feature that investment opportunities have deteriorated: there are relatively fewer "good" lending opportunities. This allows us to be precise about the source of value reduction, namely, the risk and return choices made by bank managers facing deteriorating investment opportunities.

The decline in investment opportunities means that for banks there are fewer positive net present value (NPV) loans to be made than previously. The presence (or absence) of positive NPV lending opportunities may be an attribute of individual banks which have retained profitable customers or of individual bank managers who have the ability to locate these opportunities. In reality it is probably a combination of these factors. For our purposes this distinction is not important, but in the model we assume an "unhealthy" banking industry is one with a large proportion of low quality ("bad") managers. We interpret this as reflecting these poor investment opportunities. (The model may be slightly reinterpreted as reflecting qualities of banks rather than managers, as discussed below.)

When investment opportunities are declining, managers behave differently than in "healthy" industries (see Jensen (1993)). This is particularly true in banking, where asymmetric information and deposit insurance mean that banks can continue to issue liabilities (i.e., insured demand deposits) even if there are few good lending opportunities. The risk-avoiding behavior of managers stressed in the corporate finance literature presumes that conservative behavior is sufficient for job and perquisite preservation. When bad managers predominate, conservative behavior may not allow most managers to keep their jobs and perquisites. These managers may find it optimal to take excessively risky actions. Thus, aggregate risk-taking, driven by attempts by bad managers to convince shareholders that they are good managers, can be excessive (relative to a first-best world and, perhaps, relative to an unregulated industry).

Our model and empirical work analyzes conflicts between managers and shareholders of solvent banks. Note that when banks have low capital ratios both the managers and the shareholders want to take risky actions if deposit insurance offers a subsidy for risk-taking. This is the "moral hazard" that many argue existed in the thrift industry after capital ratios fell dramatically with increases in interest rates in the 1970s. We do not dispute the logic of this argument for commercial banks when capital ratios are low and deposit insurance is fixed price. The difficulty with this explanation for commercial bank performance, however, is that it does not explain how banks came to have

[10] Also see Bagnani, Milonas, Saunders, and Travlos (1994) who study the interaction of managerial ownership and risk-taking by analyzing how managerial ownership and bond yields are related.

low capital ratios. We study well-capitalized banks and argue that our model and empirical results can explain how many banks came to have low capital ratios in the 1980s.

Section I sets out the game between a bank manager and shareholders and solves for a sequential Nash equilibrium. Section II discusses the assumptions of the model. The model makes specific predictions about the types of loans that managers make as a function of how much stock they own in the bank and as a function of the risk and return characteristics of different loan types. In Section III we discuss how this allows us to distinguish empirically the corporate control hypothesis from the moral hazard hypothesis. Tests of the model are reported on in Section IV. Section V concludes.

I. A Model of Banking Lending Decisions

In this section we discuss a model of bank lending in which managers, not outside shareholders, make lending decisions. The managers receive private benefits from control of the bank and it is costly for outside shareholders to fire them. The cost of firing faced by outside shareholders increases with the extent to which managers own stock in the bank.

A. The Lending Environment

There are three dates and many banks. Each bank is run by a manager who has $1 to invest. Investment opportunities in banking vary either because loan opportunities are locationally or specialty dependent or because managers have different abilities for locating various types of lending opportunities. We model the heterogeneity in opportunities as a function of manager type although we discuss heterogeneity in bank-specific (or market-specific) opportunities. The distribution of manager types will describe the investment opportunities available in the banking industry. Manager type is private information. For simplicity all banks are assumed to have the same leverage and cost of funds.[11]

The timing of the model is shown in Figure 2. At date 1 bank managers choose a loan portfolio. Outside owners (outsiders) observe the type of portfolio, but not its quality (the manager's type). At date 2 outsiders observe the outcomes of managers' loan choices. At this time outsiders may decide to fire some managers, but this is costly. If a manager is fired, shareholders have two choices at date 2. They can replace the fired manager with a new bank manager and continue investing in the banking industry. Or, they can move resources into a nonbanking investment.[12] Finally, also at date 2, new loans or other investments are made which have realizations at date 3. Managers receive private benefits, w, in each period that they are in control of the bank.

[11] The effects of deposit insurance will be discussed in a subsequent section.

[12] We assume that the cost of funds and leverage are again the same for all banks at date 2.

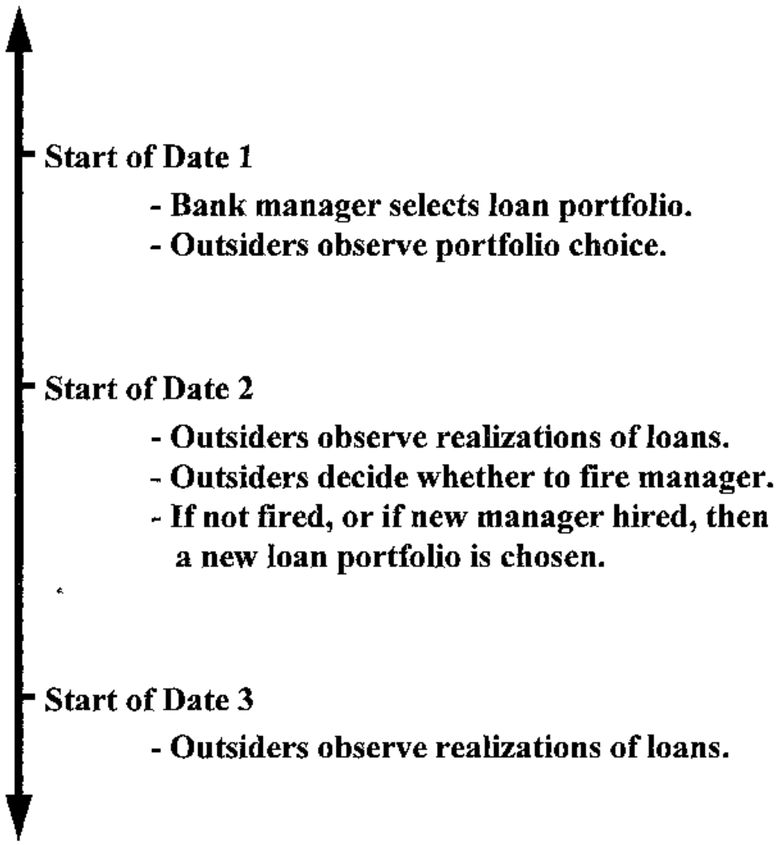

Figure 2. Sequence of events.

If managers are fired by the outside owners at date 2, they earn no control rents at date 3. All agents are risk neutral.[13]

We look for a Sequential Nash equilibrium: a firing decision rule that maximizes the utility of outsiders given the lending decisions of each type of manager and a date 1 lending decision rule for each type of manager that maximizes utility given the outsiders' rule for firing managers.[14]

In specifying the loan portfolio available to managers, we want to parsimoniously contrast the decisions outsiders want managers to make and the decisions managers do, in fact, make. Thus, we need to include portfolio choices where managers might prefer a riskier choice than outsiders and vice versa. For this, we need four types of loan portfolios—"good" and "bad" risky portfo-

[13] Risk neutrality is the simplest assumption and possibly the most realistic. The realism of the assumption depends on the extent to which individual managers have plunged in bank stock when we allow for them to own bank stock later in the paper. Williams (1987) considers the interaction between risk aversion and incentives when there are agency problems in firms.

[14] Sequential Nash equilibrium also requires that beliefs satisfy a consistency requirement. As will be seen, this is straightforward in our model.

lios as well as "good" and "bad" safe portfolios. Assume that a risky loan portfolio has a bivariate return, either R or 0. What differentiates a good risky portfolio from a bad one is the probability of getting a high return. A good risky portfolio returns R with probability θ_G while a bad risky portfolio returns R with probability θ_B, where $\theta_G > \theta_B$. Assume that a safe loan portfolio yields its expected value with probability one. A good safe loan portfolio has a return S_G and a bad safe loan portfolio has return S_B, where $S_G > S_B$. Safe loan portfolios are meant to include such assets as consumer loans and home mortgages. Assets such as Treasury bills and bonds, while possibly a part of a safe loan portfolio, offer similar yields to all types of bank managers, and thus do not serve to separate managerial types in the manner we want.

There are two cases that exemplify why managers' and outsiders' preferences might differ. The first case is when managers choose between a good risky portfolio and a good safe portfolio, where the risky portfolio offers a higher expected return than the safe portfolio:

ASSUMPTION 1: *The expected value of a good risky loan portfolio is greater than the expected value of a good safe loan portfolio:* $\theta_G R > S_G$.

We refer to managers that choose between good safe and good risky portfolios as "good" managers. This is the traditional problem examined in the corporate control literature in the sense that the industry is not declining. The second case is when managers choose between a bad risky portfolio or a bad safe portfolio, where the risky portfolio offers a lower expected return than the safe portfolio:

ASSUMPTION 2: *The expected value of a bad risky loan portfolio is less than the expected value of a bad safe loan portfolio,* $S_B > \theta_B R$.

We refer to managers that choose between bad safe and risky portfolios as "bad" managers. One interpretation of these manager types is that good managers are those that can adapt to technological changes while bad managers cannot adapt.

It is important to emphasize that underlying our model is the existence of other types of managers that always choose the first-best portfolio. That is, for any firing rule that outsiders use, the other types of managers make the portfolio choices, either risky or safe, that their outsiders want them to make. Two types in particular are necessary. Assume that some managers are only able to invest in risky portfolios (or that the safe portfolios available to them offer a significantly lower expected return than the risky portfolios). Some of these managers invest in good risky portfolios and others invest in bad risky portfolios.[15]

[15] Note that the focus on good managers, defined by Assumption 1, and bad managers, defined by Assumption 2, does not preclude the presence of managers with opportunities such that $\theta_G R < S_G$ or $S_B < \theta_B R$. It is easy to introduce a number of other types of managers. Adding other types does not change any of the results (see Gorton and Rosen (1992)).

The dividing line between a good loan portfolio and a bad loan portfolio is the point at which an outsider is indifferent about whether to fire managers if they knew the quality of the loan portfolio. In deciding whether or not to fire a manager, outsiders compare the expected return on their investment in the bank to the alternatives of hiring another bank manager or investing in a nonbanking alternative. The outsiders must also incur a cost, c, to fire the current manager (more generally, there is a liquidation cost for capital which includes firing costs; this cost is assumed to be borne by the bank). Clearly, a manager is fired if the expected increase in return from either hiring a new manager or investing in a nonbank alternative exceeds the cost of firing the manager. Let Γ be the return from the nonbanking alternative and let V be the expected return from banking if a new manager is hired (net of the private benefits, w). Then, the opportunity cost of retaining a particular manager is:

$$X = \text{Max}[V, \Gamma] - c.$$

The parameter Γ is exogenous as is V (since V depends on the relative proportions of different manager types). Note that $V < \Gamma$ would mean that there is overcapacity in the banking system, that is, the (expected) return on the nonbanking alternative, Γ, is higher than the expected return in banking. This occurs when the number of bad managers is relatively high. As a result, bank equityholders would prefer to move their resources out of banking at date 2 when they fire a manager. Below we discuss the relationship between V and Γ further.

Assume that the expected return is such that outsiders, conditional on knowing a manager's type, fire managers that have only bad investment opportunities and not managers that have at least one good investment opportunity. This assumption is stated as:

ASSUMPTION 3: *Outsiders want to fire only bad managers (those that have a choice between a bad risky loan portfolio and a bad safe loan portfolio):* $S_G - w > X > S_B - w$.

This condition is sufficient for any set of portfolio opportunities, by Assumptions 1 and 2.

Below we investigate the optimality of various rules for firing managers that could be adopted by outside shareholders. Throughout, however, we will assume that the costs of firing a manager are small enough that outsiders fire any manager that chooses a bad safe loan portfolio, because that manager is revealed to be a bad manager. This assumption is not crucial. It is important that outsiders are unable to determine the type of manager that chooses a risky project from ex post returns (since successful risky projects earn R, but the ex ante probability of earning R is not observed).

B. Preliminary Analysis

To see how private benefits affect managerial choices, suppose for illustrative purposes that the outsiders fire bad managers that choose safe loan portfolios (their quality is revealed by the realization) along with managers that choose risky loans and earn zero. By assumption, outside shareholders want good managers to choose risky loans (Assumption 1) and bad managers to choose safe loans (Assumption 2). Of course, managers take their private benefits into account when they evaluate loans. If good managers make risky loans, then there is some chance that they are fired. On the other hand, if good managers make safe loans they are never fired. Thus, because of the private benefits, good managers choose safe loans and behave too conservatively (when we say a portfolio choice is "too conservative" or "too risky" we always mean relative to first-best). Bad managers are in the opposite situation from good managers. If they choose safe loans, they are fired, but if they choose risky loans and get a high return, they retain their job. This leads bad managers to choose risky loan portfolios.[16]

By explicitly modelling both good and bad managers, we are able to characterize the state of the industry. This is important because the aggregate behavior of the industry depends on the relative proportions of different manager types. In the existing literature, the implicit assumption is that good managers predominate. In that case, the conservatism of good managers drives the aggregate level of risk-taking. On the other hand, if, as we assume, there is a high proportion of bad managers, then aggregate investments reflect the risky decisions of the bad managers.

Managerial entrenchment occurs when outsiders are unable to determine whether their manager is taking a first-best action or when it is too costly to fire a manager. In the example above, managers make suboptimal choices because outsiders are unable to distinguish manager type based on the return to risky portfolios. Implicit in the analysis above is the assumption that the firing cost, c, is low enough that outsiders want to fire managers that choose risky portfolios and get a return of zero. If the firing cost is large enough, the outsiders may find it optimal to retain managers that earn zero on risky loans. This would be a more extreme form of entrenchment.

C. Managerial Ownership

When managers are shareholders in the firms they manage, the situation is more complicated than the preliminary analysis above because managers not only receive private benefits from managing, but also benefit from ownership of a (publicly observable) fraction, α, of the stock in the bank. Ownership influences portfolio choice because decisions taken to maintain private benefits can reduce the value of the stock.

Managerial ownership of banks can affect the outsiders' cost of firing managers. The decision to fire the manager is made by the board of directors. Board membership control (by managers) is likely to depend on managerial stock ownership. Also, to the extent that managers own stock they can demand such

[16] For this to be an equilibrium, the assumed firing rule of the outsiders must be a best response to the lending strategies. This depends on the relative proportion of good managers to bad managers and on the firing cost. We omit this calculation here.

things as larger severance pay, making firing more costly. We assume that the cost of firing a manager is increasing in the manager's ownership share, $c(\alpha)$. If firing is too expensive, then owners would prefer to bear the cost of a bad manager rather than pay the firing cost. A sufficient bound on the firing cost which ensures that bad managers are not retained solely because the cost of firing is prohibitive is given by:

ASSUMPTION 4: $c'(\alpha) < w/\alpha^2$.

(This assumption reappears in the proofs in Appendix 1.) We also assume that, if fired, managers still receive the value of their shares at date 3. Note that since the final date is the end of the model, if a manager is not fired, the date 2 portfolio choice is straightforward: the manager, being a shareholder, simply chooses the first-best portfolio.

In the preliminary analysis discussed briefly above, risk-taking in the banking industry depends only on the relative proportions of good and bad managers and the firing cost. When managers own stock, however, overall risk-taking in banking also involves the distribution of stock ownership across manager types.

Rather than go through the model in detail, we provide an overview of the results. (Details of the model, and proofs of the propositions, are presented in Appendix 1). Recall that the costs of firing a manager are assumed to be small enough that outsiders fire any manager that chooses a bad safe loan portfolio because that manager is revealed to be a bad manager. However, outsiders are unable to determine the type of manager that chooses a risky project from ex post returns. Thus, any firing rule they use inevitably allows either bad managers to continue or good managers to be fired. There are three firing rules outsiders could adopt toward managers that choose a risky loan portfolio: (a) fire all managers that earn a low return of zero on their risky loan portfolio; (b) fire no managers that choose a risky portfolio; (c) fire all managers that choose a risky loan portfolio. Finding the equilibria of the model is essentially a process of examining the responses of managers to each firing rule. Since managerial ownership is observable, the firing rule depends on managerial ownership.

In what follows, we concentrate on the conditions under which (a) is the equilibrium firing rule for all levels of managerial ownership. Throughout the discussion, bear in mind that if firing costs are high enough, firing rule (b), not firing rule (a), will be the equilibrium. Clearly, when firing rule (b) is selected by outsiders, bad managers are entrenched because their jobs are protected when they choose the risky, second-best, portfolio. It is straightforward to show that for a given managerial ownership share, options (b) and (c) can only be equilibria if the proportion of managers that can choose a bad risky loan portfolio (whether or not it is the first-best) is, respectively, low enough or high enough relative to the proportion of managers that can choose a good risky loan portfolio. Sufficient conditions for (a) to be optimal are given below.

The equilibrium choice of a lending strategy by good and bad managers involves the trade-off among three factors: the private benefits of working at date 2, the cost to the manager as a shareholder from any non-expected-value maximizing choice of a loan portfolio at date 1, and the cost of firing the manager. At low levels of managerial ownership, private benefits are more important to managers than their ownership share. For higher levels of managerial ownership, managers place more weight on bank return and less on private benefits. In the limit, when the manager owns the entire bank, only the bank return matters. So:

PROPOSITION 1: *Assume Assumptions 1, 2, and 3 hold and outsider owners fire all managers that earn a low return of zero on their risky loan portfolio (firing rule (a)). Then there exists an ownership share α^* such that good managers choose safe loans if and only if $\alpha \leq \alpha^*$. There exists an α^{**} such that bad managers choose risky loans if and only if $\alpha \leq \alpha^{**}$.*

The proposition says that good managers, who choose risky loans in the absence of agency costs, choose safe loans if their equity stake is lower than a critical level, α^*. Bad managers, who choose safe loans in the absence of agency costs, instead choose risky loans if their equity stake is lower than a critical level, α^{**}. In other words, if managerial equityholding is not high enough to align managers' incentives with those of outside equityholders, then managers deviate from first-best portfolio choice. The proposition identifies the level of managerial shareholding at which this change occurs. Moreover, the deviation depends on whether the manager has good or bad investment opportunities and on the firing cost.

The optimality of firing rule (a) depends on the cost of firing a manager and the proportions of manager types at any given level of managerial ownership. We can find a set of sufficient conditions to ensure that firing rule (a) is used:

PROPOSITION 2: *Assume Assumptions 1, 2, and 3 hold. Then there exists a unique equilibrium for any managerial ownership level, α, in which outsiders choose to fire all managers that earn a low return of zero on their risky loan portfolio (firing rule (a)), and managers behave as described in Proposition 1, if the following two conditions hold:*

$$\frac{\gamma_B}{\gamma_{GG} + \gamma_G} \frac{(X + w - S_B)}{(\theta_G R - X - w)} \geq \frac{1 - \theta_G}{1 - \theta_B} \tag{1}$$

$$\frac{\theta_G}{\theta_B} \geq \frac{\gamma_{BB} + \gamma_B}{\gamma_G} \frac{(X + w - \theta_B R)}{(\theta_G R - X - w)} \tag{2}$$

where γ_{GG} is the proportion of good managers; γ_{BB} is the proportion of bad managers; γ_G is the proportion of managers that always choose a good risky loan portfolio; and γ_B is the proportion of managers that always choose a bad risky loan portfolio ($\gamma_{GG} + \gamma_{BB} + \gamma_G + \gamma_B = 1$).

The two conditions in Proposition 2 characterize when it is optimal to fire all managers that earn a return of zero on their risky loan portfolio. The conditions are not restrictive, that is, it is not the case that the proportion of bad managers need be very large for this equilibrium to exist. For example, suppose $R = 1$, $\theta_G = 0.9$, $\theta_B = 0.6$, $S_G = 0.8$, $S_B = 0.7$, and $X + w = 0.75$. Then the conditions of the proposition require that $\gamma_B/(\gamma_{GG} + \gamma_G) \geq 1/12$ and $(\gamma_{BB} + \gamma_B)/\gamma_G \leq 3/2$. These conditions are satisfied, for example, by: $\gamma_G = 0.3$, $\gamma_{GG} = 0.3$, $\gamma_B = \gamma_{BB} = 0.2$. Another example satisfying the conditions is: $\gamma_G = \gamma_{GG} = 0.4$ and $\gamma_B = \gamma_{BB} = 0.1$.

The two conditions of Proposition 2 also can be used to illustrate the conditions under which the other firing rules would be optimal. In particular, if condition (1) does not hold when S_B is replaced by $\theta_B R$ and condition (2) holds (roughly, too few good managers), then outsiders want to fire any managers that choose a risky loan portfolio. Conversely, if condition (1) holds and condition (2) does not hold when $\theta_B R$ is replaced by S_B (too many good managers), then outsiders do not fire managers choosing risky portfolios.

The equilibrium conditions in Proposition 2 depend on the cost of firing, $c(\alpha)$, since the firing cost is embedded in the opportunity cost of firing a manager, X. As the firing cost increases, outsiders find it less profitable to fire a manager, even if the manager makes risky loans and earns a zero return.

D. Equilibrium Managerial Entrenchment

An important feature of the equilibrium described by Proposition 2 is that not all bad managers are detected and fired at date 1. Bad managers that choose risky loan portfolios and have a high payoff (of R) continue to make loans at date 2. This is because these bad managers have successfully pooled with the good managers. The frictions caused by asymmetric information and costly firing prolong the period during which these managers are left in control of their banks. This persistence can explain why the banking industry appears to have adjusted slowly to the changed investment opportunities, since changed opportunities are captured here by the relatively high proportion of bad types.

Our goal is to find the aggregate pattern of risk-taking in the industry as a function of the equity ownership structure of banks (in cross-section). This relationship is likely to be highly nonlinear because it depends on the distribution of manager types and on the distribution of insider holdings across these types. Proposition 2 provides sufficient conditions for existence and uniqueness of an equilibrium with managerial entrenchment. But, to be more precise, we need to know the relationship between the critical ownership shares at which good and bad managers switch from second-best to first-best portfolio choices (α^* and α^{**} in Proposition 1). The critical levels α^* and α^{**} are determined by the tradeoff between the lost private benefits in period 2 when the manager is fired for taking the first-best action and the gain in the return on the manager's stock from taking the first-best action. Good managers that choose risky portfolios are fired only when they are not successful (and earn zero). If it is very probable that a risky portfolio is successful, then a good manager has little to fear from choosing the first best. We can show:

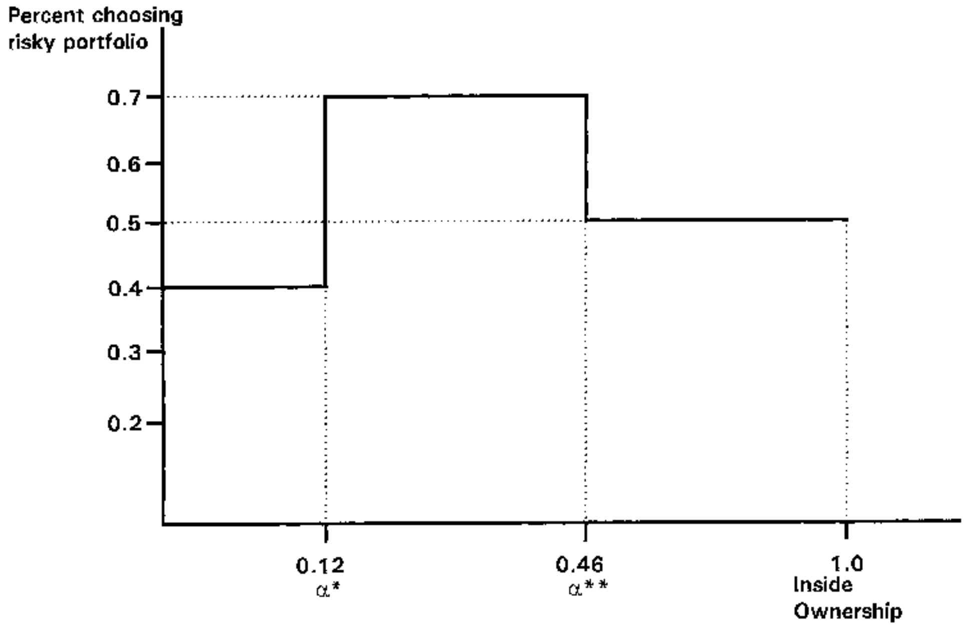

Figure 3. Example of aggregate risk-taking. The example assumes $R = 1.0$, $\theta_G = 0.9$, $\theta_B = 0.6$, $S_G = 0.8$, $S_B = 0.7$, $\gamma_G = 0.3$, $\gamma_{GG} = 0.3$, $\gamma_B = 0.2$, and $\gamma_{BB} = 0.2$. Using these values α^* and α^{**} can be calculated as can the optimal decisions of each manager type. For values of α between zero and α^*, bad managers choose risky portfolios and good managers choose safe portfolios (and all other manager types choose their first-best portfolios). Between α^* and α^{**}, both good and bad managers choose risky portfolios (and others choose first-best, as before). For values above α^{**}, bad managers choose safe portfolios and good managers choose risky portfolios.

PROPOSITION 3: *Assume Assumptions 1–4 hold and outside owners fire all managers who earn a return of zero on their risky loan portfolios (firing rule (a)). Then:*

$$\theta_B(\theta_G R - S_G) + (1 - \theta_G)((1 - \theta_G)\theta_B R - (1 - \theta_B)S_B) > 0, \tag{3}$$

implies $\alpha^* < \alpha^{**}$. Further, if conditions (1) and (2) of Proposition 2 hold, then there is a unique equilibrium with $\alpha^* < \alpha^{**}$.

Condition (3) of the proposition holds when the expected return on good risky loans is "high" (as $\theta_G \to 1$, (3) holds for any values of the other parameters). Since this is unobservable we cannot test it directly. Nevertheless, Proposition 3 provides an illustrative characterization of the pattern of aggregate risk-taking in an unhealthy banking industry that we use as a null hypothesis in our empirical work.

Note that condition (3) holds for the examples given after Proposition 2. Figure 3 illustrates the pattern of aggregate risk-taking for the first example. It shows that, over the range of managerial ownership between 0 and α^*, bad managers choose risky portfolios and good managers choose safe portfolios (and all other types of managers choose their first-best portfolios). Between α^*

and α^{**}, both good and bad managers choose risky portfolios (and, again, all others choose their first-best portfolios). Above α^{**}, bad managers choose safe portfolios and good managers choose risky portfolios (and all others choose the first-best). Figure 3 provides a concrete example showing how entrenched managers can distort aggregate risk-taking.

Figure 3, drawn under the assumption that banking is dominated by a lack of good lending opportunities, also illustrates a major difference between our model and other models of corporate control. Like other corporate control models, we find conditions under which managers take second-best actions. But, as the figure illustrates, when there are sufficient bad managers in an industry, the traditional result that corporate control problems lead to excess conservatism on the part of managers is reversed.

II. Discussion of the Model

In this section we briefly discuss the main assumptions of the above model. The assumptions discussed are as follows. The model does not have debtholders or regulators playing an active role. Also, it uses a simple ownership structure for both insiders and outsiders. Finally, we have identified investment opportunities in banking with manager types rather than with inherent characteristics of particular banks, independent of the manager.

A. Debtholders and Bank Regulators

The analysis assumes that bank depositors continue to deposit one dollar in each bank in the banking industry despite the fact that there are many bad managers. We justify this assumption for banks by appealing to (fixed-rate) deposit insurance. Deposit insurance allows banks to raise funds even when many bank managers are bad. Since the interest paid to depositors is independent of managers' actions, there is no reason for insured depositors to become informed. Further, insured and uninsured depositors face the same information problems that outside shareholders do. Allowing debtholders to play an active role (without deposit insurance) would reduce the return to the risky activity because debtholders would demand higher interest rates. But, the qualitative results of the model would not change.

The model assumes outside shareholders have no opportunity to produce information about manager types at date 1. Such information could allow outsiders to make more refined firing decisions. We consider this possibility in Gorton and Rosen (1992). When monitoring, i.e., producing information about manager type at date 1, is possible but costly, the essential features of the equilibrium remain unchanged. In particular, if outsiders monitor managers that choose risky loan portfolios and earn zero (and do not monitor managers that earn R on risky portfolios), then the only difference from the basic model is that good managers need not fear earning zero on risky portfolios. But, the incentives of bad managers are unchanged; they are fired unless they choose risky loan portfolios and earn R.

The model also assumes that outside shareholders act as a single agent. Since outside shares are often widely dispersed, possibly causing a free rider problem in monitoring and firing, the presence of a few block shareholders may be important for initiating monitoring and firing.[17] Firing and monitoring costs may depend on the fraction of outside shares that are held in blocks. Blockholders should reduce firing and monitoring costs. We include this consideration in the empirical work below. It has straightforward implications for the above analysis.

We have also not considered the role of bank regulators. Regulators might examine banks (monitor) and close banks (fire managers) under different circumstances than outside shareholders do. As discussed in Gorton and Rosen (1992), if outside shareholders face very high monitoring costs, then they do not monitor, but instead fire managers based only on loan returns. Regulators may face lower monitoring costs than outsiders, leading to most monitoring being done by regulators.

Government regulators, in addition, have more power than private citizens. In particular, they can examine banks ex ante and impose ex ante restrictions on risk-taking. Also, regulators can impose punishments ex post, such as banning individual bank managers from working in the banking industry. To the extent that they are costless, and that regulators face the right incentives, these actions can mitigate the problems we analyze. Others, however, argue that agency problems between regulators, Congress and the public distort regulators' incentives. (See, e.g., Kane (1992).)

B. The Equity Ownership Structure

Like previous researchers in this area, we assume that the distribution of equity ownership is given and, in particular, that bank managers own bank equity. This is important in our model because equity shares have voting rights and we have related this to firing costs (by assuming that these costs to outsiders are increasing in the fraction of shares owned by management). We provide no reason why managerial compensation should be in the form of equity shares with voting rights.[18] Obviously, in a larger model the equity ownership structure would have to be endogenized and this is a subject of further research. For our purposes managerial stockholdings are given.

A related issue concerns compensation in general. Managers that at date 1 know, privately, that they are good might accept a different compensation package than bad managers. That is, a separating equilibrium might exist. The agency problem we focus on can be mitigated to the extent that compensation contracts for managers can be designed to align their interests with those of outside shareholders. Of course, it may be that managers learn about

[17] See Shleifer and Vishny (1986). The empirical evidence supports the importance of large shareholders in increasing firm value. See Mikkelson and Ruback (1985), Holderness and Sheehan (1985), Barclay and Holderness (1990), and Zeckhauser and Pound (1990).

[18] Gorton and Grundy (1995) provide an argument for why firms would find it optimal to reward managers with voting equity.

the decline in investment opportunities after such contracts have been signed. In addition, as discussed below, the interpretation of types as corresponding to managers, rather than to banks, is only a simplification. Compensation contracts in banking is another area for further research.[19]

C. *Investment Opportunities and Overcapacity in Banking*

Intuitively, the conditions in Proposition 2 say that, ceteris paribus, the equilibrium depends on the return to an investment made by the current manager, given the relative proportions of good and bad managers, compared to the alternative, X (recall that $X = \mathrm{Max}[V, \Gamma] - c(\alpha)$). While the model takes Γ as exogenous, its role is important. If the expected value of the bank, conditional on drawing new managers from the population of managers at date 2, V, is less than the value of investing in the nonbanking alternative, Γ, then resources will leave the banking industry at date 2. The banking industry is unhealthy when bad managers are relatively common, causing the expected value of an investment in banking (by an outsider) to be low (relative to the alternative). If the banking industry is so unhealthy that outside shareholders would prefer to invest their resources in the nonbanking alternative at date 2, then there is overcapacity in the banking industry ($V < \Gamma$).

While it might be natural to assume that the conditions of Proposition 2 correspond to overcapacity in the banking industry, the model does not, strictly speaking, allow us to make that statement. However, that is an artifact of how investment opportunities are modelled. We modelled investment opportunities as corresponding to the distribution of manager types with different lending choices. An alternative interpretation is consistent with the results. Instead of managers being of different types, we might imagine that the banks themselves face different investment opportunities and that all managers are the same. In this case there is no alternative of hiring a different manager to obtain better performance, so poor investment opportunities means that $V < \Gamma$. Consequently, outside shareholders will want to fire the managers of bad banks since they prefer to move their resources out of banking. Managers of bad banks will want to avoid this because they will be out of jobs. Since the industry is shrinking (i.e., $V < \Gamma$), they will not be rehired at another bank. Thus, this interpretation is consistent with the above results and implies that there is overcapacity in banking.

[19] Compensation contracts in banking have been studied by Boyd and Graham (1991), Mullins (1993), Houston and James (1993), and Booth (1993). Boyd and Graham (1991) find that in banking, management compensation is positively, and significantly, related to asset size, but not significantly related to profitability. Mullins (1993) finds that bank managers' salaries and stock options are not related to risk-taking (as measured by the standard deviation of stock returns). Houston and James (1993) find no evidence that bank compensation is structured to induce risk-taking, but is related to measures of growth opportunities. Booth (1993) finds that the determinants of bank CEO compensation are similar to those of nonfinancial firms, except that bank managers' total compensation is more sensitive to board members' stock ownership.

III. Empirical Implementation of the Model

Our goal is to test the corporate control model against the alternative hypothesis of moral hazard. Towards that end, in this section we first explain how the two views can be distinguished. Then, in order to conduct the tests, we empirically determine which categories of loans correspond to the predictions of the model in terms of risk and return characteristics. (Test results are reported in Section IV.)

A. Hypotheses

Proposition 3 allows us to test the joint hypothesis that corporate control problems are important in bank portfolio choice and that the industry is unhealthy. We can look for a pattern of risk-taking in the data that is similar to Figure 3. The proposition implies that the pattern of risk-taking as a function of managerial ownership is inversely U-shaped, rising and then falling. But, the nonlinearity may be more complicated since the model has discrete manager types and discrete choices. Nevertheless, and this is the main point, the model allows us to distinguish our hypothesis from the leading alternative hypothesis of moral hazard due to fixed-price deposit insurance. In particular we can test:

HYPOTHESIS 1: *Over some intermediate range of insider ownership, the relationship between risk-taking and the share of insider stock ownership, α, is inversely U-shaped.*

Notice that if there were a sufficient proportion of good types in the banking industry, we would predict a U-shaped relationship between risk-taking and managerial ownership.

The leading alternative hypothesis to the corporate control arguments outlined above is the moral hazard hypothesis. Moral hazard models concentrate on the conflict between banks and regulators. Bank managers' interests are assumed to be aligned with those of the bank owners. In the canonical moral hazard model, the banking industry is unhealthy in the sense that charter values have declined (e.g., Keeley (1990)). Owners attempt to take advantage of fixed-rate deposit insurance by making relatively risky portfolio choices. In this theory, there is no predicted relation between risk-taking and the fraction of bank stock held by bank managers, α. Thus, one alternative hypothesis is:

HYPOTHESIS 2: *There is no relationship between managerial ownership, α, and risk-taking.*

More charitably, one might suppose that the moral hazard model applies when outside shareholders can control bank managers. This could occur if the manager's fraction of stock is low or very high. Low levels of insider holdings increase the ability of outsiders to control managerial decisions, and high levels of insider holdings mean that managers' interests align with those of outsiders. So, moral hazard models might be interpreted to predict that owner-controlled banks, and perhaps banks with low levels of insider ownership, make relatively risky portfolio choices compared to banks with entrenched managements:

HYPOTHESIS 3: *Above some level of managerial ownership, risk-taking is increasing in α. At low levels of insider ownership, risk-taking may be decreasing in α.*

Corporate control and moral hazard predict sharply different patterns of risk-taking in an unhealthy banking industry. Our corporate control model predicts that risk-taking is inversely U-shaped with respect to managerial ownership. Moral hazard models predict either no relation or the opposite: either risk-taking is U-shaped with respect to α (or it is increasing above a certain point).

In a more general model, fixed-rate deposit insurance, through its negative effect on monitoring by bank depositors, also can influence bank risk in ways that are independent of insider ownership. The absence of active monitoring of banks by depositors may reduce the incentives of bank managers to put in effort to screen potential borrowers. Thus, to the extent that bank shareholders do not want their managers spending extra time screening borrowers, fixed-rate insurance increases the overall risk in banking. This is a type of moral hazard. But, more commonly, bank owners and bank depositors have a similar interest in encouraging monitoring of borrowers by managers. When interests coincide, the pattern of risk-taking by managers should be a function of corporate control problems, not moral hazard.

B. Risk, Return, and the Composition of Banks' Loan Portfolios

As a first step toward testing our predictions on portfolio choice by bank managers, we divide bank loan portfolios into categories that are relatively risky and relatively safe. In the next section, we investigate how portfolio composition is related to the pattern of equity ownership.

What we would like is to provide evidence of the ex ante risk and return characteristics of bank loan portfolios. Unfortunately, it is not possible to determine what bank managers think the expected return on a loan portfolio is. Instead, we are forced to use ex post data from bank *Call Reports of Income and Condition* for year-end 1984–1990. The risk of a bank portfolio is estimated by using the proportion of loans that are nonperforming. (Nonperforming loans are those that are 90 days or more past due or not accruing interest.)[20] By this measure, the risk of bank loans rose considerably in the 1980s. Panel A of Table I shows a breakdown of nonperforming loans by loan category. Commercial and Industrial loans (C&I loans) are the riskiest and consumer

[20] The risk of a loan should be evaluated by the contribution of the loan to overall bank risk, but data limitations prevent this computation. Thus the risk of each category of loans is evaluated independently. The implicit assumption is that no category of loans contributes significantly more than any other to the diversification of bank's return stream. We also ignore interest rate risk due to data limitations.

Table I

Risk and Return on Bank Loans, 1984–1990 (Banks over $300 Million in Total Assets)

Panel A shows the fraction of loans that are nonperforming, by loan type. Nonperforming loans are loans that are more than 90 days past due, nonaccruing loans, and other real estate owned (foreclosed real estate). Panel B shows the return on loans (interest income on loans divided by total loans) and the return net of the average interest rate paid on deposits (net interest expense divided by total deposits and other interest-paying liabilities). Panel C shows the difference between the return on various loan categories and the average return on all loans. The source for all data is the *Call Reports of Income and Condition*.

Panel A: Rate of Nonperforming Loans, by Loan Type

Year	Total Loans	All Real Estate	C&I Loans	Consumer Loans
1984	2.71	2.81	5.38	1.53
1985	2.64	2.72	4.79	2.17
1986	2.97	3.27	4.96	2.62
1987	4.63	3.60	6.86	2.82
1988	4.15	3.09	5.33	2.71
1989	4.48	4.05	5.30	2.92
1990	5.66	6.38	6.94	3.47

Panel B: Return on Bank Loans

Year	Return	Return Net of Average Interest Paid
1984	11.23	2.01
1985	10.19	2.35
1986	8.74	2.20
1987	8.74	2.11
1988	9.28	2.01
1989	10.29	1.62
1990	9.67	1.41

Panel C: Additional Return on Bank Loans Above Average for All Loans, by Loan Type

Year	Net Additional Return on All Real Estate	Net Additional Return on All C&I Loans	Net Additional Return on All Consumer Loans
1984	−0.83	0.02	1.09
1985	−0.40	−0.48	2.12
1986	−0.30	−1.09	2.89
1987	−0.70	−0.51	2.47
1988	−1.02	−0.64	1.74
1989	−1.28	−0.24	1.27
1990	−1.23	−0.54	1.88

loans are the safest. The average real estate loan lies somewhere in the middle, but this category includes different types of loans.

Since the risk figures for real estate loans aggregate loan categories that we would expect to be (relatively) safe (such as home mortgages) with categories that are possibly very risky (such as construction and development loans), we need to find a way to disaggregate real estate loan risk. We have 1991 and 1992 data on nonperforming real estate loans by loan type. For banks over \$300 million in assets, 7.9 percent of real estate loans were nonperforming. Construction and development loans had a nonperforming rate of 20.3 percent; commercial loans had a nonperforming rate of 10.1 percent, and mortgages had a nonperforming rate of 3.1 percent. Thus, construction loans and commercial loans were both riskier than C&I loans and consumer loans. We expect that the pattern in 1991 and 1992 is representative of the pattern in the 1984–1990 period, although we recognize that 1991 and 1992 were bad years for construction and commercial real estate loans.

Examining the return on bank loans provides evidence that banking was unprofitable in the 1980s. Panel B of Table I gives the return on loans (ROL) for banks over \$300 million in assets. The first column is the gross ROL, while the second column presents the ROL net of the average interest rate on deposits. The average interest rate is deducted from the ROL in an attempt to measure the net return on bank loan portfolios. As the table shows, the gross ROL (column 1) has fallen, but some of the decline occurred at the same time as a decline in interest rates. The ROL net of the average interest rate (column 2) also fell, but by less than the gross ROL.

For a risky loan to be a bad gamble for an entrenched manager, the loan must offer a lower expected return than safer loans. A direct estimate of the return on the categories of bank loans is possible for C&I loans, consumer loans, and (total) real estate loans. To show the relative return for the different loan categories clearly, Panel C of Table I presents the difference between the return on each loan and the average return on all loans. The return on C&I loans and on real estate loans are below average, while consumer loans get an above average return.

Of course, one explanation of the risk and return characteristics discussed above is bad luck. If bad luck caused the low return and high risk of real estate construction and development loans, then there should be no relationship between this type of lending and managerial ownership. Our results suggest that if corporate control problems are important, bad entrenched managers should make the most real estate construction loans and the fewest consumer loans, with C&I loans somewhere in between. We concentrate on these three loan categories.

IV. Insiders and Outsiders in Banking: Tests

In this section we test the hypothesis that when the banking industry is unhealthy, banks with entrenched management invest in the relatively risky commercial real estate construction and development loans and less so in the relatively safe category of consumer loans.

Table II

Inside and Outside Shareholders of Banks and Nonfinancial Firms

The data on bank holding companies in Panels A and B come from SEC filings (see Appendix 2). The data on nonfinancial firms in Panel A are from McConnell and Servaes (1990). Insiders are Board members and family of Board members. Outsiders are other shareholders with at least five percent ownership.

Panel A: Summary Statistics on Insider and Outsider Holdings

	Bank Holding Companies	Nonfinancial Firms
Sample size	458	1,093
Average Insider Holdings (%)	15.25	11.84
Median Insider Holdings (%)	8.33	5.00
Range of Insider Holdings (%)	0–99	0–89
Average Outsider Holdings (%)	7.87	25.60

Panel B: Proportion of Banks in Sample, by Share of Insider Ownership

Share (%)	Number of Banks	Proportion of Banks (%)
Less than 5	166	36
5–10	84	18
10–25	107	24
25–50	71	16
Greater than 50	30	7
Total	458	100

A. Data on Equity Ownership

In order to distinguish between moral hazard problems and corporate control problems, we collect data on the ownership structure of bank holding companies. Ownership data are a cross-section of holdings in 1987/88 as described in Appendix 2. We use two measures of ownership, the holdings of insiders (directors and officers of the bank) and the holdings of outsiders (that is, noninsiders) that hold at least five percent of the outstanding stock.[21] Our measure of outside concentration includes large blockholders and serves as a proxy for the degree of outsider control. Panel A of Table II provides summary measures of our data together with the summary measures for nonfinancial firms provided by McConnell and Servaes (1990). Outsider concentration in nonfinancial firms is larger than in banks. The same is true for insider holdings.

B. The Estimation Procedure

Our goal is to empirically analyze the relationship between the share of particular loan types (of total assets) and the share of the firm held by insiders.

[21] Data from SEC 10-K reports require that shareholders with at least five percent holdings report their holdings, but the holdings of others with less than five percent are also sometimes reported.

In order to estimate and draw inferences some structure must be imposed on the relationship. This issue of functional form seems particularly important since Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990), studying nonfinancial firms, obtain essentially contradictory results using two different ad hoc nonlinear parametric specifications, while, for banks, Saunders, Strock, and Travlos (1990) use a linear specification.

Looking at Panel B of Table II conveys some sense of the difficulties. Panel B of Table II shows that over one-third of the banks in our sample have insider ownership of less than five percent. Nonfinancial firm samples also have a large number of observations at less than five percent insider ownership. Above five percent observations on insider holdings are more sparse. This suggests that the results of estimating almost any parametric specification would almost certainly be driven by managers with very small ownership shares.[22] It is quite likely that many parametric specifications would result in "significant" coefficients, though they might well not be consistent estimates.

Thus, although our model predicts, under the conditions of Proposition 3, that over some range of managerial ownership, the relationship between risky lending and managerial ownership is inversely U-shaped, estimating a quadratic relationship over the entire range of ownership shares could provide misleading results.

For these reasons, our empirical analysis is in two parts. We begin by imposing as little structure as possible, and then move on to imposing more structure. The first approach imposes no a priori functional form on the relationship between insider ownership and portfolio choice. In particular, this procedure does not impose a quadratic specification a priori. Nonparametric methods can uncover the exact nonlinear relationship (at least asymptotically) between the particular loan share choice and insider holdings. Of course, using a nonparametric procedure to estimate the relationship between insider holdings and portfolio choice, we also want to control for a number of other factors which can be expected to affect the relationship. This motivates our semiparametric procedure.

The semiparametric procedure has less precision than parametric models. The trade-off between the larger standard errors of the semiparametric model and the possibly incorrect inferences of the parametric model, discussed further below, leads us to impose further structure based on the first set of results. In particular, we also use a quadratic specification to check for the inverse U-shape predicted by Proposition 3, but with the quadratic specification we restrict attention to an intermediate range of insider holdings.

Let $\mathbf{L}_i$ be the vector with elements consisting of the fraction of loan type i in the total bank portfolio of a sample of banks.[23] Let α be the vector of insider fractional holdings. Also define the following variables: the vector $\mathbf{O}$ has

[22] The estimated relationship is robust to excluding banks with less than one percent insider holdings.

[23] Results are not qualitatively different if the ratio of loan type to total loans is examined instead of the ratio of loan type to total assets.

elements consisting of the fraction held by outside block shareholders in each bank; the vector of the log of total assets in each bank is $\mathbf{A}$; the loan to total assets ratio is $\mathbf{N}$; $\mathbf{Yr}$ indicates dummy variables for the year; $\mathbf{Z}$ indicates the region of the country in which the bank operates.[24] Letting the matrix $\mathbf{X}$ be the matrix consisting of these vectors, $\mathbf{X} = [\mathbf{O} \mid \mathbf{A} \mid \mathbf{N} \mid \mathbf{Yr} \mid \mathbf{Z}]$, the hypothesized relationship is of the form:

$$\mathbf{L}_i = \mathbf{X}'\beta + \mathbf{f}(\alpha) + \epsilon \tag{4}$$

where $E(\epsilon|\mathbf{X}, \alpha, \mathbf{L}_1) = 0$ and where $\mathbf{W} = (\mathbf{L}_1, \mathbf{X}, \alpha)$ is identically distributed. The relationship, (4), consists of a parametric part, the term $\mathbf{X}'\beta$, and the nonparametric part, the function, $f(\alpha)$.[25]

Estimation of (4) and inference are complicated by the combination of the parametric and nonparametric components. Ordinary least squares regression of $\mathbf{L}_i$ on $\mathbf{X}$ would consistently and efficiently estimate β if $E(\mathbf{X}\,\mathbf{f}(\alpha)) = 0$ which would occur, for example, if $E(\mathbf{X}) = 0$ and $\mathbf{X}$ were statistically independent of α. But, in our sample $\mathbf{X}$ and α are correlated since the largest banks tend to have smaller insider holding fractions. If we were interested primarily in β, then the bias in using OLS would be that of an omitted variable and there are a number of methods available to cope with this in a semiparametric context (see Heckman (1986, 1988), Robinson (1988), and Andrews (1990)). Our focus, however, is on the estimation of $f(\alpha)$ so we must take account of the parametric component in estimating the nonparametric part of the relationship. We use the semiparametric technique of Speckman (1988). Appendix 3 provides more detail on the estimation procedure.

C. Data

The data on loan portfolio shares are annual data from the *Call Reports* for the period 1984–1990. The annual data are not averaged so all right-hand side variables in the first step are measured annually except the outsider holdings (which are always for 1987 and 1988).[26] The parametric specification also includes year dummies to account for time affects. To avoid capturing situations where the incentives of managers and outside shareholders are aligned, we exclude observations where the ratio of equity capital to total assets is less than five percent (including these observations does not change the qualitative results).

[24] We report region dummies in the case where the country is divided into four regions (North, South, East, West). We also experimented with eight regions (North, Northeast, Northwest, etc.) and twelve regions (corresponding to Federal Reserve districts), but the results are substantively the same.

[25] The nonlinear relationship may be approximately quadratic (as in Proposition 3 above and McConnell and Servaes) or cubic (Morck, Shleifer, and Vishny) so in the parametric part of the relationship we include quadratic and cubic terms for total assets to ensure that such nonlinearities are not introduced spuriously by the parametric part of the estimation.

[26] The shapes of the estimated functions are not affected by averaging data or varying window size, and are robust to shorter time periods.

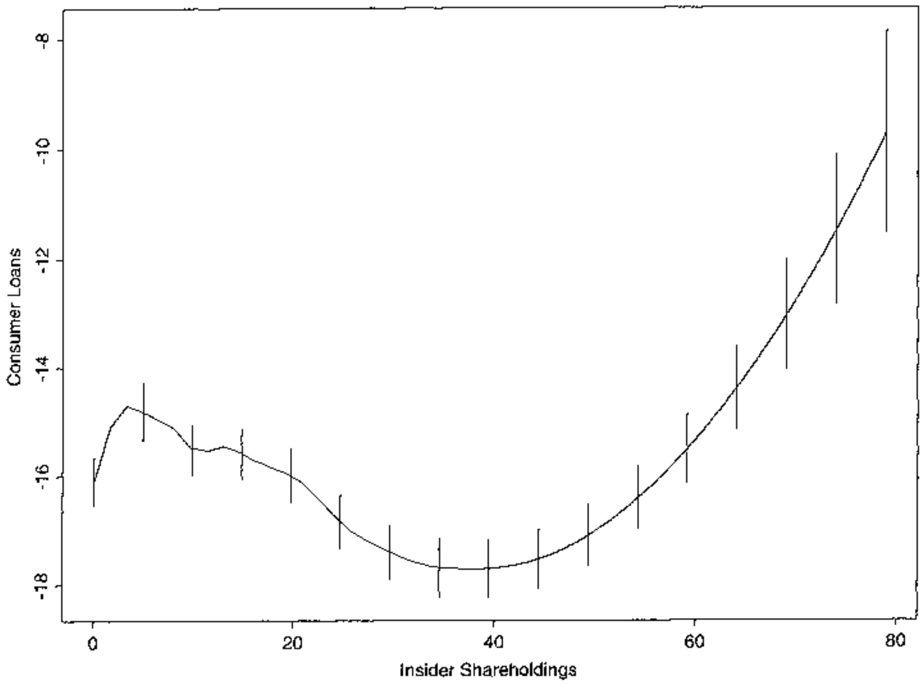

Figure 4. Results for the nonparametric component of the semiparametric regression of consumer loans against insider shareholdings (α) and control variables, 1984–1990. The figure shows the estimated function, $\mathbf{f}(\alpha)$, which is the nonparametric component of: $\mathbf{L}_i = \mathbf{X}'\beta + \mathbf{f}(\alpha) + \epsilon$. This function was estimated using the Speckman (1988) method (described in Appendix 3). The dependent variable is consumer loans; the parametric component includes outside block shareholdings, log total asset, log total asset squared, regional dummies, and year dummies.

D. Semiparametric Test Results

In Section III we established that during the 1980s consumer loans were relatively safe, while commercial real estate construction and development loans were risky. Figures 4 and 5 show the estimated nonlinear relationships between the loan shares of these two loan types and the fraction of equity held by insiders. Similarly, Figure 6 shows the estimated relationship for C&I loans, an intermediate category in terms of risk.[27] The vertical lines in the figures are 90 percent confidence intervals (see Cleveland and Devlin (1988)).

Figure 4 presents the estimated relationship between the fraction of consumer loans and insider holdings. At low levels of insider holdings, between zero and four percent, managers' interests move in the direction of outside shareholders, that is, they increasingly make relatively safe loans over this range. But, over the range from four to 40 percent, managers *reduce* their holdings of safe loans. Finally, for insider shares above 40 percent safe consumer

[27] The figures cut off the function at a level of insider holding of 80 percent for presentation purposes. No results are changed by this.

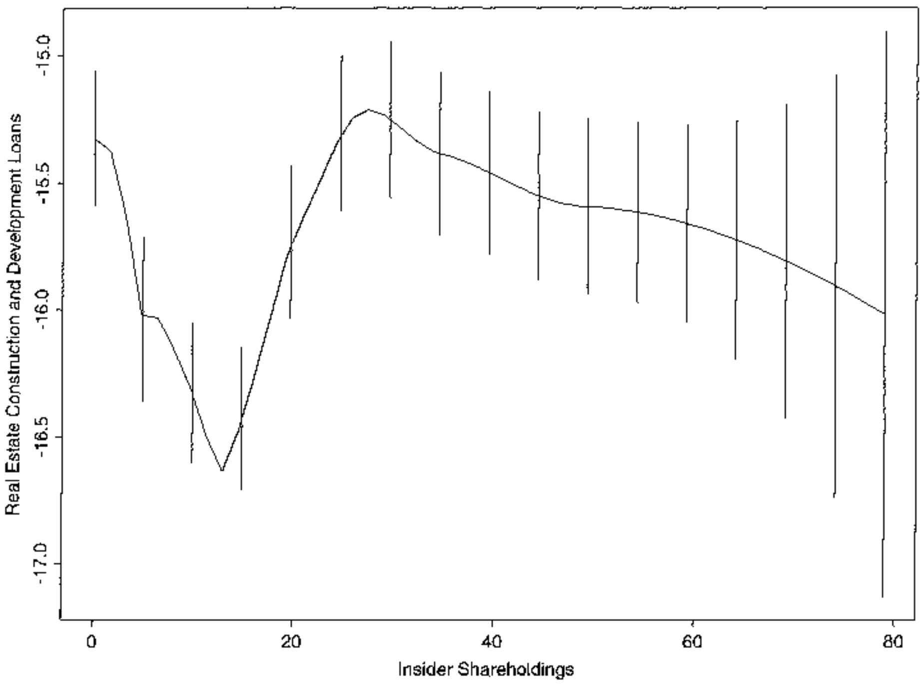

Figure 5. Results for the nonparametric component of the semiparametric regression of real estate construction and development loans against insider shareholdings (α) and control variables, 1984–1990. The figure shows the estimated function, $\mathbf{f}(\alpha)$, which is the nonparametric component of: $\mathbf{L}_i = \mathbf{X}'\beta + \mathbf{f}(\alpha) + \epsilon$. This function was estimated using the Speckman (1988) method (described in Appendix 3). The dependent variable is real estate construction and development loans; the parametric component includes outside block shareholdings, log total asset, log total asset squared, regional dummies, and year dummies.

lending increases, suggesting that at high levels of insider holdings interests become aligned; insiders basically become the owners. Thus, there appears to be a range where managers are entrenched; they take advantage of the power associated with their stockholding to make relatively few safe loans. At holdings of about 40 percent and above interests are aligned. The shape of the function in this case is similar to the U-shape imposed by McConnell and Servaes (1990).

Figure 5 shows the results for commercial real estate construction and development loans. Recall that these loans are the most risky. The pattern in Figure 5 is dramatically different from the pattern in Figure 4. In Figure 5 the pattern is a rotated s shape: over the range of insider holdings from zero to 15 percent, the share of the loan portfolio falls as insider ownership increases; from 15 to about 27 percent the function increases; it is flat from 27 to 50 percent and then declines, but the last decline is insignificant.[28] Confidence bands for higher fractions of insider holdings are very wide because we have

[28] The pattern is very similar for the category of all commercial real estate loans.

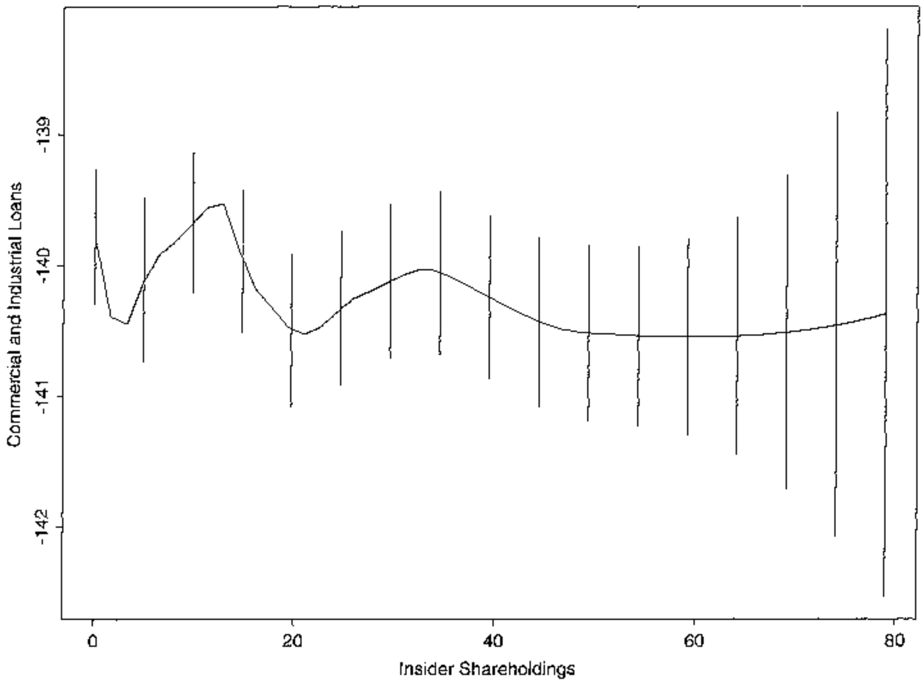

Figure 6. Results for the nonparametric component of the semiparametric regression of commerçial and industrial loans against insider shareholdings (α) and control variables, 1984–1990. The figure shows the estimated function, $\mathbf{f}(\alpha)$, which is the nonparametric component of: $\mathbf{L}_i = \mathbf{X}'\beta + \mathbf{f}(\alpha) + \epsilon$. This function was estimated using the Speckman (1988) method (described in Appendix 3). The dependent variable is commercial and industrial loans; the parametric component includes outside block shareholdings, log total asset, log total asset squared, regional dummies, and year dummies.

few observations in that range. This pattern is similar to the pattern found by Morck, Shleifer, and Vishny (1988) who focused on Tobin's q.

Figure 6 presents the results for the intermediate category of commercial and industrial (C&I) loans. As expected the pattern is not as dramatic as for real estate construction and development loans and can be interpreted as falling in between the other two categories.

With respect to the question of whether corporate control or moral hazard is better able to explain reality, the key question is the curvature of the above relationships.[29] The results are inconsistent with the moral hazard explanation of weakness in the U.S. banking system: risky loans are not made by

[29] The level of the estimated curve is, fortunately, not important, since the intercept is not identified. This is because:

$$X'\beta + f(\alpha) = (\rho + X'\beta) + f(\alpha) - \rho$$

for all ρ. Since $f(\alpha)$ can always be redefined to be $f(\alpha) - \rho$, the intercept cannot be determined unless more structure is imposed. See Robinson (1988).

managers with controlling interests; they make safe loans. At intermediate levels of stock holdings less than fifty percent, managers make relatively more risky, low-return, loans and fewer safe consumer loans. This is consistent with the view that these managers are entrenched. The results are also inconsistent with simple bad luck which we would not expect to be correlated with the fraction of stock held by insiders. We now turn to checking these initial results.

E. Results for the Parametric Specification

The advantage of the semiparametric estimation procedure is that it does not impose a functional form on $f(\alpha)$. For two reasons we also present the results of parametric estimation. First, the robustness of our results (in small sample) can be checked, using the parametric procedure. Parametric estimation is not robust in the sense of specification, since estimates are not consistent if the specification is incorrect, but, based on the semiparametric results, we can smooth the data more by imposing more structure. This can confirm our inferences in the sense that standard errors will be smaller (given that the parametric specification is consistent with the above results). Second, Proposition 3 predicts an inverse U-shaped pattern between insider holdings and riskier loans over the range where insiders are entrenched, and a U-shaped pattern for the relationship between insider holdings and relatively safe loans over the range where insiders are entrenched. By specifying a quadratic relationship between insider holdings and loan shares, restricting the sample to insider holdings between 10 and 80 percent, and including the variables from the first step into single estimation equation, we can test whether the predicted U-shaped patterns are present over the relevant range of insider holdings. Note that the quadratic specification which admits a U-shape or an inverse U-shape, and the limitation on the range of insider holdings, is consistent with the semiparametric results.

The results of these tests are shown in Table III. Over the range of insider holdings of 10 to 80 percent the pattern for the relatively safe consumer loans is U-shaped, meaning that entrenched managers make fewer of these loans. On the other hand, the pattern for real estate construction and development loans is inversely U-shaped, that is, the entrenched managers make more of these risky loans. The pattern for commercial and industrial loans is U-shaped, but the coefficients are not significant. These results confirm our inferences from the previous procedure.

F. Further Results

A bank is a complicated set of activities and the mix of activities that different managers engage in, as a function of their opportunities and stock holdings, may well differ. For example, entrenched managers may engage in speculation on interest rates or trade foreign currencies, etc., but we have little data to determine the risk-return characteristics of these activities (compared

Table III

Results of Quadratic Specification Tests on Various Loan Categories for Banks with Insider Holdings Between 10 and 80 Percent

The dependent variables in the regressions are the given loan category as a fraction of total assets. Inside and Inside^2 are insider ownership and insider ownership squared, in percentage points. Outside is the percentage of outside blockholder ownership. Log(TA) and Log(TA)^2 are log total assets and log total assets squared. The regional dummies, North, Midwest, South, and West, equal 1 if the bank is in the given region, and 0 otherwise. The year dummies, 1985 dummy–1990 dummy, are 1 if the observation is from that year and 0 otherwise. Each regression has 1212 observations. t-statistics are in parentheses.

	Dependent Variables		
	Consumer Loans	Real Estate Constr. and Development Loans	Commercial and Industrial Loans
Intercept	61.46	−65.58	47.69
	(1.85)	(3.39)	(1.07)
Inside	−0.33	0.12	−0.08
	(7.52)	(4.72)	(1.28)
Inside^2	0.005	−0.001	0.001
	(8.00)	(4.17)	(0.96)
Outside	−0.02	0.001	0.02
	(1.20)	(0.10)	(0.98)
Log(TA)	−10.72	13.64	−7.69
	(1.44)	(3.14)	(0.77)
Log(TA)^2	0.61	−0.71	0.52
	(1.46)	(2.92)	(0.93)
North	5.50	1.86	−3.30
	(3.36)	(1.95)	(1.50)
Midwest	3.39	0.08	−3.40
	(2.07)	(0.09)	(1.55)
South	2.90	2.32	−3.13
	(1.77)	(2.41)	(1.41)
West	1.91	5.61	4.01
	(1.13)	(5.70)	(1.77)
1985 dummy	−0.27	0.04	0.28
	(0.44)	(0.10)	(0.33)
1986 dummy	−0.97	0.22	−0.12
	(1.57)	(0.60)	(0.14)
1987 dummy	−1.48	0.59	−0.55
	(2.42)	(1.66)	(0.67)
1988 dummy	−1.73	0.80	−1.15
	(2.79)	(2.20)	(1.37)
1989 dummy	−2.08	0.54	−2.04
	(3.29)	(1.47)	(2.40)
1990 dummy	−2.70	0.38	−3.14
	(4.14)	(1.01)	(3.58)
Adjusted R^2	0.121	0.211	0.098

to lending). Above, we examined the fairly specific predictions of the model about the lending choices of bank managers. We focus in this section on some additional possible implications of the model.

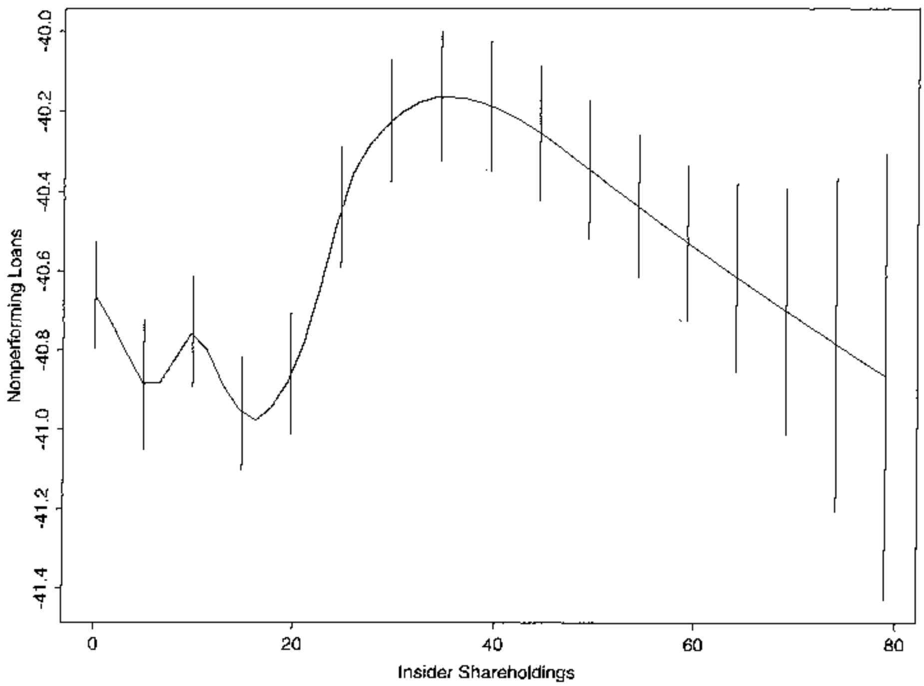

Figure 7. Results for the nonparametric component of the semiparametric regression of nonperforming loans against insider shareholdings (α) and control variables, 1984–1990. The figure shows the estimated function, $f(\alpha)$, which is the nonparametric component of: $\mathbf{L}_i = \mathbf{X}\beta' + \mathbf{f}(\alpha) + \epsilon$. This function was estimated using the Speckman (1988) method (described in Appendix 3). The dependent variable is nonperforming loans; the parametric component includes outside block shareholdings, log total asset, log total asset squared, regional dummies, and year dummies.

If entrenched bank managers make risky, low return loans, then we would expect them to suffer greater losses than other managers. Figure 7 shows the semiparametric estimate of the relationship between insider holdings and the ratio of nonperforming loans to total loans (controlling for other factors as we did earlier). Overall, the pattern has the rotated s shape. But, consistent with the above results, the relationship is roughly inversely-U-shaped over the range 10 to 80 percent. That is, over that range, entrenched managers have higher losses. This is confirmed with the quadratic specification results shown in Table IV.

If the risk-taking propensities of managers vary depending on how much equity they own, then this should be apparent in choices other than asset selection. On the liability side of the balance sheet, managers can increase risk by adding leverage. Figure 8 is the semiparametric estimate of the (book) equity-to-total-asset ratio. (Recall that all the banks in our sample satisfy regulatory capital requirements.) Again, the high leverage banks are those with managers in the entrenched range, consistent with the results. The parametric results are shown in Table IV.

Table IV

Results of Quadratic Specification Tests on Various Financial Ratios for Banks with Insider Holdings Between 10 and 80 Percent

The dependent variables in the regressions are nonperforming loans as a fraction of total loans, the ratio of equity capital to total assets, and the return on assets, all expressed as percentages. Inside and Inside^2 are insider ownership and insider ownership squared, in percentage points. Outside is the percentage of outside blockholder ownership. Log(TA) and Log(TA)^2 are log total assets and log total assets squared. The regional dummies, North, Midwest, South, and West, equal 1 if the bank is in the given region, and 0 otherwise. The year dummies, 1985 dummy–1990 dummy, are 1 if the observation is from that year and 0 otherwise. The first two regression have 1,212 observations, the final regression has 1,174 observations. t-statistics are in parentheses.

	Dependent Variables		
	Nonperforming Loans Ratio	Equity-to Assets Ratio	Return on Assets
Intercept	−5.13	14.54	−3.83
	(0.42)	(1.94)	(1.17)
Inside	0.05	−0.05	−0.002
	(2.93)	(4.87)	(0.48)
Inside^2	−0.001	0.00	0.00003
	(2.74)	(5.09)	(0.59)
Outside	0.01	−0.001	−0.004
	(1.85)	(0.07)	(2.56)
Log(TA)	1.77	−0.60	1.07
	(0.65)	(0.36)	(1.45)
Log(TA)^2	−0.12	−0.02	−0.06
	(0.79)	(0.19)	(1.42)
North	−0.65	−0.27	0.12
	(1.08)	(0.74)	(0.71)
Midwest	−0.60	−0.46	0.01
	(1.01)	(1.24)	(0.04)
South	0.92	−0.05	−0.10
	(1.52)	(0.13)	(0.58)
West	0.64	−0.26	0.02
	(1.05)	(0.68)	(0.11)
1985 dummy	0.18	0.04	−0.01
	(0.79)	(0.32)	(0.16)
1986 dummy	0.23	0.15	−0.07
	(1.01)	(1.11)	(1.14)
1987 dummy	0.15	0.41	−0.09
	(0.68)	(3.00)	(1.56)
1988 dummy	0.07	0.40	−0.00
	(0.30)	(2.87)	(0.06)
1989 dummy	0.29	0.54	−0.02
	(1.24)	(3.76)	(0.36)
1990 dummy	0.77	0.64	−0.15
	(3.22)	(4.34)	(2.34)
Adjusted R^2	0.119	0.148	0.025

Finally, if the corporate control hypothesis is correct, then we would predict that, looking to the future, banks with entrenched management would be less profitable. We can examine future rates of return to see if they reflect banks'

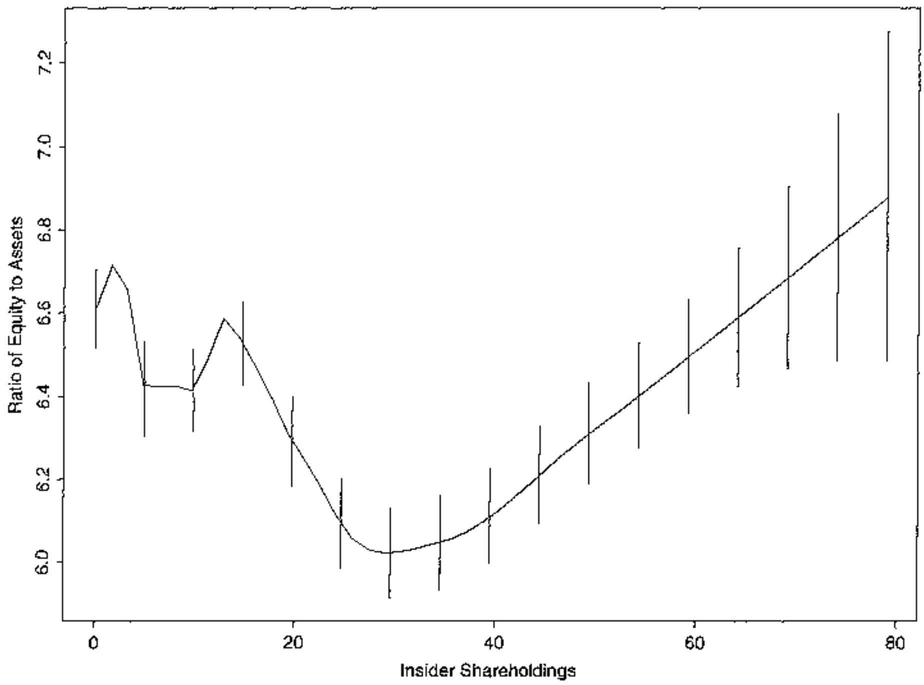

Figure 8. Results for the nonparametric component of the semiparametric regression of equity-to-assets ratio against insider shareholdings (α) and control variables, 1984–1990. The figure shows the estimated function, $f(\alpha)$, which is the nonparametric component of: $\mathbf{L}_i = \mathbf{X}'\beta + \mathbf{f}(\alpha) + \epsilon$. This function was estimated using the Speckman (1988) method (described in Appendix 3). The dependent variable is the equity-to-assets ratio; the parametric component includes outside block shareholdings, log total asset, log total asset squared, regional dummies, and year dummies.

equity ownership structure. We look at (book) return on assets (ROA) for the three years following our observation on managerial ownership. However, we find that there is no predictive power of the equity ownership structure for ROA (the figure is omitted, but Table IV shows the parametric result). We also find (but do not show) similar results for (book) return on equity. We believe that survivorship bias against low-return and high-risk entrenched managers reduces our ability to find a significant relationship.

G. Summary

Overall, the empirical results confirm the pattern of lending behavior that the model of corporate control predicts. Notably, none of the results are what a moral hazard model would predict. The effect of moral hazard on bank decisions can vary. By relieving the need of insured depositors to monitor bank actions, deposit insurance makes it easier for banks to increase risk slightly. Deposit insurance can also lead banks with low charter values to "go for broke." The moral hazard hypothesis should hold no matter the degree of moral hazard. If the effect of moral hazard is slight, however, it could potentially be overwhelmed by the effect of corporate control problems. Thus, while our results imply that corporate control problems are more important than moral hazard, we cannot conclude that deposit insurance has no effect on bank decisions. Our conclusion is that corporate control problems were empirically more important than moral hazard in explaining problems for large U.S. banks (which met regulatory capital requirements) during the 1980s. Moral hazard was not a significant problem.

V. Conclusion

Throughout the 1980s the U.S. banking industry systematically trended towards reduced profits and increased riskiness. The bank failure rate rose exponentially during the decade. It has been difficult to explain these trends. The previous literature tends to focus on the moral hazard hypothesis as an explanation, but evidence for this view has proved elusive. For example, Furlong (1988) finds that capital deficient bank holding companies in 1981 did not increase their risk over the next five years. McManus and Rosen (1991) do find a negative correlation between risk and return at banks, but only for banks above regulatory capital minimums. Banks with low capital levels appear to attempt to reduce risk, perhaps under regulatory pressure.

We propose an explanation for these trends based on corporate control problems in banking: outside equity holders do not make the lending decisions directly, but instead rely on managers. When bank managers receive private benefits of control, and outside shareholders can only imperfectly control them, managers will tend to take on excessive risk (relative to no agency costs) when the industry is unhealthy. This tendency is due to the incentives that managers face when the fraction of the bank they own is large enough for them to make outside discipline costly, but not so large as to cause their interests to be aligned with those of outsiders. This result contrasts with management behavior when the industry is healthy. In that case, the entrenched managers behave too conservatively.

We test the predictions of the model and find that, over the range of insider holdings where managers would tend to be entrenched, they make more risky loans (commercial real estate construction and development) and fewer relatively safe (consumer) loans. These results are consistent with the corporate control model, but contradict the pure moral hazard model (for banks with equity ownership structures over which the interests of managers and outside shareholders are not aligned). While we cannot rule out moral hazard, our findings suggest that corporate control problems have a bigger impact on bank risk-taking. (Mullins (1993) finds similar results: the relationship between insider holdings and the standard deviation of stock returns in inversely U-shaped.) Since a joint hypothesis of the test was that the banking industry was unhealthy during the 1980s (i.e., characterized by declining investment opportunities), we have also provided evidence of this.

While our results suggest that corporate control problems are more important than moral hazard problems, our analysis is done for adequately-capitalized banks. If the value of bank equity is low enough, then the interests of inside and outside owners are aligned, so there are no corporate control problems of the sort we model. A reasonable interpretation of our results is that corporate control problems allow unprofitable banks to persist in making risky, low-return, loans. If, in the process, these banks lose enough equity value, then there may come a point at which inside and outside owners want to take excessive risk as the moral hazard hypothesis predicts. It may be accurate to say that, for large U.S. banks, corporate control problems have been the cause of the conditions of which moral hazard may be an accurate characterization.

The market for corporate control in banking is weaker than it is in markets for unregulated firms since regulation prevents nonbanks from taking over banks. The evidence on takeovers and takeover threats suggests that in the United States this is the main mechanism for disciplining managements (see Jensen and Ruback (1983)). Without the threat of nonbank takeovers it may be more difficult to induce bank managers to maximize shareholder value.[30] Consequently, the presence of agency costs suggests that the underlying trends that reduced profitability in the 1980s may persist, despite high bank earnings in the early 1990s. That banking is regulated does not appear to be a sufficient countervailing force.

"Banking" has traditionally corresponded to financing loans by issuing deposits. The combination of these activities has, historically, been the source of public policymakers' concerns. Firms called "banks" may eventually find other activities which are profitable, as Boyd and Gertler (1994) suggest, and transform themselves into viable entities which compete with other firms called "nonbanks," e.g., General Motors Acceptance Corporation. To the extent that chartered banks must transform themselves into nonbanks we say that "banking" is in decline. Whether chartered banks can survive by this transformation is not a question we consider. Our conclusions concern the difficulties that outside equityholders face during the transition period.

Appendix 1: Equilibrium With Managerial Stock Ownership and Costly Firing

Proof of Proposition 1: We compute the optimal response for managers given their beliefs about the firing rule used by outside owners. When firing rule (a) is used, a good manager is fired if and only if a risky loan portfolio is selected

[30] The importance of the takeover market in banking has been studied by James (1984) and James and Brickley (1987). Both studies examine the differences between two sets of banks: one set consists of states that prohibit corporate acquisitions of commercial banks, while the other set allows corporate acquisitions of banks. James (1984) finds that salary expenses, occupancy expense, and total employment are higher for banks in states which prohibit acquisitions. James and Brickley find that banks in states which allow acquisitions have more outside directors on their boards.

and gets a zero return. Thus, a good manager, maximizing expected return, makes risky loans if:

$$\theta_G[(R - w)\alpha + w + (\theta_G R - w)\alpha + w] + (1 - \theta_G)[-w\alpha + w + \alpha X]$$
$$> (S_G - w)\alpha + w + (\theta_G R - w)\alpha + w. \quad (5)$$

If the manager chooses a risky loan portfolio, the left-hand-side of (5), then with probability θ_G, the return is R. The manager gets the private benefits, w. To compute the return on the manager's stock, the private benefits, w, are deducted from the gross return so the manager's ownership share earns $(R - w)\alpha$. Since the loan return is R, the manager is allowed to continue to control the bank at date 2. Because the expected return on a good risky portfolio exceeds the expected return on a good safe portfolio, the manager chooses the risky portfolio at date 2 and expects to earn $(\theta_G R - w)\alpha + w$. If the return on the date 1 risky loan portfolio is zero, which occurs with probability $(1 - \theta_G)$, then the manager is fired. Since the private benefits, w, are paid at date 1, as a shareholder, the manager must pay $w\alpha$, his share of the private benefits, to himself, and, as a manager, he receives private benefits of w. While he is fired, he remains a shareholder and receives αX, his share of the outsiders' best alternative at date 3.

If a safe loan portfolio is selected at date 1, the right-hand-side of (5), the manager receives his share of the return (net of the private benefits), $(S_G - w)\alpha$, plus the private benefits, w, at date 1. The return on his safe loan portfolio reveals him to be a good manager, so he is allowed to continue at date 2. At date 2 a good manager chooses a risky portfolio (because there is no distortion and it has a higher expected return than safe portfolio, by Assumption 1). Simplifying (5) shows that a manager chooses a risky loan portfolio if:

$$\Omega(\alpha) \equiv [\theta_G^2 R - S_G + (X + w)(1 - \theta_G)]\alpha - w(1 - \theta_G) > 0. \quad (6)$$

It is easy to see that $\Omega(0) = -w(1 - \theta_G) < 0$, so a good manager chooses a safe portfolio when he owns none of the bank. It also follows that:

$$\Omega(1) = \theta_G^2 R - S_G + X(1 - \theta_G) = \theta_G(\theta_G R - X) + (X - S_G) > 0 \quad \text{for any} \quad X,$$

so a good manager chooses a risky portfolio when he owns the bank and when he has committed to using firing strategy (a). More importantly, given the cost of firing a manager, we can show that there is a critical share α^* such that a good manager chooses the safe portfolio for $\alpha < \alpha^*$ and the risky portfolio for $\alpha > \alpha^*$. Taking the derivative of $\Omega(\alpha)$ gives:

$$\begin{aligned}\Omega' &= [\theta_G^2 R - S_G + (X + w)(1 - \theta_G)] + (1 - \theta_G)\alpha X' \\ &= (1 - \theta_G)(w/\alpha - \alpha c') > 0 \qquad \text{at} \quad \Omega = 0\end{aligned}$$

since $[\theta_G{}^2 R - S_G + (X + w)(1 - \theta_G)] > 0$ whenever $\Omega = 0$ and $w > \alpha^2 c'$ by Assumption 4. Thus, since the function Ω is continuous, we know that there exists an α^* such that $\Omega(\alpha) \leq 0$ if $\alpha < \alpha^*$ and $\Omega(\alpha) \geq 0$ if $\alpha > \alpha^*$. In fact, we can solve for α^*:

$$\alpha^* = \mathrm{Min}\left[\frac{w(1-\theta_G)}{\theta_G^2 R - S_G + (X+w)(1-\theta_G)}, 1\right]. \tag{7}$$

Now consider the decisions of bad managers. Since firing rule (a) is assumed, bad managers choose risky portfolios if:

$$\theta_B[(R-w)\alpha + w + (S_B - w)\alpha + w] + (1-\theta_B)[-w\alpha + w + \alpha X] > (S_B - w)\alpha + w + \alpha X. \tag{8}$$

Simplifying (8):

$$\Delta(\alpha) \equiv -[\theta_B(X + w - R) + (1-\theta_B)S_B]\alpha + w\theta_B > 0.$$

So, $\Delta(0) = w\,\theta_B > 0$ and $\Delta(1) = -[\theta_B(X - R) + (1-\theta_B)S_B]$ which can be either positive or negative since $X < R$ by Assumption 3. The derivative of Δ is:

$$\begin{aligned}\Delta' &= -[\theta_B(X + w - R) + (1-\theta_B)S_B] + \theta_B\alpha\, c' \\ &= -w\theta_B/\alpha + \theta_B\alpha\, c' \qquad \text{when} \quad \Delta = 0 \\ &= -\theta_B(w - \alpha^2 c')/\alpha < 0 \qquad \text{by} \quad (A4).\end{aligned}$$

So, if $\Delta(1) > 0$, then a bad manager always chooses a risky portfolio, otherwise, since $\Delta' < 0$, there is a unique share of managerial ownership that is the dividing line between risky and safe portfolio choices:

$$\alpha^{**} = \mathrm{Min}\left\langle\frac{\theta_B w}{\theta_B w - \theta_B(R - X) + (1-\theta_B)S_B}, 1\right\rangle. \tag{9}$$

This completes the proof.

Proof of Proposition 2: To prove Proposition 2, we need to solve the complete game between managers and outsiders. Given portfolio choices by managers, the expected return to an outsider (with one share) is $U_i(\psi, \phi)$ when outsiders choose firing rule $i \in \{a, b, c\}$, good managers choose lending strategy $\psi \in$ {risky, safe}, and bad managers choose lending strategy $\phi \in$ {risky, safe}.

When firing rule (a) is used, good managers choose a safe portfolio, and bad managers choose a risky portfolio, the expected return to outsiders is:

$$\begin{aligned}U_a(\text{safe, risky}) = \gamma_{GG}&[S_G + \theta_G R - 2w] \\ &+ \gamma_G[\theta_G(1+\theta_G)R + (1-\theta_G)(X+w) - 2w] \\ &+ \gamma_{BB}[\theta_B(R + S_B) + (1-\theta_B)(X+w) - 2w] \\ &+ \gamma_B[\theta_B(1+\theta_B)R + (1-\theta_B)(X+w) - 2w].\end{aligned}$$

A good (GG) manager chooses a safe portfolio at date 1. The return on the portfolio is S_G, of which shareholders get $S_G - w$, so the manager is allowed to continue control of the bank at date 2. Because the expected return on a good risky loan portfolio exceeds the expected return on a good safe portfolio, the good manager chooses a risky portfolio at date 2. The date 2 decision of the good manager offers the outsider an expected return of $(\theta_G R - w)$. A G manager chooses (per force) a risky portfolio at date 1. With probability θ_G, the return on the portfolio is R, so shareholders get $(R - w)$ after the manager take his private benefits. The manager is allowed to continue control of the bank at date 2, and chooses a risky portfolio, returning an expected $(\theta_G R - w)$ to outsiders. If the return on the risky portfolio selected at date 1 is zero, which occurs with probability $(1 - \theta_G)$, then the manager is fired. The private benefit is paid anyway and the outsider earns his expected opportunity cost X from the date 2 decision. A bad (BB) manager chooses a risky portfolio at date 1 and, if successful in avoiding being fired, chooses a safe portfolio at date 2. A B manager chooses a risky portfolio whenever he is in control.

The expected profit from firing rules (b) and (c) when good managers choose safe loans at date 1 and bad managers choose risky loans at date 1 can be similarly calculated. For firing rule (b),

$$U_b(\text{safe, risky}) = \gamma_{GG}[S_G + \theta_G R - 2w] + \gamma_G[2\theta_G R - 2w] + \gamma_{BB}[\theta_B R + S_B - 2w] + \gamma_B[2\theta_B R - 2w].$$

For firing rule (c),

$$U_c(\text{safe, risky}) = \gamma_{GG}S_G + \theta_G R - 2w] + \gamma_G[\theta_G R + X - w] + \gamma_{BB}[\theta_B R + X - w] + \gamma_B[\theta_B R + X - w].$$

Recall that the actions of the managers are taken as given in the above calculations. So, firing rule (a) is preferred by outsiders when good managers choose a safe portfolio and bad managers choose a risky portfolio if

$$U_a(\text{safe, risky}) > U_b(\text{safe, risky}) \tag{10}$$

and

$$U_a(\text{safe, risky}) > U_c(\text{risky, safe}). \tag{11}$$

(10) holds if:

$$\begin{aligned}\gamma_{GG}[S_G + \theta_G R - 2w] + \gamma_G[\theta_G(1 + \theta_G)R + (1 - \theta_G)(X + w) - 2w] \\ + \gamma_{BB}[\theta_B(R + S_B) + (1 - \theta_B)(X + w) - 2w] \\ + \gamma_B[\theta_B(1 + \theta_B)R + (1 - \theta_B)(X + w) - 2w] \\ \geq \gamma_{GG}[S_G + \theta_G R - 2w] + \gamma_G[2\theta_G R - 2w] \\ + \gamma_{BB}[\theta_B R + S_B - 2w] + \gamma_B[2\theta_B R - 2w],\end{aligned}$$

which reduces to

$$\gamma_G(1-\theta_G)(X+w-\theta_G R)+\gamma_{BB}(1-\theta_B)(X+w-S_B) + \gamma_B(1-\theta_B)(X+w-\theta_B R)\geq 0.$$

Since $\theta_B R < S_B$ by Assumption 2, this is true if:

$$\left\langle\frac{\gamma_{BB}+\gamma_B}{\gamma_G}\right\rangle\left\langle\frac{X+w-S_B}{\theta_G R-X-w}\right\rangle\geq\frac{1-\theta_G}{1-\theta_B}.$$

(11) holds if

$$\begin{aligned}\gamma_{GG}[S_G+\theta_G R-2w]+\gamma_G[\theta_G(1+\theta_G)R+(1-\theta_G)(X+w)-2w]\\ +\gamma_{BB}[\theta_B(R+S_B)+(1-\theta_B)(X+w)-2w]\\ +\gamma_B[\theta_B(1+\theta_B)R+(1-\theta_B)(X+w)-2w]\\ \geq\gamma_{GG}[S_G+\theta_G R-2w]+\gamma_G[\theta_G R+X-w]\\ +\gamma_{BB}[\theta_B R+X-w]+\gamma_B[\theta_B R+X-w],\end{aligned}$$

which reduces to

$$\gamma_G\theta_G(\theta_G R-(X+w))+\gamma_{BB}\theta_B(S_B-(X+w)) + \gamma_B\theta_B(\theta_B R-(X+w))\geq 0.$$

Since $\theta_B R < S_B$ by Assumption 2, this is true if:

$$\frac{\theta_G}{\theta_B}\geq\left\langle\frac{\gamma_{BB}+\gamma_B}{\gamma_G}\right\rangle\left\langle\frac{X+w-\theta_B R}{\theta_G R-X+w}\right\rangle.$$

Similar calculations show U_a(risky, safe) > U_b(risky, safe) if

$$\left\langle\frac{\gamma_B}{\gamma_{GG}+\gamma_G}\right\rangle\left\langle\frac{X+w-S_B}{\theta_G R-X-w}\right\rangle\geq\frac{1-\theta_G}{1-\theta_B},$$

U_a(risky, safe) > U_c(risky, safe) if

$$\frac{\theta_G}{\theta_B}\geq\left\langle\frac{\gamma_B}{\gamma_{GG}+\gamma_G}\right\rangle\left\langle\frac{X+w-S_B}{\theta_G R-X-w}\right\rangle,$$

U_a(safe, safe) > U_b(safe, safe) if

$$\left\langle\frac{\gamma_B}{\gamma_G}\right\rangle\left\langle\frac{X+w-\theta_B R}{\theta_G R-X-w}\right\rangle\geq\frac{1-\theta_G}{1-\theta_B},$$

U_a(safe, safe) > U_c(safe, safe) if

$$\frac{\theta_G}{\theta_B}\geq\left\langle\frac{\gamma_B}{\gamma_G}\right\rangle\left\langle\frac{X+w-\theta_B R}{\theta_G R-X-w}\right\rangle,$$

U_a(risky, risky) > U_b(risky, risky) if

$$\left(\frac{\gamma_{BB} + \gamma_B}{\gamma_{GG} + \gamma_G}\right)\left(\frac{X + w - S_B}{\theta_G R - X - w}\right) \geq \frac{1 - \theta_G}{1 - \theta_B},$$

U_a(risky, risky) > U_c(risky, risky) if

$$\frac{\theta_G}{\theta_B} \geq \left(\frac{\gamma_{BB} + \gamma_B}{\gamma_{GG} + \gamma_G}\right)\left(\frac{X + w - \theta_B R}{\theta_G R - X + w}\right).$$

It is clear from these inequalities that firing rule (a) dominates firing rule (b) for any strategies chosen by managers if (1) holds and that firing rule (a) dominates firing rule (c) for any strategies chosen by managers if (2) holds. This, along with Proposition 1 gives us the existence of a unique equilibrium. This completes the proof.

Proof of Proposition 3: By (7) and (9),

$$\alpha^* - \alpha^{**} = \mathrm{Min}\left[\frac{w(1 - \theta_G)}{\theta_G^2 R - S_G + (X + w)(1 - \theta_G)}, 1\right]$$

$$- \mathrm{Min}\left[\frac{\theta_B w}{\theta_B w - \theta_B(R - X) + (1 - \theta_B)S_B}, 1\right].$$

When α^{**} and α^* are less than 1, then $\alpha^{**} > \alpha^*$ iff:

$$\theta_B(\theta_G^2 R - S_G + (1 - \theta_G)(X + w)) - (1 - \theta_G)((1 - \theta_B)S_B - \theta_B R + \theta_B(X + x))$$

$$= \theta_B(1 - \theta_G + \theta_G^2)R - \theta_B S_G - (1 - \theta_G)(1 - \theta_B)S_B$$

$$= \theta_B((1 - \theta_G)^2 + \theta_G)R - \theta_B S_G - (1 - \theta_G)(1 - \theta_B)S_B$$

$$= \theta_B(1_G R - S_G) + (1 - \theta_G)((1 - \theta_G)\theta_B R - (1 - \theta_B)S_B) > 0.$$

The last line is the condition given in the proposition. Note that it is increasing in R and decreasing in S_G and S_B. The derivatives with respect to θ_G and θ_B are ambiguous. This completes the proof.

Appendix 2: Equity Ownership Data

The data on the ownership structure of bank holding companies are constructed from 13D and 13G SEC filings as well as proxy statements, compiled by *Compact Disclosure*. *Compact Disclosure* was searched for data for the top 1274 bank holding companies. Usable data were found for 456 bank holding companies. In many cases the holding company was not listed, presumably because it is not publicly held. In other cases, the data was not usable because it did not include the holdings of members of the board of directors. In a few cases the holdings added up to more than 100 percent of the outstanding stock; these cases are omitted.

The compilation lists all shareholders with at least five percent of the outstanding stock. To obtain the holdings of *outside* shareholders (with at least five percent), insider holdings are subtracted. Insider holdings are the amounts of stock held by officers and directors of the bank holding company. In addition, the following are counted as insiders: (1) director nominees; (2) stock in a holding company controlled pension fund or "ownership" plan; (3) stock held in trust for a director; (4) stock held by families of directors or officers; and (5) stock held by the bank's trust department, except when there are no other insiders. Excluded from the holdings of either insiders or outsiders is the stock of the parent company held by subsidiaries or stock of the bank which it holds itself. These two categories are treasury stock.

In the case of shares held by families of insiders, which are counted as inside holdings, the last name was used to identify families. For example, in the case of Jefferson Bankshares, Richard Crowell, Jr. is a director, but Richard Crowell, Sr. is not an officer or a director. Richard Crowell, Sr.'s stock is counted as an insider holding. Other examples are along the same lines. In general, the amount of inside holdings subtracted from the total outside holdings of those with at least five percent was added to the holdings of the remaining insider holdings.

The 13D and 13G other filing dates often differ from the dates of proxy filings. Sometimes dates were not provided. We used the most recent dates when dates were provided.

Appendix 3: Semiparametric Estimation

To estimate (4) we follow Speckman (1988). Assume that the population regression function is a smooth function and that $\mathbf{X}$ and α are related via the regression model $E(\mathbf{X} \mid \alpha) = \mathbf{g}(\alpha)$, i.e.,

$$\mathbf{X} = \mathbf{g}(\alpha) + \eta \tag{12}$$

where η is a mean zero error term independent of α. The function $f(\alpha)$ (see equation (4)) is estimated by assuming the existence of a smoother matrix, $\mathbf{K}$ for estimating the function $f(\alpha)$ (we use locally weighted regression, as described below). Intuitively, $\mathbf{K}$ is the operator which, for each value of the nonparametric independent variable, calculates a value of the function at that point by attaching weights to neighboring points according to an assumed weighting function or density.

The smoother, $\mathbf{K}$, cannot be applied directly to estimate the nonparametric part of the relationship, $f(\alpha)$, because of dependence on the parametric part, $\mathbf{X}'\beta$. The basic approach is to purge each component of dependence on the other component, and then estimate the parametric part with OLS and the nonparametric part with a nonparametric estimator. Start by defining:

$$\mathbf{X}^* = (\mathbf{I} - \mathbf{K})\mathbf{X} \qquad \mathbf{L}_i^* = (\mathbf{I} - \mathbf{K})\mathbf{L}_i$$

which are the variables $\mathbf{X}$ and $\mathbf{L_i}$ "adjusted" for dependence on α, via $\mathbf{K}$. ($\mathbf{I}$ is the identity matrix.) Then β is estimated from partial residuals by:

$$\hat{\beta} = (\mathbf{X}^{*\prime}\mathbf{X}^{*})^{-1}\mathbf{X}^{*\prime}\mathbf{L}_{\mathrm{i}}^{*}.$$

And the estimate of the nonparametric component is given by:

$$\hat{\mathbf{f}} = \mathbf{K}(\mathbf{L}_{\mathrm{i}} - \mathbf{X}'\hat{\beta}).$$

Assuming (12), Speckman (1988) proves that: $\mathrm{n}^{1/2}[\hat{\beta} - \mathrm{E}(\hat{\beta})] \xrightarrow{\mathrm{D}} \mathrm{N}(0, \sigma^2\mathbf{V}^{-1})$ ($\mathrm{n}^{-1}\eta'\eta \to \mathbf{V}$, where $\mathbf{V}$ is positive definite) and that the bias in estimating the nonparametric function, $\mathrm{f}(\alpha)$, and its variance are negligible asymptotically. We now turn to a discussion of the choice of $\mathbf{K}$.

We use locally weighted regression (see Cleveland and Devlin (1988), Müller (1987), Stute (1984), and Cleveland (1979)).[31] Local regression uses a weighted least squares estimate at each point using a neighborhood of the data points determined by choice of a window size or smoothing parameter, say g. The function $\mathrm{f}(\alpha)$, at a point α_j (an element of α), $\mathrm{f}(\alpha_j)$, is estimated by linear or quadratic weighted least squares. By varying the independent variable point, α_j, and recalculating the relevant neighborhood and weights at each point, the function can be traced out over its domain. Intuitively, the procedure is analogous to a moving average in time series analysis. Instead of averaging over time, however, the average is with respect to a neighborhood around each point (in cross-section).[32] Standard errors can be obtained following Cleveland and Devlin (1988).

Local regression requires choice of a smoothing parameter, g. Thus, the estimate of $\mathrm{f}(\alpha)$, say $\gamma_g(\alpha)$, depends on g and, therefore, the expected mean squared error also depends on g. The expected mean square error, S_g, is: $S_g = B_g + V_g$, where B_g is the contribution of bias to the expected mean square error and V_g is the contribution of variance. Nonparametric estimators are biased (see Scott (1992)) when $\gamma_g(\alpha)$ is a nearly unbiased estimate (which occurs when g is low, e.g., 0.2), then the expected value of B_g is nearly 0, but this depends on the choice of g. The difficulty is that choice of window size, g, trades-off variance of the estimator against bias.[33] There are a number of procedures for

[31] The smoother matrix, $\mathbf{K}$, may be linear or nonlinear (e.g., a low order polynomial) and possible methods include kernel, weighted regression, and spline procedures. (See Härdle (1990, 1991) and Müller (1988) for discussions.) The choice of locally weighted regression is due to the superior features of this method compared to kernel estimation. Local regression is more efficient that kernel methods and does not have "boundary effects" caused by the lack of a neighborhood on one side of data points near either end of the sample. These results are due to Fan (1992, 1993) and Stute (1984).

[32] Note, however, that local regression is computationally burdensome even for samples of, say, $n = 200$ because at each point the sample must be sorted to find the q nearest neighbors. In time series the sorting is not an issue. In our case this issue is nontrivial because $n = 2{,}000$.

[33] Bias and variance as $q \to \infty$, $n \to \infty$, and $g \to 0$ are given by:

$$\mathrm{E}[\gamma_g(\alpha)] - f(\alpha) \approx \frac{1}{24h(\alpha)^3}[(f''h + 2f'h')(\alpha)]g^2 \qquad \mathrm{Var}[\gamma_g(\alpha)] \approx \frac{\sigma^2(\alpha)}{g}$$

where $h(\alpha)$ is the marginal density of α. See Härdle (1991). Observe that the bias is increasing and the variance is decreasing in the smoothing parameter g.

making the optimal choice of window size (which determines how smooth the estimated function is). However, our results do not change over a fairly broad range of window sizes.

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