

The Institutional Memory Hypothesis and the Procyclicality of Bank Lending Behavior

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Abstract

Stylized facts suggest that bank lending behavior is highly procyclical. We test a new hypothesis that may help explain why this occurs. The institutional memory hypothesis is driven by deterioration in the ability of loan officers over the bank's lending cycle that results in an easing of credit standards. This easing of standards may be compounded by the simultaneous worsening of agency problems between loan officers and management and between management and external stakeholders due to the lack of observed problem loans. We test this hypothesis using data from individual U.S. banks over 1980-2000. We employ over 200,000 observations on commercial loan growth measured at the bank level, over 2,000,000 observations on interest rate premiums on individual loans, and over 2,000 observations on credit standards and bank-level loan spreads from bank management survey responses. The empirical analysis provides support for the hypothesis, although there are differences by bank size class.

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1. Introduction

The linkage between the financial system and the business cycle has been the subject of much investigation. Arguments that the financial system is procyclical are quite consistent with economic events, such as the credit crunch in the U.S. during the early 1990s, the Russian and Asian financial crises in the late 1990s, and the large corporate bankruptcies of the early 2000s. Many theories focus on the increase and decrease in the supply of bank credit over the business cycle in order to explain two stylized facts widely observed by central bankers, regulators, practitioners, and researchers. One stylized fact is that lending often increases significantly during business cycle expansions, and then falls considerably during subsequent downturns, sometimes dramatically enough to be labeled a “credit crunch.” These changes in lending are generally more than proportional to the changes in economic activity, suggesting that they are changes in bank loan supply that tend to accentuate the business cycle.

A second stylized fact about bank loan procyclicality is that observed measures of loan performance problems appear to follow a distinct pattern over the business cycle. Past due, nonaccrual, provisions, and charge-offs are generally very low during most of the expansion, start to appear at the end of the expansion, then rise dramatically during the downturn. This suggests that banks may take significantly more risks during the expansion, but these risks are revealed only later because it takes time for loan performance problems to appear.

Consistent with these stylized facts, Federal Reserve Chairman Alan Greenspan noted that regulators agree that “the worst loans are made at the top of the business cycle.” (Chicago Bank Structure Conference May 10, 2001). Practitioners often echo this sentiment, as reflected in a recent trade publication, “Human nature being what it is, lenders and borrowers frequently assume that strong growth will continue unabated. Loans made towards the end of an economic cycle are often underwritten based upon unrealistic assumptions concerning growth.” (Furth 2001, p. 31). Greenspan also noted that at the bottom of the cycle, “the problem is not making bad loans ... it is not making any loans, whether good or bad, to credit-worthy customers,” consistent with the sometimes dramatic fall in lending during the cyclical downturns. Timing patterns consistent with these stylized facts are also evident in other nations, as shown in recent research (e.g., Borio, Furfine, and Lowe 2001, Horvath 2002, Borio and Lowe 2002). The stylized facts thus suggest that the seeds of loan performance problems may be sown during an economic expansion when low-quality loans are made, and then these problems are revealed during the downturn.

The specific causes behind these fluctuations in bank loan supply and performance are the subject of considerable debate. In this paper, we test a new hypothesis that may explain in part why bank lending follows this procyclical pattern. We hypothesize that an “institutional memory” problem may drive a pattern of business lending that is associated with a deterioration in the ability of bank loan officers to recognize potential loan problems and an easing of credit standards as time passes since the bank’s last loan “bust,” or significant experience with problem loans. The deterioration in loan officer ability is partly due to a proportional increase in officers that have never experienced a loan bust, and partly due to the atrophying skills of experienced officers as time passes since their last experience with problem loans. As a result of this deterioration, officers may be less able to differentiate low-quality from high-quality borrowers, the longer is the time since the bank’s last bust.

The bank may accommodate the deterioration in loan officer skills by allowing an easing of credit standards as time passes since the last bust, and wait until the next bust to tighten standards when loan officer memories are restored. As a result, some negative net present value (NPV) loans may be granted to low-quality borrowers that are not differentiable from high-quality borrowers. Such loans would then be rejected at the time of the following bust.

This may be a value-maximizing strategy in the long run despite the extension of some negative NPV loans in the short run. This is because the alternative strategy of reducing credit would eliminate some positive NPV loans and destroy some positive NPV bank-borrower relationships. Thus, it may be optimal to accommodate the easing of credit standards, and wait until the next bust to sort out the positive and negative NPV loans and relationships. Although the institutional memory hypothesis is rooted in the bank’s own loan performance problems rather than the aggregate business cycle, this hypothesis may help explain the stylized facts about bank lending over the aggregate cycle because problem loans are highly correlated with the aggregate cycle.

The institutional memory problem and resulting easing and tightening of standards may be exacerbated by agency problems within the bank that prevent management from knowing the extent to which individual loan officers are afflicted by skills atrophy. Similarly, the problem may be aggravated by agency problems between external stakeholders (e.g., outside equity holders, subordinated debt holders, government regulators) and management that prevent the stakeholders from knowing the extent to which the institutional memory problem affects individual banks. As discussed in more detail below, these agency problems are expected to worsen as time passes since the bank’s last bust due to the lack of observed problem loans, which are used by managers and external stakeholders to evaluate the performance of individual officers and banks, respectively. Because of the

reduced information available to decision makers, it may be more difficult to take actions other than accommodating the deterioration in loan officer skills. Thus, bank managers and external stakeholders may allow an easing of credit standards as time passes since the last bust, and wait until the next bust to tighten standards when these decision makers know more about the individual loan officers and banks as well as more about the individual loan customers.

Importantly, the institutional memory problem and easing/tightening effects may occur in the absence of agency problems within the bank. Consider the extreme case of a bank with a single loan officer that also manages and owns the institution. This officer/manager/owner may maximize the value of the institution by easing credit and extending some negative NPV loans in the short run to avoid eliminating some positive NPV loans and destroying some positive NPV bank-borrower relationships, and then tighten standards in the next bust when the officer/manager/owner's skills are restored.

The institutional memory problem may have a number of adverse consequences. First, the procyclical lending behavior it produces can exacerbate the business cycle and increase systemic risk. This may be especially serious for developing countries with relatively fragile and less well-regulated banking systems (Mero 2002). Second, the procyclical lending behavior could significantly misallocate resources if a large number of negative net present value (NPV) loans are extended during an expansion and positive NPV loans are denied during a downturn. Third, the cyclicity of problem loans may make it difficult for external stakeholders to impose regulatory and market discipline because of the lagged nature of problem loans.

The institutional memory hypothesis implies that credit standards ease as time passes since a bank's last loan bust. Our main tests examine whether a bank increases its commercial lending as time passes since its last bust, controlling for other factors affecting the demand for and supply of its credit. This increase in the supply of bank credit is a necessary condition of the institutional memory hypothesis as an explanation of the stylized facts about bank lending over the aggregate business cycle. We also run secondary tests of whether banks reduce their loan interest rate premiums and whether their senior management reports easing their standards and loan spreads as time passes since the bank's last loan bust.

The models are estimated using data from individual U.S. banks over the period 1980-2000 – approximately two full business cycles. The dependent variables are taken from three different data sets – over 200,000 observations on commercial loan growth measured at the bank level from the Call Report, over 2,000,000 observations on interest rate premiums on individual loans from the Federal Reserve's Survey of Terms of Bank

Lending (STBL), and over 2,000 observations on credit standards and bank-level loan spreads from responses to the Federal Reserve's Senior Loan Officer Survey (SLOS). The key exogenous variable – the number of years since the bank's last loan bust – is measured as the time since the ratio of the allowance for loan and lease losses to total loans was at its maximum over an interval that includes the current year and the prior 10 years.

The regressions include a number of control variables to account for other factors affecting the demand for and supply of bank credit. We include bank fixed effects in all of our tests and also run the tests both with and without time fixed effects. The inclusion of time fixed effects makes the tests quite stringent because the findings for the key exogenous variable are based only on the variation in the bank's boom-and-bust-cycle that is not correlated with the aggregate cycle and other factors that change systematically over time. The time fixed effects also help control for the other hypotheses of procyclicality to the extent that these other hypotheses are driven by or correlated with the aggregate business cycle or other overall economic conditions.

The remainder of our paper is organized as follows. In the next section, we explain the institutional memory hypothesis. In Section 3, we review the extant literature on procyclicality in lending and how it relates to the new hypothesis. In Section 4, we discuss the empirical methodology, variables, and data sets. We present our empirical results in Section 5, and offer some conclusions in Section 6.

2. The institutional memory hypothesis

The institutional memory hypothesis is based on deterioration in the ability of loan officers as time passes since the bank's last loan bust or significant experience with problem loans. Early in a bank's lending cycle (i.e., immediately after a loan bust) the lessons of the bank's last bust are still fresh in the memory of loan officers who have just witnessed the *ex post* realization of their prior loan decisions. These lessons include insights about the association between firm characteristics and risk, the success of different contract structures, the efficacy of different monitoring methods, and the best strategies for managing distressed credits to mitigate losses. Thus, as the bank starts its rebound from its most recent significant experience with problem loans, loan officer skills are maximized as the lessons are fresh in the minds of those officers who survived the experience.

As time passes after the bank's last loan bust, loan officer skills tend to deteriorate and it becomes more difficult to differentiate low-quality from high-quality borrowers. The officers may also do a worse job of structuring their loans, monitoring them after origination, and designing and implementing work-out strategies if and when these loans become distressed.

One factor that may drive this deterioration is a decrease in the fraction of experienced loan officers. New

officers are hired and trained to replace experienced officers who leave the bank or are promoted to senior positions elsewhere in the institution. Additional new officers may be hired to service increased loan demand as time passes since the bank's last bust. New officers generally have not had the "learning experience" of a loan bust. Although some of them may have the talent, perceptiveness, and initiative to overcome their lack of experience, others likely do not. Another factor that may drive the deterioration in skills is that some officers who have experienced a loan bust may suffer atrophy of their lending skills as they forget some of the lessons of the past. This may affect some experienced officers more than others. Although it is only the memory of the loan officers that deteriorates, we call it the institutional memory hypothesis because it affects the behavior and performance of the institution as a whole.

When a bank's loan boom turns to a bust, its loan officers turn more of their attention to managing their distressed credits. This process of addressing problem loans helps restore institutional memory as officers "re-learn" how to differentiate low-quality from high-quality borrowers, how to structure and monitor, and how to work-out problem loans. Specifically, loan officers gain knowledge about which combinations of loan contract terms (e.g., business collateral, personal collateral, guarantees, covenants, maturity, etc.) and monitoring strategies (e.g., frequency of borrower contact, field exams, frequency and intensity of collateral reporting) used during the bank's boom minimized losses during its bust, and which did not.¹ That is, officers learn which combinations of contract terms were most and least effective in mitigating the adverse selection problem and which monitoring strategies were most and least effective in mitigating the moral hazard problem through early detection of deteriorating credits and fraud.²

Under the institutional memory hypothesis, the bank accommodates the deterioration in loan officer skills by allowing an easing of credit standards as time passes since the last bust. Negative NPV loans are granted to low-quality borrowers that are no longer differentiable from high-quality borrowers. As noted above, this may be a value-maximizing strategy despite the extension of some negative NPV loans. This is because policies to reduce negative NPV loans to low-quality borrowers would also reduce positive NPV loans to the high-quality borrowers

¹ For many risky commercial loans, banks send their own "field examiners" to audit the books and records of the borrower rather than just relying on their customer's auditor (see Kerwin 1994).

² Fraud-driven loan losses have recently received considerable press attention. However, fraud has always been a major source of commercial loan losses and a major focus of prudent commercial loan management. While hard quantitative and statistical techniques can be useful in detecting fraud (Beneish 1999), early detection of fraud by commercial lenders is substantially dependent on more qualitative soft factors such as the character of the owner or manager of the firm (Udell 2003, Chapter 12).

that are not differentiable from the low-quality borrowers. As well, policies that reduce credit may destroy some bank-borrower relationships that are very profitable over the long run. Therefore, it may be value maximizing to accommodate the easing of credit standards, and wait until the next bust to sort out the positive and negative NPV loans and relationships. At that time, institutional memory is restored, credit standards are tightened, and negative NPV loans are rejected.³

The institutional memory problem and its effects on credit standards may be exacerbated by agency problems within the bank that also worsen as time passes since the bank's last bust due to the lack of observed problem loans. Although the institutional memory hypothesis may hold in the absence of agency problems within the bank – as in the example above of the single officer/manager/owner – the governance structure of most banks includes some separation between loan officers and management and between management and external stakeholders that may create agency problems. These problems may reduce the information available to management and external stakeholders, and make it more costly for them to take actions to reduce credit rather than accommodating the deterioration in loan officer skills.

Consider first the agency problems between loan officers and management. Officers typically gather both “hard” and “soft” information about their commercial loan clients. The hard information – such as financial ratios, collateral values, covenant violations, repayment histories, and credit scores – is generally quantitative and is relatively easily communicated to and verified by management. In contrast, the soft information – such as information about character and reliability of the owner gathered by personal contact by the loan officer – is generally not quantitative, and is relatively difficult to communicate and verify. The soft information, which also includes the personal judgment of the loan officer, is more likely to create agency problems than the hard information.

Loan review is a key internal loan auditing system that management uses to reduce these agency problems by assessing the ability and effort of individual officers through costly monitoring of each officer's loan portfolio (Udell 1989). While hard information from the loan files can be relatively easily assessed by the loan review committee, it may still be difficult for management to fully evaluate loan officer ability and effort due to the presence of soft information. To address this problem, loan review relies heavily on drawing inferences about each officer's ability and effort from the *ex post* performance of that officer's loans. The process includes

³ The bank may further reduce the supply of credit during the bust as loan officer time is reallocated away from making new loans and toward dealing with problem loans.

analyses of 1) whether the *ex ante* structure of the loans helped reduce the occurrence of problem loans and mitigated losses when problems subsequently occurred, 2) the frequency and severity of problem loans, 3) whether problem loans were detected sufficiently early, and 4) whether appropriate and timely intervention/renegotiation strategies were implemented.

In principle, loan review may also be used to identify which loan officers have succumbed to the institutional memory problem and suffered skills deterioration since the bank's last bust and the extent of any such deterioration. That is, management could use the loan review function to determine which of its new loan officers are unable to overcome their lack of experience and which of its experienced officers suffered skills atrophy and the extent of these difficulties. For each individual loan officer that has a memory problem, management could then decide the extent to which to accommodate the memory loss by allowing an easing of credit standards and the granting of some negative NPV loans versus reducing credit to the customers of these loan officers and bearing the cost of eliminating some positive NPV loans and destroying some profitable bank-borrower relationship.

However, the capacity of loan review to perform this function is likely to diminish as time passes since the bank's last bust because there are fewer observed problem loans to use in evaluating loan officers. As indicated, the *ex post* observation of problem loans is to drawing inferences about loan officer behavior and the soft information they use in the lending process. Thus, at the same time that loan officer skills are deteriorating, the agency problem between bank management and the officers may worsen and potentially exacerbate the institutional memory problem.

Bank management could alternatively try offset some of the decline in credit standards and reduce the number of negative NPV loans issued by adjusting its lending policies and procedures in a more blunt fashion linked to hard information. For instance, management could reduce the amount of credit authority it delegates to its loan officers based on observable characteristics of the officers and loans. Similarly, management could impose incremental premiums on loan interest rates or more stringent collateral requirements on certain categories of loans to compensate for the unobserved low-quality credits that are likely to be included in these categories.

The impact of such blunt policy instruments is complicated by the fact that they may affect all loan officers, rather than focusing on those that are contributing significantly to the institutional memory problem. When the blunt instruments are used, it is likely that that a relatively high proportion of the credits that are reduced are positive NPV projects or loans to valuable relationship customers, rather than negative NPV investments. This is because some of the loans that are affected by the blunt instruments are made by officers that do not have

significant memory problems and are not making significant numbers of negative NPV loans. Thus, the agency problems between loan officers and management raises the costs of taking actions to reduce credit in terms of the loss of positive NPV loans and relationships relative to the benefits of reducing negative NPV loans, and may make it more likely that management chooses to accommodate the easing of credit standards as time passes since the last bust. Management may then wait until the next bust to tighten standards when it knows more about which individual loan officers suffered memory loss as well as which loans and relationships are positive and negative NPV.

The agency problems between management and external stakeholders similarly worsen as time passes since the bank's last bust. Outside equity holders, subordinated debt holders, government regulators, and other external stakeholders generally have even less information about the bank's loan officers and portfolio than does bank management and may also need to observe loan performance problems to draw inferences about the bank and its management. However, they face the same problem as bank management – too few observable problem loans on which to make inferences when time has passed since the bank's last bust.

Similar to agency problems between loan officers and management, the worsening agency problems between management and external stakeholders may make it more likely that a policy of disciplining the banks or loan officers by reducing credit availability will affect banks and officers that do not have significant institutional memory problems, and be more costly in terms of the loss of positive NPV loans and relationships relative to the benefits of reducing NPV loans. As a result of these higher costs of discipline, external stakeholders may find it in their interests to accommodate the easing of credit standards as time passes since the last bust and wait until the next bust to tighten standards when it knows more about which individual banks and officers suffered memory loss as well as learning more about values of the loans and relationships.

This additional layer of agency problems could also reduce the incentive for bank management to directly address the institutional memory problem. For example, management may be reluctant to impose the blunt rationing, pricing, and collateral policies discussed above because their implementation would likely result in the bank reporting lower short-run profits than observably comparable banks. It may be optimal for some bank managers to hide the quality of their loan officer staff and their own loan review effort from outside claimants by avoiding the implementation of these blunt instruments. Similarly, bank managers may choose herding or assume correlated risks in order to avoid the costs of separating themselves from their peers (e.g., Devenow and Welch 1996, Acharya 2001). Other managers may assume more unobservable risk by not constraining their loan officers

in order to mimic unobservably stronger banks (Gorton and Rosen 1995).

The institutional memory hypothesis may apply more to either large or small banks because of different governance structures and different types of loans. On the one hand, large banks usually have a greater separation of ownership and control and more layers of separation between management and the individual loan officers than small banks. These characteristics may increase agency problems and exacerbate the institutional memory problem. On the other hand, small banks tend to make proportionately more relationship loans to informationally opaque borrowers based on soft information. Large banks may be less inclined to make such loans because they are at organizational disadvantages at handling soft information that cannot be easily communicated to and verified by management (Berger and Udell 2002, Stein 2002). As indicated above, the use of soft information makes it more difficult for management to assess loan officer skills through loan review, and so may exacerbate the institutional memory problem due to greater agency problems between loan officers and management. It may also be the case that the skills deterioration of loan officers as time passes since the last bust affects their processing of soft information more than their processing of hard information. In our empirical analysis, we distinguish where possible by bank size and loan size.

To the best of our knowledge, we are the first to articulate the institutional memory hypothesis laid out here – a deterioration in the ability of loan officers over a bank’s lending cycle due to officer turnover and/or skills atrophy that may be exacerbated by worsening agency problems because fewer problem loans are observed by bank management and by external stakeholders. Under the hypothesis, it is rational for all involved parties to allow credit standards to ease and some negative NPV loans to be made, in part because imposing blunt policies to tighten standards may eliminate some positive NPV loans and/or destroy valuable bank-borrower relationships.

Although this hypothesis does not appear elsewhere to our knowledge, there is some related literature on memory and cycles that focuses on the memory of management, rather than loan officers. One recent paper in the management literature is based on interviews of managers at three large Canadian banks. It finds that lessons from credit losses in certain sectors can be embedded as hard information in management policies and procedures and that adherence to these policies and procedures may decline over the lending cycle, although it does not directly analyze lending data over the cycle (Paul-Chowdhury 1998).⁴ The focus on hard information in management

⁴ Paul-Chowdhury (1998) is part of a larger management literature on learning and memory in organizations that analyzes how information may be acquired, stored, or lost, and may be used or misused by management (e.g., Walsh and Ungson 1991).

policies and procedures differs significantly from our focus on the deterioration of loan officer skills in processing soft information. Some related literature also suggests that senior management experience with a prior financial crisis may have helped the Australian banking system weather the 1930s depression (Butlin and Boyce 1985, Fisher and Kent 1999).

3. The related literature on bank procyclicality

Much of the research on procyclicality has focused on credit crunches during business cycle downturns, particularly on the credit crunch in the early 1990s in the U.S. and elsewhere. A number of hypotheses for explaining the timing and the magnitude of the decline in lending were tested and found to be consistent with the data to varying degrees. These include: implementation of tougher capital standards – risk-based or leverage-based, explicit or implicit (e.g., Berger and Udell 1994, Hancock and Wilcox 1994, Peek and Rosengren 1995b, Hancock, Laing, and Wilcox 1995, Shrieves and Dahl 1995, Wagster 1999, Furfine 2001); an increase in supervisory toughness, such as worse CAMELS ratings, higher classified assets, more formal actions for a given portfolio (e.g., Peek and Rosengren 1995a, Jordan, Peek, and Rosengren 2000, Berger, Kyle, and Scalise 2001, Furfine 2001); bank retrenchment or reduced risk taking due to portfolio risks, losses, impaired capital, changed risk tolerance, etc. (e.g., Hancock and Wilcox 1994, 1998, Berger and Udell 1994, Peek and Rosengren 1995b, Wagster 1999, Furfine 2001); or reduced loan demand (e.g., Bernanke and Lown 1991, Berger and Udell 1994, Furfine 2001).

The research on the credit crunch provides only a partial explanation of the stylized facts about procyclicality because it addresses only part of the cycle. A credit crunch is a reduction in supply that is measured against a control period of “normal” credit supply, or supply during an economic expansion. If there is a significant easing of credit standards during an aggregate expansion – as would be consistent with the stylized facts – then a credit crunch during the downturn may be the result, at least in part, of low-quality loans issued during the expansion that created problem loans and depleted capital ratios that become apparent later in the cycle. That is, the seeds of the credit crunch may be sown at the top of the cycle.

Some recent research has examined the expansionary part of the business cycle to try to explain some of the stylized facts. One explanation is over-optimism. During the expansion, banks may underestimate their risk exposure and ease their credit standards, which increases the magnitude of losses when the next downturn occurs.

This type of behavior may be consistent with recent theories of behavioral finance or bounded rationality.⁵ Bank lending behavior might be based on euphoric expectations associated with an investment boom driven by the business cycle (Minsky 1977) or on “disaster myopia” where the subjective probability of a major shock decreases as time elapses since the last shock (Guttentag and Herring 1984). The paucity of data available to bank managers across business cycles may also be a contributing factor, making it particularly difficult for them to assess the systematic component of risk in their portfolios (e.g., Borio, Furfine, and Lowe 2001).⁶

Reduced supervisory toughness or lessened market discipline during an expansion offers another explanation of a decline in credit standards. Bank supervisors were found to soften their loan classification standards and their CAMELS ratings during an expansion (Berger, Kyle, and Scalise 2001), and capital market participants were found to exercise less discipline over issues of subordinated debt during relatively good periods (Covitz, Hancock, and Kwast 2000). As discussed above, reduced discipline by external stakeholders could come about because agency problems are exacerbated by the lack of data on loan performance problems during an expansion. Some are also concerned that the new Basel capital regulations could introduce more procyclicality in lending to the extent that banks adopt the internal ratings-based (IRB) approach. This could occur because individual borrower ratings may depend on assessed probability of default, which may be correlated with the business cycle (Altman and Saunders 2001, Zsomboki 2002).

Herding behavior may also be a factor in explaining the stylized facts. Because of the agency problem between bank managers and outside owners, managers of different banks may ease credit standards simultaneously during an expansion to mask emerging problems, then tighten standards only when the condition of the borrowing sector has deteriorated considerably (Rajan 1994).⁷ Similarly, banks may herd because penalties imposed by government supervisors may be perceived to be lighter if many banks are troubled simultaneously (Acharya 2001) or because of contagion effects across institutions (Acharya and Yorulmazer 2002).

⁵ This is analogous to investors becoming over-optimistic about recent winners and over-pessimistic about recent losers (De Bondt and Thaler 1995).

⁶ One recent paper found that commercial real estate lending follows a “trend-chasing” pattern in which investment is at its highest when *ex ante* returns are at their lowest, consistent with over-optimism (Mei and Saunders 1997).

⁷ Herding in a lending model may involve an information cascade in which the initial actions of some agents cause others to ignore their own private information and make negative NPV loans (Banerjee 1992, Welch 2000). This type of model would typically result in a rapid shift away from this overlending once they learn that their lending activities are problematic. However, in one model of procyclicality in which ability is valued more during a boom than in a bust, herding behavior persists until late in the boom (Rajan 1994). In this model, lending is exceptionally expansionary during the boom but normal during the bust.

One potential explanation for the second stylized fact – that observed loan performance problems are minimal until the end of an expansion, then rise dramatically during the downturn – is loan seasoning. Seasoning refers to the phenomenon that loan performance problems – such as past due, nonaccrual, provisions, and charge-offs – are ex post measures of bank risk taking that generally materialize only with a lag. During an expansion, more new loans are issued, making the stock of loans relatively young and less likely to have observed performance problems (e.g., Avery and Gordy 1995). During a downturn, fewer loans are issued, so the average loan age increases and more problem loans are observed.

The institutional memory hypothesis does not rule out the other theories of procyclicality – they may be complementary. The institutional memory problem may be exacerbated by the credit crunch hypotheses, over-optimism, reductions in supervisory toughness/market discipline, herding, and/or loan seasoning. For example, over-optimism may encourage loan officers to ease their credit standards further, causing inexperienced loan officers to lend even more, and further clouding the memories of the experienced loan officers. Similarly, loan seasoning that delays the observation of problem loans may add further to the lags with which 1) junior loan officers gain experience with problem loans, 2) senior loan officers restore their memory about problem loans, and 3) bank management and external stakeholders obtain sufficient hard information to evaluate lending behavior.

The economic significance of the procyclicality of bank lending due to the institutional memory hypothesis or any of the other hypotheses depends largely on the extent to which this procyclicality affects the business cycle and aggregate output. Empirical evidence on the two credit channels of monetary policy transmission suggests that bank lending is important to the aggregate economy. Research on the “bank lending view” credit channel shows that monetary policy significantly affects the supply of bank loans through its impact on bank reserves; and this, in turn, significantly affects the macroeconomy (see Kashyap and Stein 1997 for a survey). Research on the “balance sheet” credit channel indicates that monetary policy affects lending and the macroeconomy significantly through changes in interest rates that affect the creditworthiness of borrowers by altering the quality of their balance sheets and collateral (see Bernanke and Gertler 1995, Bernanke, Gertler, and Gilchrist 1996 for summaries).

Evidence from the credit crunch literature suggests that factors such as changes in bank capital that suppressed bank lending also had an effect on the real economy (Hancock and Wilcox 1998). There is also evidence that changes in credit standards may be linked to the macroeconomy. One study using a VAR methodology found that shocks to lending standards as reported by senior management on the Senior Loan Officer

Survey (SLOS) significantly affected both commercial loan volume and real output (Lown and Morgan 2002). Another study found that loan rate premiums were lower during economic expansions and higher during downturns, and that this was linked to the unemployment level over the business cycle (Asea and Blomberg 1998).

4. Empirical model, variables, and data sets

In this section, we first briefly outline the empirical model employed to test the institutional memory hypothesis. We then describe the variables and data sets employed in the tests.

4.1 Empirical model

The main testable prediction of the institutional memory hypothesis is that credit standards ease as time passes since the bank's last loan bust. The basic empirical model employed in the tests is given by:

$$\text{Indicator of bank's credit standards}_{b,t} = f(\text{time since bank's last bust}_{b,t}, \text{control variables}_{b,t-1}), \quad (1)$$

where the dependent variable is an indicator of bank b's credit standards at time t, the key exogenous variable is the number of years since bank b's last bust, and the control variables account for other factors affecting the demand for and supply of bank b's credit. Equation (1) is a reduced form that takes both demand and supply factors into account, although our attention is primarily focused on one supply factor – the time since the bank's last bust.

We test the institutional memory hypothesis using the bank's commercial loan growth as the main indicator of its credit standards. In our secondary tests, we also run equation (1) using the premiums over risk-free rates charged on its commercial loans, and its responses to the Senior Loan Officer Survey regarding its credit standards and spreads of its loan rates over its cost of funds. The key exogenous variable is measured as the number of years since the bank's loan portfolio was in its worst condition over an interval that includes the current year and the prior 10 years, i.e., the time since its worst condition over the interval [t-10,t]. The control variables are discussed below.

The model is estimated using data from individual U.S. banks from 1980-2000 – approximately two full business cycles (although the full period is not available for all tests). The data sets also include information back to 1970 to construct the “time since” exogenous variables, which are based on the last bust over the [t-10,t] time interval. For an observation to be included in the data set, the bank must have a history of 10 consecutive prior years of performance to construct a sufficient “time since” history. For the discarded observations, it would be

difficult to determine the time since their last bust and it is not clear how well the institutional memory hypothesis would apply (i.e., their loan officers have not had much time to “forget”).

We also run the model separately for several subsets of the data. We run the tests separately for the cycles of the 1980s (1980-1989) and 1990s (1990-2000) to examine how the results apply to these two cycles. There are reasons to believe that the 1990s are different – tougher capital standards, recovery from a significant credit crunch, technological change, etc. We also report the results for the 1986-2000 subsample because of a slight change in the definition of one of the variables (discussed below). Where possible, the tests are also run by bank size classes to investigate the extent to which the hypothesis applies to large versus small banks and by loan size class to determine the extent to which the hypothesis applies to loans to large versus small borrowers. We also run the regressions with only non-merging banks – i.e., deleting observations on banks that engaged in mergers over the $[t-10,t]$ time interval – to insure that our results are not due to mergers.

Descriptions and summary statistics for all of the variables employed in the analysis are shown in Table 1. Sample means are also shown for the three different data sets – the Call Report (CALL), Survey of Terms of Bank Lending (STBL), and Senior Loan Officer Survey (SLOS) data sets. Note that CALL and SLOS data are used in calculating some of the exogenous variables for all of the tests, but we divide up the tests and data sets by the dependent variables. All financial values are expressed in real 1994 dollars using the GDP deflator.

4.2 Dependent variables and their corresponding data sets

Our main indicators of credit standards are based on loan growth for each bank for each year taken from the CALL data set. We measure the annual proportional change in lending (i.e., $(L_{b,t} - L_{b,t-1})/L_{b,t-1}$) for commercial and industrial loans and commercial real estate loans, $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$. In both cases, the loan growth is merger-adjusted, so that any change in lending due to the effects of adding two or more balance sheets together through mergers is removed. We also delete the top and bottom 1% of the observations of $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$. These extreme values – such as banks that increase their lending by several thousand percent in a single year or reduce lending to close to zero – likely reflect either data errors or idiosyncratic events that are unrelated to the institutional memory hypothesis. As shown in Table 1, the sample mean annual growth rates for C&I and CRE loans (after trimming off the extreme values) are 6.52% and 11.00%, respectively. Although the institutional memory hypothesis may apply to any category of lending, the effects are likely to be strongest for these commercial loan categories, in which loan officer judgment is of primary importance. As discussed below, we also try robustness checks using other types of bank loans.

The loan growth data are annual, and are available for the full sample period from 1980 – 2000. The 21 years of data provide 203,243 bank-year observations that are employed in the loan growth regressions.⁸ These regressions are run by OLS.

The institutional memory hypothesis predicts a greater flow of new lending as time passes since the bank's last bust, after controlling for other demand and supply factors. As time passes and the human capital of the loan officers deteriorates and credit standards decline, the loan officers may approve loans that they otherwise would have rejected earlier in the cycle and may raise the credit limits on other borrowers that would have received limited credit because the loan officers are less able to assess loan quality.

The loan growth tests using $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$ are relatively straightforward tests of the institutional memory hypothesis, as an increase in lending corresponds quite closely with the concept of an easing of lending standards. A significant increase in lending is also a necessary condition for the institutional memory hypothesis to help explain the stylized fact that bank lending tends to increase significantly during a business cycle expansion and fall significantly during a downturn. However, we acknowledge that the change in the stock of loans is an imprecise measure of the flow of new loans, because the change in the stock also varies with loan maturity, prepayments, defaults, etc.

As secondary tests, we also examine the effects of the time since the bank's last bust on other indicators of credit standards. First, we use the premiums over risk-free rates charged on its loans taken from the Federal Reserve's Survey of Terms of Bank Lending (STBL) as an indicator of credit standards. The STBL covers approximately 300 U.S. banks per quarter (although the respondent set is not constant over time), obtaining contract terms on all of their new domestic C&I loans during one or more days of the first week of the second month of the quarter. The survey covers almost all of the largest banks in terms of C&I lending plus a stratified random sample of smaller banks.

For each loan, we measure the loan rate premium over the risk-free rate of comparable duration, i.e., the appropriate U.S. Treasury rate. For loan i made by bank b at time t with duration d , we measure $\text{PREM}_{i,b,t,d} \equiv r_{i,b,t,d} - r_{US,t,d}$ as our dependent variable. The data are for individual loans from 1980 – 2000. The 21 years of data provide 2,296,906 observations on individual loan contracts. As shown in Table 1, the average loan premium is 3.89% – i.e., the average loan has a rate of 389 basis points above the risk-free rate. The PREM regressions are

⁸ The CALL frequency is quarterly, but we prefer to use the annual data because the December CALL is generally considered to be the most accurate and because it smoothes out seasonal and other short-term fluctuations in lending.

run by OLS.

We test whether loan premiums decline as time passes since the bank's last bust, controlling for other factors affecting demand and supply. The institutional memory hypothesis predicts that loan officers become less able to recognize potential loan problems and to differentiate low-quality borrowers from higher-quality borrowers later in the bank's cycle. As a result, the bank may charge low premiums for some relatively risky loans. For example, as credit standards ease, loan officers may put some unobservable "prime + 3" borrowers into the "prime + 2" risk pool, reducing PREM.

Despite this prediction of the hypothesis, PREM may not decline even if the institutional memory hypothesis is true. Bank management may keep rates from falling or even impose higher rates as time passes since the bank's last bust as one of the blunt instruments for addressing the institutional memory problem. As discussed in Section 2, management could impose higher rates based on observable characteristics of loans or loan officers to compensate for the likely inclusion of unobservable low-quality credits in high-quality risk pools.⁹

Thus, the PREM tests are not direct tests of the institutional memory hypothesis, but they may be informative about its effects. Given the potential offsetting effects, if we were to find in our main tests that commercial loan growth increases as time passes since the bank's last bust, and we were to find that if we were to find that PREM declines as well, we would view this as evidence consistent with the institutional memory hypothesis. If we were to find in our main tests that $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$ increase, but PREM does not change significantly or perhaps even increases, we would view this as evidence consistent with the institutional memory hypothesis, but that management may be imposing higher rates as one of the blunt instruments for partially offsetting the decline in credit standards and compensating for the higher risks. If our main tests do not show increases in $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$ as time passes since the last bust, we would conclude that the data are not consistent with the institutional memory hypothesis, no matter what the PREM show.

Our third set of indicators of credit standards are taken from responses to the Federal Reserve's Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOS). The SLOS has asked a consistent set of questions about the credit standards of about 60 large commercial banks from around the U.S. since 1990:Q3.

⁹ The effect of the institutional memory hypothesis in reducing PREM may also be moderated by banks imposing "sticky" loan pricing policies in which loan rates do not vary much with aggregate interest rates or credit conditions (e.g., Stiglitz and Weiss 1981, King 1986, Berger and Udell 1992, Petersen and Rajan 1995, Berlin and Mester 1999).

These large banks account for over half of all domestic C&I lending (e.g., the 61 SLOS banks in 2000 made 54.22% of all domestic C&I lending).

The SLOS asks senior management whether over the prior three months the bank's credit standards on commercial and industrial (C&I) loans and credit lines (other than those used to finance mergers and acquisitions) 1) tightened considerably, 2) tightened somewhat, 3) remained basically unchanged, 4) eased somewhat, or 5) eased considerably (although no bank reported considerable easing). As shown in Table 1, we combine the two tightening categories and reverse the order to obtain a quarterly trinomial variable for each bank, $STANDARDS_{b,t}$, which equals 1 if bank b reports that it eased its credit standards in quarter t , 2 if standards remained basically unchanged, and 3 if standards were tightened.¹⁰

In addition, the SLOS asks about the spreads charged on these C&I loans and lines over the bank's cost of funds. We again combine the categories and obtain a quarterly trinomial variable for each bank, $SPREADS_{b,t}$, which equals 1 if bank b reports that it narrowed its spreads (eased its pricing standards) in quarter t , 2 if spreads remained basically unchanged, and 3 if spreads were widened (standards were tightened).

The $STANDARDS$ and $SPREADS$ variables are available quarterly from 1990:Q3 – 2000:Q4, and cover approximately one business cycle, rather than the approximately two cycles of the $CALL$ and $STBL$ data sets. The 42 quarters of data provide 2,338 bank-quarter observations, or an average of 55.67 banks per quarter. The SLOS sample also represents only large banks. Of these observations, 1,602 (68.52%) have assets over \$10 billion, 734 (31.39%) have assets between \$1 billion and \$10 billion, and only 2 (0.09%) have assets between \$100 million and \$1 billion.

The sample mean of $STANDARDS$ is 2.0453, with banks having reported easing credit standards slightly less often (5.30% of the time) than they reported tightening (9.84%), although the majority of the time (84.86%) the banks reported no change in standards. The sample mean of $SPREADS$ is 1.9196, with banks having reported easing or narrowing spreads slightly more often (26.43% of the time) than they reported easing or widening the spreads (18.39%), with no basic change in spreads most of the time (55.18%).

The institutional memory hypothesis predicts that individual loan officers ease their credit standards as time passes since the bank's last bust, but provides no direct prediction about intentional easing or tightening by

¹⁰ The credit standards are collected separately for credits to large and middle-market firms (annual sales of \$50 million or more) and small firms (sales of less than \$50 million). Since the responses are almost always the same (about 98% of the time), we simply use the responses for the credits to the former group.

the senior management of the bank to whom the questions are addressed. It is nonetheless informative to learn whether senior management acknowledges the changes in credit standards by its loan officers if the hypothesis is true. As discussed above, senior management may attempt to offset part of the easing of loan officer standards by imposing blunt policy instruments like higher premiums, tighter credit limits, or increased collateral requirements on observed classes of loans to compensate for the unobserved low-quality credits that may be included in these classes. This tightening could influence the responses to the STANDARDS and SPREADS questions. Similar to the PREM tests, we view our main test using $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$ as determining whether the data are consistent with the institutional memory hypothesis, and view the STANDARDS and SPREADS results as giving extra information about the attitude of management and whether they likely impose the blunt instruments to help offset some of the effects of the hypothesis.

4.3 The key exogenous variable – Time since the bank’s last bust

Our key exogenous variable – time since the bank’s last bust – is defined as the number of years since the bank’s portfolio was in its worst condition over the interval $[t-10,t]$, and may take values between 0 and 10, inclusive. This interval is longer than the longest aggregate expansion in the data set, giving enough time for most banks to have had at least one “learning experience.” Experiences that occurred more than 10 years prior are less likely to be relevant to the current set of loan officers.

As our main measure, we use $\text{TIME-ALLL}_{b,t}$, years since the ratio of the allowance for loan and lease losses to total loans (ALLL) was at its maximum over the $[t-10,t]$ time interval. For the CALL and STBL data sets, which cover the full 1980-2000 time interval, $\text{TIME-ALLL}_{b,t}$ has sample means of 4.9544 and 4.9800 years, respectively. For the SLOS sample, which only covers large banks over 1990:Q3 – 2000:Q4, the mean is 4.5522 years. There is also considerable dispersion in this variable both across time and across banks. For example, in the CALL data set, 17.80% of observations take the value 0 (i.e., this year is worse than any of the prior 10 years), 17.04% take the value 10 (i.e., this year and the prior 9 years are all better than 10 years ago), and nontrivial proportions take each value between 0 and 10 years (not shown in tables).

ALLL is arguably the best indicator of the status of problems in the loan portfolio. It measures problem loans at any given time and takes into account the severity of the problems. The point in time at which ALLL is at its maximum over the period is likely to give the best opportunity for a “learning experience” in which loan officers can connect ex post outcomes with their ex ante decisions. Importantly, ALLL is monitored by supervisors to be sure that banks have enough reserves to cover expected losses from their existing loans.

Examiners check the loan portfolio and require that banks raise their ALLL when it is not sufficient.¹¹ Because of reporting changes on the CALL, we measure TIME-ALLL with a slightly different definition over the years 1980-1985, although robustness checks shown below using only observations from 1986-2000 suggest that this is not a determining factor in our findings.¹²

A potential shortcoming of ALLL is that it captures only one dimension of a lending relationship's ex post outcome – expected future loan losses. Other dimensions of a problematic ex post outcome include the loss in profitability from other components of the bank-borrower relationship (e.g., fees on derivative products, cash management services, and capital market products) and the increased costs of loan officer and senior management time and other expenses related to the management of deteriorating credits (e.g., conducting on-site field examinations of borrower books and records), etc. To address this potential shortcoming, we use $\text{TIME-ROE}_{b,t}$ – years since the bank's return on equity was at its minimum over the $[t-10,t]$ interval – as an alternative measure in a robustness check. ROE captures the earnings losses from other components of the bank-borrower relationship and the increased costs of managing distressed credits, as well as the current provisions to ALLL. A drawback of ROE is that it also includes earnings that are unrelated to the loan portfolio.

4.4 The control variables

The control variables include measures of bank health, bank size and market concentration, and loan demand. For some of the loan premium regressions, we also include controls for other loan contract terms. In all cases, we include fixed effects for the individual banks, which account for average differences across banks not captured by the other exogenous variables. The bank fixed effects reduce correlations across error terms as well.

We also run the tests both with and without time fixed effects. As noted, time fixed effects make for quite stringent tests of the institutional memory hypothesis, by in effect removing the part of the bank's lending cycle

¹¹ Banks are required to hold reserves equal to at least 1% to 2% for unclassified and special mention loans, 15% for substandard, 50% for doubtful, 100% for loss.

¹² The CALL variable RIAD3123, allowance for loan and lease losses, is available on a consistent basis from 1976 through 2000 (except that leases are excluded prior to 1984), so this definition is used in the numerator of the ALLL measures to compute TIME-ALLL for the years 1986-2000. This variable cannot be used for construction of TIME-ALLL for 1980-1985 because of the need for 10 prior years of consistent data to determine the bank's last bust over the $[t-10,t]$ time interval. For 1970-1975, the closest variable is RIAD3120, reserve for bad debt losses on loans, which includes the allowance for loan losses plus other items. We come as close as possible to a consistent series that matches RIAD3120 over 1976-1983 by summing RIAD3123 with RIAD2936 and RIAD2937 (the latter two items measure deferred income taxes which are included in RIAD3120 for 1970-1975). For 1984 and 1985, RIAD2936 and RIAD2937 are not available, so we use the 1983 values for the same bank. These data manipulations apply only to TIME-ALLL, which requires lagged variables prior to 1976, and do not affect the ALLL variable used in the regressions as a measure of bank health.

that is correlated with the aggregate business cycle. The time fixed effects also in effect control for the other hypotheses of procyclicality to the extent that these other hypotheses are driven by or correlated with the aggregate business cycle or other overall economic conditions. In addition, the time fixed effects reduce serial correlation in the error terms.

The t-1 subscript on the control variables in equation (1) denotes that these variables are measured as of the prior period to minimize any unintentional feedback from the endogenous variables, and to ensure that the credit standards being measured in the dependent variables did not occur prior to the exogenous control variables. One exception discussed below is that the loan contract terms that are sometimes included are for the same loan at the same time. Most of the control variables are taken from the CALL and matched to the dependent variables for the appropriate data set, although the STBL and SLOS also provide some controls.

The bank health variables include both $ALLL_{b,t-1}$ and $ROE_{b,t-1}$, the levels of allocations for loan and lease losses and return on equity, as well as $EQUITY/GTA_{b,t-1}$, the bank's ratio of equity to gross total assets (GTA). Bank health is included because prior research has demonstrated that banks in poor financial condition reduce credit supply due to pressure from regulators and supervisors and other external stakeholders, as well as internal pressure to rebuild capital and avoid financial distress.

For bank size, we include the log of gross total assets, $LN(GTA)_{b,t-1}$, because banks may compete in somewhat different loan markets with different conditions as they change in size. We also include the weighted average Herfindahl index of market concentration across all the markets in which the bank competes, $HERFINDAHL_{b,t-1}$, to account for potential differences in market power.

It is particularly important to control for loan demand, both in terms of loan applicants of a given risk class demanding more or less credit, and in terms of applicants becoming riskier or safer, since a riskier borrower will be granted less credit or pay a higher $PREM_{b,t-1}$ even if there is no change in loan supply. We include state and national income growth, $ST-GROW_{b,t-1}$ and $GDP-GROW_{b,t-1}$, as higher income growth is likely to be associated with improved investment opportunities and greater demand for credit for a given risk and with reduced risk. The spread between Moody's BAA and AAA long-term bonds, $MOODY_{b,t-1}$, is an indicator of aggregate risk. The three-month Treasury rate, $RF3MO_{b,t-1}$, affects the demand for credit in conventional terms, and also may affect borrower risk through moral hazard and adverse selection effects (e.g., Stiglitz and Weiss 1981). When we include time fixed effects, we exclude the national demand variables $GDP-GROW$, $MOODY$, and $RF3MO$, since these are collinear with the time dummies.

For the SLOS data set, we also control for a measure of demand specific to the bank. Beginning in 1992:Q1, the SLOS asks whether the perceived demand for C&I loans over the prior three months was 1) substantially stronger, ..., 5) substantially weaker. We use the responses to form three control variables, SLOS-Own Demand $_{j,b,t-1}$, where $j=1, 2, 3$ correspond to weaker, unchanged, and stronger demand, respectively, over the prior quarter, with SLOS-Own Demand1 excluded from the SLOS regressions as the base case. In some cases, the Own Demand variables are missing from the SLOS data set because the observation occurs during 1990:Q3 – 1991:Q4 (before the Own Demand series began) or because the bank answered about its STANDARDS and SPREADS but did not respond to the Own Demand question. We indicate these cases with the SLOS-Missing Own Demand dummy variable and set the other SLOS-Own Demand variables to zero.

For the CALL, STBL, and SLOS data sets we also form three control variables for aggregate loan demand changing from the prior year, SLOS-Aggregate Demand $_{j,t-1}$, $j=1, 2, 3$, in ascending order from weaker to stronger demand (again excluding the first variable for weak demand from the regressions as the base case). These variables represent the proportions of banks facing on average stronger, similar, or weaker demand over the four prior quarters, starting with the first quarter of the current year. These SLOS demand variables are set equal to zero for observations prior to 1992, when there was no information available on demand from the SLOS. To neutralize the average effect of these missing observations, we also include in all the regressions the SLOS-Missing Agg. Demand dummy, which equals 1 for all of the observations with no SLOS aggregate demand variables.¹³ As above, when we include time fixed effects, we exclude all the SLOS aggregate demand variables as collinear with the time effects.

As additional control variables in the PREM regressions only, we include other loan contract terms for whether collateral is pledged, whether the loan is drawn under a commitment, the repayment duration of the loan, whether the rate is floating, and the total size of the credit (including the entire commitment, if any), COLLATERAL $_{i,b,t}$, COMMITMENT $_{i,b,t}$, DURATION $_{i,b,t}$, FLOATING RATE $_{i,b,t}$, and TOTAL CREDIT SIZE $_{i,b,t}$, respectively, for loan i issued by bank b at time t . These other terms help control for the risks, costs, borrower type, etc. However, to some extent, these terms are also endogenous and may change with the credit standards of the bank, so we run the PREM regressions with and without these controls.

5. Empirical results

¹³ Similar to the credit standards, the demand variables are collected separately for credits to large and middle-market firms and small firms, and we simply use the responses for the former group.

5.1 Loan growth test results

Table 2 displays the results of the main tests of the institutional memory hypothesis employing loan growth, $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$, to indicate bank credit standards using the CALL data set for the full sample from 1980-2000. The first two columns display the tests including both the bank and time fixed effects, and the last two columns show these tests with the bank fixed effects only. The control variables are identical except that the aggregate loan demand variables that do not vary in the cross section are excluded when the time fixed effects are included to avoid perfect collinearity.

The coefficients on the TIME-ALLL variable are positive and statistically significant at the 1% level in all four cases in Table 2, consistent with the implication of the institutional memory hypothesis that credit standards ease and more loans are issued as time passes since a bank's last bust. These figures of between 0.0024 and 0.0058 are large in magnitude as well as statistically significant. For example, the coefficient of 0.0053 predicts that for an additional year since a bank's ALLL was at a maximum over the $[t-10,t]$ interval, its domestic C&I loan growth would be 0.53 percentage points higher. Thus, after 5 years of a sustained boom – approximately the sample average of TIME-ALLL – the expected annual loan growth would be 2.65 percentage points higher, which is substantial relative to the mean value for $\Delta\text{LOANS-C\&I}$ of 6.52%.

As shown in Table 3, we rerun the regressions for a number of different subsamples of the data. The table shows only the estimated coefficients and t-statistics for the key exogenous variable TIME-ALLL, but the same control variables are included. The test results are robust across all of the subsamples. As shown, the loan growth results are statistically significant and large in magnitude for the three time subsamples. The 1980-1989 and 1990-2000 subsamples roughly correspond to the two aggregate business cycles covered by our data set, and the 1986-2000 subperiod avoids the slight change in definition of TIME-ALLL due to reporting changes on the Call Report, as discussed above. These data suggest that the institutional memory hypothesis holds for both business cycles and that our test findings were not driven by the slight change in variable definition.

Table 3 also shows the test results when the model is rerun for each of four bank size classes separately, gross total assets (GTA) under \$100 million, \$100 million to \$1 billion, \$1 billion to \$10 billion, and over \$10 billion. As discussed above, the institutional memory hypothesis could apply with greater force to either small or large banks. As shown in Table 3, the test results are again robust – the coefficients of TIME-ALLL are statistically significant and large in magnitude for banks of all size classes for both C&I and commercial real estate loan growth.

We also try trimming the CALL data set down to only banks in the STBL data set. In addition, we try including only non-merging banks – banks that have not engaged in mergers over the entire $[t-10,t]$ time interval. Neither of these sample selection issues appears to matter – the results are statistically significant and of substantial magnitude for these subsamples as well.

The loan growth results were also robust with respect to a number of other changes in specification not shown in the tables. As noted above, the institutional memory hypothesis may apply to any category of lending, so we also tried alternative dependent variables, replacing $\Delta\text{LOANS-C\&I}$ and $\Delta\text{LOANS-CRE}$ with the growth of total loans, consumer loans, and other loans. We also tried alternative specifications of the key exogenous variable, replacing TIME-ALLL with the time since ROE was at its minimum over the $[t-10,t]$ interval and with the time since net loan loss provisions (the flow into ALLL) was at its maximum over the interval. In all of these cases, the results were statistically significant and large in magnitude.

For the most part, the control variables in the loan growth regressions shown in Table 2 have the expected signs and are statistically significant. As expected, healthier banks, larger banks, and banks in growing states tend to lend more, all else equal. Some of the aggregate demand variables have conflicting signs, but this may be due to putting in so many similar measures as well as including the bank fixed effects.

5.2 Loan rate premium test results

Table 4 shows the loan rate premium tests using the STBL data set for the full sample from 1980-2000. The regressions in the first two columns show the PREM tests including both the bank and time fixed effects, and the last two columns show the tests with the bank fixed effects only. The regressions are also run both with and without the other loan contract terms as control variables because of potential endogeneity.

The coefficients on TIME-ALLL are negative and statistically significant in three cases and positive and statistically significant in the fourth case, but none of these coefficients are economically different from zero. The coefficients of between -0.00005 and 0.00003 predict that for an additional year since the bank's ALLL were at a maximum over the $[t-10,t]$ interval, PREM would be between about 0.005 percentage points ($\frac{1}{2}$ of 1 basis point) lower and 0.003 percentage points ($\frac{1}{3}$ of 1 basis point) higher. Thus, after 5 years of a sustained boom the expected PREM would be between 0.025 percentage points (2.5 basis points) lower and 0.015 percentage points (1.5 basis points) higher, which is fairly small relative to the mean value for PREM of 3.89% (389 basis points).

However, this finding of no substantial effect of the time since the bank's last bust on PREM does **not** hold for all sizes of banks. Table 5 shows the PREM regressions for various subsamples. For the two smallest

size classes (banks with GTA below \$1 billion), all eight coefficients on TIME-ALLL are statistically significant and negative, and most of the magnitudes are much larger than for the main results and for most of the other subsamples. For example, the coefficients of -0.00048 and -0.00050 for the smallest bank size class using the bank-fixed-effects-only specification predict that for each additional year since the bank's ALLL were at a maximum over [t-10,t], PREM would be about 0.050 percentage points (5 basis points) lower. After 5 years of a sustained boom, the expected PREM would be about 0.250 percentage points (25 basis points) lower, which is substantial in magnitude. Again, the results in the PREM tests are robust to replacing TIME-ALLL with the times since ROE was at its minimum and net loan loss provisions were at their maximum over the [t-10,t] interval.

In contrast, the finding of essentially a zero effect of the time since the bank's last bust on commercial loan prices holds for the large bank size classes (GTA above \$1 billion). This finding also holds for the time subsamples, holds for different credit size classes of loans (less than \$100,000, \$100,000 to \$1 million, over \$1 million), and holds for non-merging banks. Presumably, the findings for the full sample and the findings for these other subsamples are due to the fact that the banks in the large size classes dominate the data sets. As shown in Table 5, more than two million of the observed loan premiums are from banks with over \$1 billion in GTA, and less than 200,000 are from banks with under \$1 billion in GTA. Consistent with this presumption, when the time subsamples, credit size classes, and non-merging bank subsamples are re-run using data only for banks with GTA under \$1 billion, the measured effects are negative and larger in magnitude than for the full sample (not shown).

As discussed above, the PREM tests are not direct tests of the institutional memory hypothesis, but they may nonetheless be informative. For small banks (below \$1 billion in GTA), the finding that PREM declines as time passes since the bank's last bust, given the earlier results that loan growth also increased, is consistent with the institutional memory hypothesis. For large banks (above \$1 billion in GTA), the finding of no effect could reflect that the institutional memory hypothesis has no effect on loan pricing or could reflect that the pricing effects of the hypothesis are offset by management imposing higher rates on observable risk classes to compensate for likely inclusion of low-quality credits.

5.3 SLOS STANDARDS and SPREADS test results

Table 6 shows the results of the STANDARDS and SPREADS tests using the SLOS data set, which primarily covers large banks during 1990-2000. These equations are run as ordered trinomial logit estimations – eased, basically unchanged, or tightened for STANDARDS and narrowed, basically unchanged, and widened for SPREADS. The arrangement of the data is such that a negative coefficient on TIME-ALLL indicates easing

standards or narrowing spreads as time passes since the bank's last bust. The first two columns show the STANDARDS test results with and without the time fixed effects, and the last two columns show corresponding tests for the SPREADS variable.

None of the four coefficients on TIME-ALLL in Table 6 suggest that the management of the large institutions responding to the SLOS intentionally eased standards as time passed since the bank's last bust. Three of the four coefficients are not statistically significantly different from zero and the one that is statistically significant – SLOS SPREADS with bank fixed effects only – is positive, rather than negative. As discussed above, the institutional memory hypothesis is about the behavior of the individual loan officers, rather than the intentions of senior management. Given our finding above of a significant increase in commercial lending, the finding of no reported easing of standards or narrowing of spreads by senior management may imply that the changes in standards are not intentional on the part of senior management or that the management is actively trying to offset the easing of standards, perhaps using one or more of the blunt policies described above.

6. Conclusions

We test a new hypothesis that may explain in part why bank lending behavior follows a strong procyclical pattern. The institutional memory hypothesis is driven by deterioration in the skills of loan officers over their bank's lending cycle. Under the hypothesis, as time passes since the last significant "learning experience" with problem loans – the last time that the bank suffered a loan "bust" – loan officer skills decline. Part of this decline may be due to an increase in the fraction of new officers who have never had such a learning experience, and part may be due to the atrophying skills of experienced loan officers as time passes since they last addressed significant loan problems.

Under the hypothesis, the deterioration in loan officer skills results in an easing of credit standards and lending to low-quality borrowers that would otherwise be rejected, as officers become less able to recognize potential loan problems and less able to differentiate low-quality borrowers from high-quality borrowers. The institutional memory problem and its effects on credit standards may be exacerbated by agency problems between loan officers and management and between management and external stakeholders (capital market participants, government regulators) that also worsen as time passes since the bank's last bust due to the lack of observed problem loans, although the hypothesis may hold in the absence of these agency problems. It may be optimal for management and external stakeholders to accommodate the easing of credit standards because the imposition of blunt instruments to ration credit to low-quality borrowers with negative NPV loans may also ration some positive

NPV new loans and destroy some positive NPV bank-borrower relationships. Thus, it may be a value-maximizing strategy over the long run to wait until the next bust when they can sort out the good officers from the bad officers, even though it involves the extension of some negative NPV loans in the short run. Although the institutional memory hypothesis is based on a bank's own loan performance problems, it nonetheless may help explain the stylized facts about the procyclicality of bank lending behavior over the aggregate business cycle because problem loans are highly correlated with the aggregate cycle.

We test the institutional memory hypothesis using data from individual U.S. banks over the interval 1980-2000, drawing data from several different sources. The main testable prediction of the hypothesis is that credit standards ease as time passes since the bank's last bust. Our main tests whether a bank's commercial and industrial lending and commercial real estate lending increase as time passes since the bank's last loan bust, controlling for other demand and supply factors using data from individual bank Call Reports. The last loan bust is measured as the point in time at which the ratio of the allowance for loan and lease losses to total loans was at its maximum over an interval that includes the current year and the prior 10 years. We find that the coefficient on this variable is positive, statistically significant, and large in magnitude for the growth of both types of commercial loans, consistent with the institutional memory hypothesis.

Running the tests for various subsamples of the data show that the main findings hold for the business cycles of both the 1980s and the 1990s, and also hold for all size classes of banks, ranging from less than \$100 million in assets to over \$10 billion in assets. Over both decades, and for institutions of all sizes, banks are found to increase their commercial loan growth as time passes since their last bust, controlling for other demand and supply factors. The findings are robust as well with respect to the exclusion of banks engaging in mergers, to the specification of additional loan categories, and to alternative specifications of the key exogenous variable.

Our main findings are also robust to the inclusion of both bank fixed effects and time fixed effects. The time fixed effects make the tests quite stringent because these effects control for the aggregate business cycle and other factors that change systematically over time. The time fixed effects also control for the effects of other hypotheses of procyclicality to the extent that these other hypotheses are driven by, or are correlated with, the aggregate cycle or other systematic factors.

The findings with regard to loan pricing, however, differ by size of bank. Using the Federal Reserve's Survey of Terms of Bank Lending, we find evidence that small banks (assets under \$1 billion) reduce their loan interest rate premiums by a substantial magnitude as time passes since their last bust. Although this is not a direct

test of the institutional memory hypothesis, it is nonetheless consistent with the hypothesis. The finding that premiums decline as loan growth increases for small banks is consistent with the implication of the hypothesis that the loan officers in these banks may be less able to recognize potential loan problems and place some low-quality borrowers in high-quality risk pools with lower premiums as time passes since their last bust.

Large banks, in contrast, exhibit essentially no change in loan premiums as time passes since their last bust. This finding could reflect that the institutional memory hypothesis does not significantly affect loan pricing for large banks or that the management of these banks may implement pricing policies to compensate for some of the pooling of unobserved low-quality credits with high-quality credits due to the institutional memory problem. Consistent with this interpretation, we also find that large banks that responded to the Federal Reserve's Senior Loan Officer Opinion Survey showed no evidence that the senior management of these institutions intentionally eased standards or narrowed loan spreads as time passed since the bank's last bust. The difference in loan pricing results between large and small banks may also be due to the different types of credit issued by these banks, to the different organizational structures of these banks, or to other factors.

Thus, the evidence suggests that the loan officers of banks of all size classes ease their credit standards over their bank's lending cycle in terms of increased commercial loan growth in accordance with the institutional memory hypothesis. However, the senior management of large institutions may recognize this dynamic and compensate to some degree by imposing higher rates or putting other restrictions on observed risk classes of loans.

Overall, our findings suggest that the institutional memory problem may significantly affect bank credit standards and their supply of commercial credit. These findings have several potential policy implications. They suggest the possibility that regulatory capital requirements and supervisory scrutiny might be made more countercyclical than they otherwise would be to compensate for the unobserved changes in problem loans driven by the loss of institutional memory. Other theories of procyclicality that may operate concomitantly with the institutional memory hypothesis – over-optimism, loan seasoning, herding, and the credit crunch hypotheses – also emphasize the potential benefits from countercyclical regulatory and supervisory responses. Our findings suggest in addition that supervisors might act to counter an individual bank's lending cycle by becoming tougher when significant time has passed since the bank experienced its own last bout of performance problems.

Our findings may also suggest how bank managers and government supervisors might adjust the way they monitor bank loan portfolios. For example, banks might groom junior officers by exposing them to more loan work-outs early in their careers than they otherwise would to improve their learning experiences. As well, banks

might allocate more seasoned officers than they otherwise would to loans that have not shown problems for a sustained period to look for more subtle indicators of future difficulties. Similarly, supervisors might expose junior examiners to banks with problem loans more than they otherwise would and assign more seasoned examiners than they otherwise would to banks that have not shown problems for a sustained period.

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Table 1: Variable Definitions and Summary Statistics. Table 1 contains definitions and summary statistics for all variables used in estimation. The variables used in the loan growth regressions represent bank-year observations and appear in column 1. Summary statistics for Δ LOANS-C&I and Δ LOANS-CRE exclude observations in their respective 1st and 99th percentiles (N=203,243), whereas sample statistics for all other variables in Column 1 include all observations (N=207,390). The variables used in the loan premium regressions represent individual loan observations and appear in column 2. The variables used in the loan standards and spread regressions are bank-quarter observations and appear in column 3. All financial variables are expressed in real 1994 dollars, using the GDP deflator.

Variables	Definitions	Column 1 Call Report (CALL) 1980-2000 (n=207,390)	Column 2 Survey of Terms of Bank Lending (STBL) 1980-2000 (n=2,296,906)	Column 3 Senior Loan Officer Survey (SLOS) 1990:Q3- 2000:Q4 (n=2,338)
Dependent Variables				
Δ LOANS-C&I	Annual proportional change in domestic C&I lending. Loan growth is merger adjusted, so that any change in lending due to the effects of adding two or more balance sheets is removed.	0.0652 (0.3354)		
Δ LOANS-CRE	Annual proportional change in domestic commercial real estate lending. Loan growth is merger adjusted, so that any change in lending due to the effects of adding two or more balance sheets together is removed.	0.1100 (0.3885)		
PREM	Bank premium over the Treasury rate of comparable duration. For fixed-rate loans, we use a Treasury security with duration equal to that of the loan. For floating-rate loans, we assume that the loans are expected to be repriced within 4 weeks and use the Treasury rate with duration equal to the minimum of the loans' durations and 4 weeks.		0.0389 (0.0180)	
STANDARDS	Quarterly trinomial variable based on the Senior Loan Officer Survey (SLOS): 1 indicates the bank reports that it eased its credit standards, 2 indicates the bank's credit standards remained basically unchanged, and 3 indicates the bank's credit standards tightened.			2.0453 (0.3865)
SPREADS	Quarterly trinomial variable based on the Senior Loan Officer Survey (SLOS): 1 indicates the bank reports that its spreads narrowed, 2 indicates the bank's spreads remained basically unchanged, and 3 indicates the bank's spreads widened.			1.9196 (0.6648)
Institutional Memory and Bank Health Variables				
ALLL	Allowance for loan and lease losses / total loans.	0.0147 (0.0106)	0.0182 (0.0109)	0.0223 (0.0128)
TIME-ALLL	Time since the bank's last bust as measured by years since ALLL was at its maximum over the prior 10 years. Definition changes slightly over time (see note in text).	4.9544 (3.6815)	4.9800 (3.6732)	4.5522 (3.0845)
ROE	Bank's return on equity.	0.0988 (0.2583)	0.1210 (0.2038)	0.1339 (0.1500)
EQUITY / GTA	Bank's equity / gross total assets (GTA) ratio	0.0888 (0.0287)	0.0672 (0.0205)	0.0703 (0.0166)

Table 1 Continued: Variable Definitions and Summary Statistics			
	Column 1 (CALL)	Column 2 (STBL)	Column 3 (SLOS)
Bank Size and Market Concentration Variables			
LN(GTA)	11.0879 (1.2581)	16.0251 (1.6157)	16.6333 (1.1098)
HERFINDAHL	0.2072 (0.1544)	0.1270 (0.0655)	0.1138 (0.0501)
Loan Demand Variables			
ST-GROW	0.0281 (0.0259)	0.0332 (0.0215)	0.0312 (0.0243)
GDP-GROW	0.0292 (0.0202)	0.0314 (0.0182)	0.0339 (0.0188)
MOODY	1.1842 (0.4613)	1.0721 (0.4343)	0.7688 (0.1418)
RF3MO	7.6299 (3.0346)	6.9841 (2.8016)	4.9385 (1.0767)
SLOS-Own Demand1			0.0971 (0.2961)
SLOS-Own Demand2			0.4530 (0.4979)
SLOS-Own Demand3			0.1523 (0.3594)
SLOS-Missing Own Demand			0.2977 (0.4573)
SLOS-Aggregate Demand 1	0.0753 (0.1182)	0.1006 (0.1235)	0.1819 (0.1168)
SLOS-Aggregate Demand 2	0.1646 (0.2302)	0.2061 (0.2293)	0.3932 (0.1844)
SLOS-Aggregate Demand 3	0.1159 (0.1810)	0.1673 (0.2022)	0.2889 (0.1808)
SLOS-Missing Agg. Demand	0.6441 (0.4788)	0.5259 (0.4993)	0.1360 (0.3429)
Loan Contract Terms (STBL dataset only)			
COLLATERAL		0.6953 (0.4603)	
COMMITMENT		0.7395 (0.4389)	
DURATION		0.7345 (1.0954)	
FLOATING RATE		0.8185 (0.3854)	
TOTAL CREDIT SIZE		6.0560 (2.5111)	

Table 2: Loan Growth Tests, Full Sample, 1980-2000.

OLS Regressions for $\Delta LOANS-C\&I$, the annual proportional change in C&I lending from the previous year, and $\Delta LOANS-CRE$, the annual proportional change in commercial real estate lending from the last year. Data are taken for 1980-2000. Variables represent bank-year observations. Number of observations is 203,243. Regressions include bank and time fixed effects as indicated (fixed effects not shown). Significance at the 10%, 5%, and 1% levels denoted by *, **, and *** respectively.

Specification Includes: Dependent Variable:	Bank and Time Fixed Effects			Bank Fixed Effects Only		
	$\Delta LOANS-C\&I$	$\Delta LOANS-CRE$		$\Delta LOANS-C\&I$	$\Delta LOANS-CRE$	
Variable:	Coefficient	T-Stat	Coefficient	T-Stat	Coefficient	T-Stat
TIME-ALLL	0.0053 ***	20.96	0.0030 ***	10.29	0.0058 ***	23.49
ALLL	-0.2893 ***	-2.75	-1.0521 ***	-8.71	-0.3785 ***	-3.64
ROE	0.0533 ***	15.99	0.0195 ***	5.11	0.0546 ***	16.37
EQUITY / GTA	0.7431 ***	15.69	0.4360 ***	8.05	0.7772 ***	16.55
LN(GTA)	0.0296 ***	10.40	0.0432 ***	13.26	0.0284 ***	10.48
HERFINDAHL	0.0751 ***	4.12	0.0847 ***	4.02	0.1581 ***	9.04
ST-GROW	1.0036 ***	24.67	1.2623 ***	26.82	0.5194 ***	14.34
GDP-GROW					-0.2848 ***	-5.96
MOODY					0.0561 ***	18.86
RF3MO					-0.0006 ***	-1.25
SLOS-Aggregate Demand 2					0.1604 ***	9.04
SLOS Aggregate Demand 3					0.2745 ***	22.24
SLOS-Missing Agg. Demand					0.1037 ***	8.92
Adjusted R-Squared	0.028		0.0300		0.0231	
N	203,243		203,243		203,243	

Table 3: Loan Growth Tests, Various Subsamples

Table 3 reports coefficients and t-statistics for TIME-ALLL in OLS regressions for Δ LOANS-C&I, the annual proportional change in C&I lending from the previous year, and Δ LOANS-CRE, the annual proportional change in commercial real estate lending from the previous year. As in Table 1, the regressions control for bank health (ALLL, ROE, and EQUITY/GTA), bank size and concentration (LN(GTA) and HERFINDAHL), and loan demand (ST-GROW, GDP-GROW, MOODY, RF3M0, SLOS-Aggregate Demand 2, SLOS-Aggregate Demand 3, and SLOS-Missing Agg. Demand). The regressions also include bank and time fixed effects as indicated. Number of observations vary across regressions. Bank size subsamples are determined by GTA in real 1994 dollars. The non-merging banks subsample excludes banks that survived a merger during the previous ten years. Significance at the 10%, 5%, and 1% levels denoted by *, **, and *** respectively.

Specification Includes: Dependent Variable:	Bank and Time Fixed Effects			Bank Fixed Effects Only			
	Δ LOANS-C&I Coefficient	T-Stat	Δ LOANS-CRE Coefficient	Δ LOANS-C&I Coefficient	T-Stat	Δ LOANS-CRE Coefficient	T-Stat
Time Subsamples							
1980-1989 (N=111,216)	0.0054***	14.76	0.0029***	0.0060***	16.99	0.0025***	5.73
1990-2000 (N=89,156)	0.0039***	8.45	0.0045***	0.0037***	8.23	0.0046***	9.89
1986-2000 (N=134,278)	0.0062***	18.54	0.0044***	0.0064***	19.29	0.0046***	12.27
Bank Size Subsamples							
Banks, $GTA < \$100M$ (N=141,529)	0.0046***	14.10	0.0023***	0.0051***	15.84	0.0018***	4.92
Banks, $\$100M < GTA < \$1B$ (N=54,748)	0.0059***	14.02	0.0046***	0.0065***	16.10	0.0038***	8.11
Banks, $\$1B < GTA < \$10B$ (N=5,914)	0.0072***	7.00	0.0044***	0.0076***	7.73	0.0034***	2.65
Banks, $\$10B < GTA$ (N=1,052)	0.0055***	2.90	0.0068**	0.0043**	2.39	0.0071**	2.42
Other Subsamples							
Banks in the STBL (N=6,339)	0.0067***	6.33	0.0061***	0.0065***	6.37	0.0042***	3.17
Non-Merging Banks (N=181,222)	0.0053***	19.17	0.0032***	0.0058***	21.49	0.0027***	8.63

Table 4: Loan Premium Tests, Full Sample, 1980-2000.

OLS Regressions for PREM, the premium over the Treasury rate of comparable duration. Data are taken for 1980-2000. Variables represent individual loan observations. Number of observations is 2,296,906. Regressions include Q2, Q3, and Q4, which indicate the quarter in which the loan was made, in addition to bank and time fixed effects as indicated (fixed effects not shown). Significance at the 10%, 5%, and 1% levels denoted by *, **, and *** respectively.

Specification Includes:	Bank and Time Fixed Effects		Bank Fixed Effects Only	
	Contract Terms	No Contract Terms	Contract Terms	No Contract Terms
Variable:	Coefficient	Coefficient	Coefficient	Coefficient
TIME-ALLL	-0.00005 ***	-0.00003 ***	-0.00003 ***	0.00003 ***
ALLL	0.0098 ***	0.0328 ***	0.0130 ***	0.0271 ***
ROE	-0.0002 ***	-0.0004 ***	-0.0001 *	-0.0002 ***
EQUITY / GTA	0.0055 ***	0.0181 ***	-0.0048 ***	-0.0054 ***
LN(GTA)	-0.0002 ***	0.0006 ***	-0.0006 ***	-0.0005 ***
HERFINDAHL	-0.0099 ***	-0.0031 ***	-0.0052 ***	0.0051 ***
ST-GROW	-0.0328 ***	-0.0333 ***	-0.0306 ***	-0.0285 ***
GDP-GROW			-0.0479 ***	-0.0648 ***
MOODY			-0.0066 ***	-0.0071 ***
RF3MO			0.0017 ***	0.0019 ***
SLOS-Aggregate Demand 2			0.0089 ***	0.0100 ***
SLOS Aggregate Demand 3			0.0116 ***	0.0096 ***
SLOS-Missing Agg. Demand			0.0060 ***	0.0077 ***
COLLATERAL	0.00375 ***		0.00368 ***	155.09
COMMITMENT	0.00377 ***		0.00386 ***	117.09
DURATION	-0.00342 ***		-0.00349 ***	-353.58
FLOATING RATE	0.00422 ***		0.00416 ***	137.27
TOTAL SIZE	-0.00272 ***		-0.00286 ***	-507.93
Adjusted R-Squared	0.2441	0.0931	0.2089	0.0443
N	2,296,906	2,296,906	2,296,906	2,296,906

Table 5: Loan Premium Tests, Various Subsamples

Table 5 reports coefficients and t-statistics for TIME-ALLL and TIME-ROE in OLS regressions for PREM, the premium over the Treasury rate of comparable duration. As in Table 4, the regressions control for bank health (ALLL, ROE, and EQUITY/GTA), bank size and concentration (LN(GTA) and HERFINDAHL), loan demand (ST-GROW, GDP-GROW, MOODY, RF3M0, SLOS-Aggregate Demand 2, SLOS-Aggregate Demand 3, and SLOS-Missing Agg. Demand), and the quarter in which the loan was made (Q2, Q3, and Q4), in addition to bank and time fixed effects as indicated. Results are shown including and excluding loan contract terms. Number of observations vary across regressions. Bank size and loan size subsamples are determined by GTA and TOTAL CREDIT SIZE, respectively, in real 1994 dollars. The non-merging bank subsample excludes banks that survived a merger during the previous ten years. Significance at the 10%, 5%, and 1% levels denoted by *, **, and *** respectively.

Specification Includes:	Bank and Time Fixed Effects			Bank Fixed Effects Only		
	Contract Terms	No Contract Terms	T-Stat	Contract Terms	No Contract Terms	T-Stat
Time Subsamples						
1980-1989 (N= 984,680)	-0.00001 *	0.00001 *	1.81	-0.00017 ***	-0.00012 ***	-16.92
1990-2000 (N=1,312,226)	-0.00007 ***	-0.00004 ***	-6.29	-0.00014 ***	-0.00014 ***	-21.30
1986-2000 (N=1,753,558)	-0.00007 ***	-0.00006 ***	-13.26	-0.00009 ***	-0.00011 ***	-21.81
Bank Size Subsamples						
Banks, GTA<\$100M (N=23,836)	-0.00024 ***	-0.00026 ***	-4.98	-0.00048 ***	-0.00050 ***	-9.46
Banks, \$100M<GTA<\$1B (N=175,611)	-0.00014 ***	-0.00013 ***	-7.12	-0.00026 ***	-0.00024 ***	-13.87
Banks, \$1B<GTA<\$10B (N=1,015,788)	-0.00005 ***	-0.00001	-1.08	-0.00004 ***	0.00003 ***	3.93
Banks, \$10B<GTA (N=1,081,671)	0.00001 *	-0.00002 **	-2.21	0.00007 ***	0.00011 ***	14.89
Credit Size Subsamples						
Total Credit Size<\$100K (N=724,211)	0.00002 *	0.00003 ***	2.71	-0.00006 ***	-0.00003 ***	-3.77
\$100K<Total Credit Size<\$1M (N=612,585)	-0.00005 ***	-0.00007 ***	-9.85	0.00008 ***	0.00004 ***	5.20
\$1M<Total Credit Size (N=960,110)	-0.00006 ***	-0.00009 ***	-15.46	-0.00004 ***	-0.00008 ***	-14.75
Other Subsamples						
Non-Merging Banks (N=634,005)	0.00000	0.00005 ***	4.24	-0.00009 ***	0.00000	0.01

Table 6: Senior Loan Officer Survey Credit Standards and Spreads Tests, 1990-2000.

Ordered logit regressions for STANDARDS, which equals 1 if the bank's credit standards eased, 2 if the bank's credit standards remained basically unchanged, and 3 if the bank's credit standards tightened, and SPREADS, which equals 1 if the bank's lending terms eased, 2 if the bank's lending terms remained basically unchanged, and 3 if the bank's lending terms tightened. Data are taken for 1990:Q3-2000:Q4. Number of observations is 2,338. Regressions include Q2, Q3, and Q4, which indicate the quarter in which the loan was made, in addition to bank and time fixed effects (fixed effects not shown). Significance at the 10%, 5%, and 1% levels denoted by *, **, and *** respectively.

Dependent Variable:	SLOS STANDARDS				SLOS SPREADS			
	Bank and Time Fixed Effects		Bank Fixed Effects Only		Bank and Time Fixed Effects		Bank Fixed Effects Only	
Variable:	Coefficient	T-Stat	Coefficient	T-Stat	Coefficient	T-Stat	Coefficient	T-Stat
INTERCEPT1	-1.7942	-0.42	-14.0256***	-3.22	-2.2515	-0.74	-14.3818***	-4.56
INTERCEPT2	5.1225	1.20	-7.2762*	-1.67	1.3783	0.46	-10.8897***	-3.46
TIME-ALLL	-0.0369	-0.92	0.0249	0.65	0.0117	0.41	0.0905***	3.32
ALLL	-28.5907***	-2.80	-27.9593***	-2.76	4.7866	0.68	4.3013	0.62
ROE	-1.0534**	-2.18	-1.0785**	-2.24	-0.0181	-0.05	-0.0677	-0.17
EQUITY / GTA	-8.7794	-1.18	-0.3363	-0.05	-3.6970	-0.75	5.0979	1.07
LN(GTA)	0.1374	0.55	0.7917***	3.72	0.1863	1.04	1.0407***	6.76
HERFINDAHL	1.5845	0.34	9.7400**	2.21	-12.4209	-3.61	-1.3305	-0.42
ST-GROW	1.4454	0.22	-9.0446**	-2.32	6.2677	1.45	-1.4260	-0.58
GDP-GROW			-21.0482**	-2.26			-38.8949***	-6.21
MOODY			0.3287	0.24			2.3486**	2.56
RF3MO			0.7317***	6.30			0.3588***	4.42
SLOS-Own Demand 2	-0.0731	-0.30	-0.1625	-0.66	0.0090	0.05	-0.1226	-0.74
SLOS-Own Demand 3	-0.1835	-0.64	-0.3079	-1.08	-0.0740	-0.38	-0.2862	-1.49
SLOS-Missing Own Demand	-0.3119	-1.04	-0.5432*	-1.86	-0.2697	-1.38	-0.5289***	-2.76
SLOS-Aggregate Demand 2			-7.0091***	-3.29			-10.7427***	-7.44
SLOS Aggregate Demand 3			-7.1152***	-3.71			-7.0167***	-5.68
SLOS-Missing Agg. Demand			-4.9944***	-2.86			-7.1276***	-6.08
N	2,338		2,338		2,338		2,338	