Are the Major Japanese Banks Uniform or Unique?

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I. Motivation

Kashyap (2002) reports that while the Japanese public and regulators may not admit it, the major Japanese banks as a group are bankrupt.[1] He claims that the bad loans of major banks exceed their capital.[2] This may not be readily apparent because Japanese banks underreport their non-performing loans and they under reserve for their acknowledged bad loans. According to Hoshi and Kashyap (1999) the return on assets of Japanese city banks declined from 1955 through 1997, and the decline increased in the 1990s. Smith (2003) shows that the increased decline is due to increased bad loans. He decomposes Japanese banks' profits into core earnings; net gains on security holdings and sales; and loan loss expenses from provisions and direct write-offs. Core earnings were relatively constant over the years 1982 through 2001 and gains on securities fluctuated between positive and negative while averaging about zero. From 1982 through

[1] Since the major banks had and continue to have positive stock prices Kashyap's comment refers to their book values not their market values, which include the value of intangible assets.

[2] Kashyap (2002) bases his conclusion on capital and loan loss estimates prepared in 2001 and 2002 by analysts from Goldman Sachs, Morgan Stanley, ING Securities, Credit Suisse First Boston, Lehman Brothers and Fitch Ratings. Their estimates of net loan losses in 2002 for the major banks average ¥21 trillion. This is similar to an official estimate of non-performing loans at major banks in 2002 of ¥20 trillion. See Figure 2-2-1 in *Annual Report on the Japanese Economy and Public Finance 2003*, October 2003, Cabinet Office, Government of Japan. http://www5.cao.go.jp/keizai/index-e.html

1990 loan losses were relatively small and banks had positive profits. Beginning in 1991 loan losses increased and cumulative bank profits were negative from 1995 through 2001.[3]

The poor performance of Japanese banks is also reflected in comparisons with other banks around the world. 42 of the 250 largest banks in the world according to 1998 total assets in BankScope's data set are Japanese. Among these banks, the average ratio of impaired loans/gross loans is 6.72 for the Japanese banks and 4.52 for all of the others. ROA is –0.73% for the Japanese banks, 0.47 for the others. In *The Banker's* July 2000 list of the 1000 largest banks in the world, 18 of the 100 largest banks in the world ranked by assets are Japanese. However, there are no Japanese banks among the 100 most profitable measured in terms of return on assets, and 26 of the approximately 150 banks with NPL/Loans above 5.00% are Japanese.

Smith (2003), Hoshi and Kashyap (1999), Hayashi and Prescott (2002), and Barseghyan (2003) provide explanations for the poor performance which include a weak economy, lax or delayed regulatory intervention, and management incentives. All of these explanations treat the Japanese banks uniformly. This makes sense with respect to the economy, but the banks could differ with respect regulatory treatment or incentives.

In this paper we use banking theory to try to understand the loan loss provisioning and write-off behavior of Japanese banks during Japan's economic slow growth period that began in 1992.[4] We focus on loan loss provisions and write-offs because much of

[3] Official government data show that major banks' disposals of non-performing loans also exceeded their core operating profit in 2002. See Figure 2-2-3 in *Annual Report on the Japanese Economy and Public Finance 2003*, October 2003, Cabinet Office, Government of Japan. http://www5.cao.go.jp/keizai/index-e.html

[4] Japanese GDP grew 3.8% per year from 1974-1991, and 1.1% per year from 1992-2001. Source: Cabinet Office, Government of Japan http://www.esri.cao.go.jp/index.html

the discussion of the banks' problems centers on the supposedly abysmal quality of their loan portfolios. How the banks choose to provision for and write off their problem loans are critical decisions.

We want to know if the major Japanese banks are uniform or unique relative to each other and to banks in other countries. We begin with a theory that treats loan loss reserves as an inventory, with provisions coming in and write-offs going out. This theory gives us an empirical model for both loan loss provisions and write-offs. We then use the model to compare behavior across Japanese banks, and between Japanese banks and banks from other countries around the world that have similar banking systems. We explore whether any apparent differences are driven by behavior (reflected in different model coefficient estimates) or by shocks (reflected in different values of the explanatory variables). A major and surprising finding is that Japanese city banks differ from Japanese trust banks but not from banks in other countries with similar banking systems. The Japanese banks are neither uniform nor unique.

The paper proceeds as follows. In section II we develop our loan loss reserve inventory model. In section III we discuss how the economy, regulatory intervention, and incentives might affect estimates of the model. In section IV we introduce the data. Section V covers the cross sectional Japanese bank tests while Section VI covers the tests that compare Japanese banks with banks from other similar countries. Section VII discusses possible interpretations of the results, and Section VIII concludes.

II. Inventory model of loan loss reserves

In this section, we build a model of loan loss reserves and then discuss the factors that might alter the way bank managers implement the model. Dewenter and Hess (2003) present a full discussion of the model.

Since banks lend to borrowers whose cash flows may be particularly difficult to estimate, banks' earnings may be opaque to outside investors. As such, investors may demand a premium for the additional risk of owning a bank's stock. Banks may be able to reduce this premium by signaling their inside information about the quality of their assets. Two signals for marking-to-market the bank's assets are the declaration of non-performing loans and adjustments to loan loss reserves.

Loan loss reserves, a contra-asset account on a bank's balance sheet, are an inventory that has loan loss provisions, an income statement expense, as an inflow and loan write-offs as an outflow.[5] An incorrect level of loan loss reserves (i.e., an uninformative signal), on either the high or low end, may cause the bank to pay an additional risk premium to investors.

Inventory theory distinguishes between fixed-order-quantity models and fixed-reorder-interval models. In a fixed-reorder-interval model the inventory manager reorders inventory on a fixed time schedule. This corresponds to the financial reporting practices of banks, which have monthly, quarterly and annual reporting schedules. The fixed-reorder-interval inventory model relates the cost-minimizing order quantity to

[5] U.S. bank regulators require banks to follow generally accepted accounting principles (GAAP) and supervisory guidance in determining their loan-loss allowances. GAAP include Financial Accounting Standards No. 114 (FAS 114) and FAS 5. FAS 114 relates to specific loans that are non-performing, and FAS 5 specifies allowances for groups of similar loans based on historical write-offs for loans in the group. See "Policy Statement on Allowance for Loan and Lease Losses Methodologies and Documentation for Banks and Savings Institutions," Federal Financial Institutions Examination Council, July 2, 2001.

expected demand, the time between orders, the uncertainty of demand, and the beginning inventory. Applying the model to banks, loan loss provisions, *LLP*, should increase with the expected value of loan write-offs (normalized by the amount of loans) over the coming interval of time, $E_t(WO_{t+1}/L_t)$, and with the probability, $z_{WO} \cdot \sigma_t(WO_{t+1}/L_t)$, it will not have sufficient reserves to absorb unexpected random variation in write-offs during the reorder interval.[6] The term z_{WO} is the number of standard deviations the bank chooses to set its probability of not having to make unexpected loan loss provisions. Loan loss provisions should decrease with the beginning balance of loan loss reserves, LLR_{t-1}/L_{t-1}. The fixed-reorder-interval inventory model is:

$$\frac{LLP_t}{L_t} = E_t\left(\frac{WO_{t+1}}{L_t}\right) + z_{WO} \cdot \sigma_t\left(\frac{WO_{t+1}}{L_t}\right) - \frac{LLR_{t-1}}{L_{t-1}}. \qquad (1)$$

Several of the variables that determine loan loss provisions in the inventory model may not be directly observable or measurable even by a bank's managers. A bank can examine its loans individually and determine which ones are non-performing, or it can apply historical loan losses to a group of loans to estimate a probable amount of loan losses. Expected write-offs for individual loans that are non-performing may be related to the amount of its non-performing loans, *NPL*, which some banks report in notes to their financial statements. Expected write-offs for groups of loans may be related to the bank's past record of write-offs and to the book value of its outstanding loans to assets, *L/A*.

$$E_t\left(WO_{t+1}/L_t\right) = G\left(NPL_t/L_t, WO_t/L_t, L_t/A_t\right) \qquad (2)$$

[6] The inventory model differs from the model of Laeven and Majnoni (2001). They relate loan loss reserves to expected loan losses and use the bank's capital to absorb unexpected loan losses. The inventory model uses loan loss reserves to cover both expected and unexpected loan losses.

Stating these two equations in a regression format, gives a two-equation system that explains loan loss provisions and expected write-offs. Our data have an observation period of one year, during which a bank's managers obtain updates on customers' loan repayments. Thus, expected write offs within a year may be closely linked to actual write offs during the year.

$$LLP_t / L_t = \beta_0 + \beta_1 \left(WO_t / L_t \right) + \beta_2 \sigma_t \left(WO_t / L_t \right) - \beta_3 \left(LLR_{t-1} / L_t \right) + \varepsilon_t \qquad (3)$$

$$WO_t / L_t = \beta_4 + \beta_5 \left(NPL_t / L_t \right) + \beta_6 \left(Loans_t / A_t \right) + u_t \qquad (4)$$

Assuming that bank managers act to maximize the bank's value within the constraints of regulatory guidelines, we believe that over the long run managers will set loan loss allowances equal to the expected value of future loan losses in accordance with the inventory model.[7] However, regulatory, macroeconomic, and accounting considerations may be important in the short run.

As specified by the Basel Accord (1988), most industrialized nations require banks to meet a minimum ratio of capital-to-assets. Under this system, the cost to a bank of too little loan loss reserves is the chance of losing its charter.[8] With insufficient reserves, a bank must match a loan write off with an equal charge against earnings. If its capital ratio is low, the direct write off of loans could cause the bank's capital ratio to fall below the regulatory minimum leading to a loss of the bank's charter. The cost of

[7] Wall and Koch (2000) identify three different approaches to loan loss accounting. Economists say the loan loss allowance should be the expected value of future loan losses. Contrary to the economist's view, the Financial Accounting Standards Board (FASB) does not permit allowances to reflect the expected effects of future events, but instead requires them to reflect losses that are sure to occur due to events this period. Banking regulators in the United States, on the other hand, view loan loss allowances as a reserve that is built up in good times to absorb losses during bad times.

[8] Since loan loss reserves are pre-tax, a potential additional cost of too little loan loss reserves is foregone tax savings.

holding too much loan loss reserves is the reduced earnings that could have gone to build up the capital ratio, allowing the bank to expand its assets or their risk.

The business cycle may modify how banks apply the inventory model to loan loss reserves. Inventory models assume that the inventory manager always has funds available to purchase goods for inventory at each reorder point. In contrast, a bank may have insufficient earnings to fund its loan loss provisions and meet its capital requirements. As Cavallo and Majnoni (2002) report, if a bank's borrowers operate in an economy subject to business expansions and recessions, the bank's non-performing loans and expected loan write-offs are likely to increase in recessions, just when the bank's ability to provision out of income is constrained.

The fixed-interval inventory model can incorporate this uncertainty by having the bank manage its loan loss reserves over a business cycle instead of over a calendar year. Optimal reserves and provisioning increase with average loan write-offs over the cycle, the uncertainty of loan write-offs, and the probability that the bank will not run short of reserves during the replenishment period. The probability depends on z_{PPI}, the number of standard deviations the bank chooses to guard against an income shortfall when it has to replenish its loan loss reserves, and $\sigma_t\left(PPI_c / L_c\right)$, the standard deviation of the ratio of the bank's pre-provision income to loans. Pre-provision income is income available for loan loss provisions, or income before provisions, taxes, and extraordinary items. The business cycle, fixed-reorder-interval inventory model is:[9]

$$\frac{LLP_c}{L_c} = E\left(\frac{WO_c}{L_c}\right) + z_{WO} \cdot \sigma\left(\frac{WO_c}{L_c}\right) + z_{PPI} \cdot \sigma\left(\frac{PPI_c}{L_c}\right) - \frac{LLR_{t-1}}{L_{t-1}} \qquad (5)$$

[9] The subscript c means the variable is measured over a business cycle.

A third factor that may affect how managers apply the model is their capital ratio. When the bank's expected write-offs exceed loan loss reserves plus earnings, the bank manager must choose between declaring the loans as non-performing, writing them off against capital and possibly falling below the minimum level of required capital, or not recognizing the loans as non-performing and having their stock price fall if investors are noisily aware of the understatement.[10]

Peek and Rosengren (2003) argue that banks with insufficient reserves and earnings to absorb their non-performing loans resort to renewing loans that have negative values. They call this evergreening loans. A bank evergreens a loan when it makes a new loan to a distressed borrower and the borrower uses the money to make payments on its non-performing loan. To maintain its charter, an evergreening bank will first allocate income to keeping the capital ratio at or above its minimum required level. Once the capital ratio meets or exceeds its required level, the bank's managers can increase loan loss provisions in response to additional earnings, all the while maintaining the minimum capital ratio. Thus, in the neighborhood of the required capital ratio, higher levels of pre-provision income (PPI) are associated with higher levels of provisions.

$$LLP_t / L_t = \gamma_0 + \gamma_1 PPI_t / L_t \qquad (6)$$

When a bank is not capital ratio constrained it can follow the inventory model.

[10] Bank loans require borrowers to repay principal and interest according to a schedule of payment dates and amounts. When borrowers do not repay their loans according to the schedule, banks may declare the loans to be non-performing. While there is no universal definition of non-performing loans across countries, Cortavarria et al (2000) report that in most G-10 countries, loans are considered non-performing if (a) principal or interest is due and unpaid for 90 days or more; or (b) interest payments equal to 90-day interest or more have been capitalized, refinanced, or rolled over.

III. Impact of the economy, regulatory intervention, and incentives

This section reviews how the economy, regulatory intervention, and incentives could affect the data and concludes with a discussion of the constraints on disentangling the three effects. We focus on how the recent events in Japan might affect model estimates.

III.A. The economy

One effect of the decade-long recession in Japan is the quality of banks' loans. A weak and worsening loan portfolio should be associated with higher levels of both provisions and write offs. Relatively higher non-performing loans, loan loss provisions, and write-offs should show up in comparisons of Japanese banks with banks from other countries, rather than in the cross section of Japanese banks (because they were all subject to the same poor economic conditions).

The prolonged recession may also affect a bank's capital adequacy. Numerous years of low income coupled with high provisions will decrease the capital ratio and thus introduce an incentive for banks to evergreen poorly performing loans while the bank tries to increase its capital ratio. In the model, this manifests itself in a significant positive relation between loan loss provisions and pre-provision income for the banks with the lowest capital ratios. Across the Japanese banks, this could show up in a positive relation between write-offs and pre-provision income. This relation is due to the Japanese bank practice of directly writing off some of their non-performing loans against income. (See a full description of Japanese bank write off methods in the Data section below.)

III.B. Regulatory intervention

Fearful that the banks would have a shortage of capital and a banking crisis would be unavoidable, the Japanese government took several measures to increase banks' capital during the sample period (1991-2001). In March 1998, the government injected a total of 1.8 trillion yen into 18 city and trust banks and 3 regional banks in the form of subordinated debt. However, this turned out to be insufficient and in March 1999 15 city and trust banks and 17 regional banks received a second round of capital infusion totaling 8.8 trillion yen.[11] Effective March 1999, the government also made two changes in the accounting rules for banks. First, banks were allowed to add latent capital gains on their land holdings to their capital. Second, banks were allowed to add estimated tax refunds to their capital.[12]

All three actions lifted the banks' capital ratios, allowing or perhaps even forcing them to interrupt their ongoing operations to boost temporarily their provisions for and write-offs of poorly performing loans. As a result, across the Japanese banks, we expect to find discreet jumps in loan loss provisions and write-offs in the years during or immediately following regulatory intervention. Depending on the amount of aid received, these jumps could vary across the banks.

[11] 1998 Capital injection is based on "Financial Function Stabilization Law (1998)", and the 1999 injection is based on the "Early Strengthening Law (1999)." Both are described at http://www.dic.go.jp. There have been other occasions of capital infusions to ultimately failed banks, but they occurred after our sample period.

[12] Capital gains from land holdings is based on the "Land Revaluation Law (1998)." The estimated tax refund is based on opinion issued by Japan Institute of Certified Public Accountants (May 12, 1998), and confirmed by Ministry of Finance and Ministry of Justice on June 16, 1998. Source: *Zenkoku Ginkou Zaimu Shohyo Bunseki*. The tax refund may be realized once the loan loss reserve (which is not tax deductible at the time of provisioning) is actually written off and the loss is realized.

We must also consider regulatory intervention in the other countries we study (Denmark, France, Germany, Spain, and Sweden). Of these countries, Sweden and France both had banking crises in the early 1990s, but the crises were over by the beginning of our sample period and banks that were subject to the most severe regulatory interference are not included in our sample.[13] Without comparable interventions in the other countries, and assuming the effect of the Japanese interventions was to boost provisions and write-offs, we expect to find relatively higher loan loss provisions and write-offs at the Japanese banks than at the banks from the other countries in our sample. The Japanese bank capital ratios could be higher or lower depending on how rapidly the aid was used to clean up their loan portfolios.

III.C. Incentives and conflicts of interest

Across banks, the incentives to monitor and renegotiate debt vary. These differences will affect the level and time series behavior of loan loss provisions and write-offs. Below we discuss the theory and its behavioral implications for our model.

III.C.i. Theory

Allen and Gale (1995) distinguish between transactional and relationship banks. Relationship banks, such as the German Hausbanks, the Japanese main banks, and banks in some other countries provide both debt and equity financing to their clients, have long-lasting ties with them, serve on their boards of directors and in some cases serve as senior

[13] The one exception to this is a bank in France that was nationalized, Credit Lyonnais. We conduct robustness tests to confirm this experience does not affect the results.

managers, and renegotiate debt contracts during periods of financial stress.[14] Transactional banks in the former English colonies primarily provide short-term bank loans but not equity financing, monitor loan covenants, have limited interference in corporate management, and are reluctant for legal reasons to renegotiate loans of distressed firms. The implicit and explicit equity holdings of the relationship banks in their clients lead to conflicts of interest in their loan monitoring activities.

In his review of banking theory, Boot (2000) identifies two characteristics of a relationship-based financial intermediary: it obtains and safeguards proprietary information about each customer's business; and it has multiple interactions with each customer. The close interactions between a borrower and a relationship lender may lead the lender to forbear enforcing loan terms when a borrower is in financial difficulty. Boot calls this the soft-budget problem. The soft-budget problem occurs when the gain to the lender from not enforcing the terms of a loan exceeds its gain from enforcing the loan terms.

An equity claim on the customer exacerbates the soft-budget problem and a senior debt claim reduces it. Dewatripont and Tirole (1994) write that debt exists to create a tough investor who disciplines management in hard times. They show that soft claimholders (equity holders) should control a borrower's assets when the borrower's financial performance is satisfactory and tough claimholders (debt holders) should control the assets when performance is unsatisfactory. Thus, a bank with an implicit or

[14] Allen and Gale (1995), Aoki (1994), Aoki, Patrick and Sheard (1994), Hoshi, Kashyap, and Scharfstein (1990), Prowse (1996), Steinherr and Huveneers (1994).

explicit equity stake in a borrower is less likely, ceteris paribus, to enforce a hard budget constraint.[15] Instead, the bank has an incentive to evergreen a problem loan.[16]

III.C.ii. Behavioral implications

Differences in behavior across relationship banks could be driven by differences in the intensity of their incentive to evergreen loans or in their ability to evergreen.[17] We propose several proxies for a bank's incentive to evergreen. The first proxy, the ratio of equity investments to total assets, indicates the value to the bank of its option to wait for the borrower's financial performance to improve. A higher ratio indicates a stronger incentive to evergreen loans. Two additional proxies consider revenue sources. The ratio of fees-to-loan interest income and the ratio of net fees-to-total loans measure the breadth of the relationship with client firms and the profitability of non-loan business, respectively. Due to cross-country differences in the level of detail of income statements, these two measures are not directly comparable across countries, but they are still informative for within-country comparisons. Increases in these measures are associated with stronger incentives to evergreen loans. The final proxy is the Tier 1 capital ratio.[18]

[15] For example, an implicit equity claim is demonstrated in Wilner's (2000) trade creditor model where a creditor with an enduring, profitable relationship with a borrower (but not an equity investment) grants more concessions to a distressed borrower than would a competitive lender

[16] Berlin et al (1996) show that a borrower whose business depends on the trust of its suppliers gets better terms of trade when an outside agency, such as a bank with inside information, signals that the borrower is solvent. By relying on the lending bank's alleged superior information, outside creditors lend to the bank's borrowers at rates that reflect the bank's information. Outside creditors will grant superior terms and rates only if they trust the bank to act prudently in its dealings with the borrowers. To minimize its overall borrowing costs, a borrower will seek out a bank that the borrower's other creditors trust and think is competent. Such a bank is one that renegotiates lending terms for borrowers that are in financial distress but have continuation values that exceed foreclosure values, and to foreclose otherwise.

[17] The close interactions between lender and borrower may give the relationship bank superior information. However, Dewenter and Hess (2003) show that among relationship banks outside Japan, the incentive effects seem to overshadow the information effects.

[18] Tier 1 capital, sometimes called core capital, is a risk-weighted measure of capital adequacy where equity and disclosed reserves are counted as capital. Tier 2 capital includes other items such as undisclosed

As noted above, a capital constrained bank has an incentive to continue evergreening loans as it uses its income to increase its capital ratio.

If a bank evergreens a loan, the borrower can eventually repay the loan, or the borrower defaults and the bank must write off both the first loan and the subsequent evergreen loans. In the short run, the evergreening bank could have lower non-performing loans and write-offs than a non-evergreening bank. In the long run, however, assuming that the true status of the loans eventually is known and the bank has to write them off, a bank that evergreens loans on average will have greater non-performing loans and loan write-offs than a similarly situated bank that does not evergreen loans or evergreens less.

Regardless of the impact of evergreening, a relationship bank's incentives could lead to relatively higher non-performing loans. A bank's equity investment in a borrower may influence its behavior toward the borrower. To protect the option value of its claim to indirect sources of revenue from the borrower, a bank with an equity investment may be more likely to grant a loan, and be less strict in monitoring it than a bank without an equity investment. As a result, banks with equity investments in their borrowers have higher fractions of non-performing loans.

In sum, across relationship banks, we expect to find relatively higher levels of non-performing loans at the banks with the highest incentives to evergreen loans. The higher non-performing loans should be associated with higher provisions and write-offs. In the inventory model, the banks with the highest incentives to evergreen should show relatively lower provisions for a given level of expected write-offs as they delay the

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reserves, loss reserves, and subordinated debt in capital. Since 1992, the minimum Tier 1 ratio is 4% and the minimum Tier 2 ratio is 8%.

write-offs with evergreen loans. They should also show relatively lower write-offs for a given level of non-performing loans or loans.

In some circumstances, regardless of incentives, banks are forced or enabled to interrupt their evergreening.[19] This can occur when regulators change the rules or their level of enforcement, the government provides capital infusions or other assistance, or stockholders demand greater transparency. The most obvious proxy for enabling is direct capital infusions. Changes in bank regulations that boost the capital ratio and provide more room to provision and write off problem loans are also enabling. Actions by regulators to force a permanent or temporary cessation of evergreening, or by stockholders to demand more transparency, are harder to observe or measure. When a bank interrupts its evergreening, it will need to declare more truthfully the extent of its problem loans, begin to write off both the original and the evergreen loans, and provision for a higher expected level of write-offs. Relative to a bank that continues to evergreen, a bank that interrupts its evergreening should have higher non-performing loans, write-offs, and loan loss provisions. In addition, these changes should cause discreet shifts in the time series of these three activities.

III.D. Disentangling the effects of the economy, regulatory intervention, and incentives

The above discussion suggests that it will be extremely difficult, if not impossible, to identify definitively which factor (the economy, regulatory intervention, incentives) is causing any cross sectional differences in bank behavior. First, all three factors were at

[19] We consciously use the term interrupt rather than stop because the actions that lead to a (temporary) halt in evergreening often do nothing to change the underlying incentives to evergreen.

play over our sample period, with sometimes conflicting and sometimes complementary effects. For example, assuming that Japanese banks have relatively high incentives to evergreen, the economy, regulatory intervention and incentives should all lead to relatively higher write-offs at the Japanese banks than at the other banks. This confluence of factors makes it impossible to develop a set of hypotheses that would uniquely distinguish the three effects. Second, it is commonly understood that Japanese banks understate their non-performing loans, although the level of understatement may have fallen over the last decade. The understatement and its changing level severely hamper our ability to make any predictions that are linked to NPL, a key variable in the model. Third, in the middle of the sample period, the Japanese government massively intervened in the banking sector. Because we do not know the exact nature of the discussions and/or instructions that the regulators had with the banks, we cannot predict exactly how these changes might affect bank behavior. Moreover these interventions may introduce unpredictable discontinuities in the time series we study.

As a result, we are left with the empirical question of whether we can find differences in the loan loss provision and write-off data across the Japanese banks and between the Japanese banks and banks from other countries. Japanese banks may perform poorly relative to other international banks because they have been hit by relatively large shocks (via the economy or regulatory intervention), or because their managers respond differently to external conditions. If their poor performance is due to shocks, the coefficients that link loan loss provisions and write-offs to their regressors will be the same for the two sets of banks. If this is the case, differences in performance are due to differences in the values of the regressors. If Japanese bank managers act

differently from other bank managers, the coefficients will be different. Our intent is to see if any apparent differences among the Japanese banks or between the Japanese and other banks are driven by shocks (reflected in the values of the variables) or behavior (reflected in the estimated regression coefficients).

IV. The data

Steinherr and Huveneers (1994) and Berlin (2000) classify countries as having either transactional or relationship banking systems. Based on their information and data availability, our relationship bank sample consists of banks from Denmark, France, Germany, Spain, and Sweden. All relationship bank data come from the BankScope data set. The sample period covers 8 years over 1994-2001. In order to assure that we are comparing similar banks, we only include banks in our sample for which:

- The bank is in an OECD developed country.
- BanksSope identifies the bank as a commercial bank or medium and long-term credit bank. We do not include banks identified as savings institutions, real estate and mortgage banks, or cooperative banks.
- The bank has at least one subsidiary outside the home country.[20]
- All non-local corporate owners hold less than 10% of total equity, or are from a country with a similar banking system (e.g.: institutional investor in one relationship country invests in a bank in another relationship country).
- Available bank data include at least NPL, LLR, and LLP for five years.[21]

[20] The opening sentence of the Basle Committee on Banking Supervisions' July 1988 report reads "This report presents the outcome of the Committees' work over several years to secure international convergence of supervisory regulations governing the capital adequacy of *international banks*." (Italics added). Given the close links between LLP and the capital ratio, it is important to have a sample where all banks are subject to the same capital regulations, i.e. the Basel Accord.

These criteria leave us with a sample of 16 relationship banks: Denmark (2), France (3), Germany (3), Spain (5), and Sweden (3). Appendix A lists the banks.

We collect Japanese bank data from *Zenkoku Ginkou Zaimu Shohyo Bunseki* (*Analysis of Financial Statements: All Banks*) published annually by Japanese Bankers Association. This publication contains financial data from the filings of each bank with the Ministry of Finance, called *Yuka Shoken Hokokusho*. The sample period is from the March 1992 to March 2002 financial statements. (Throughout the paper, our convention is to refer to data from the March 1992 statements as the 1991 fiscal year.) For banks that merged during the sample period, we add together data from pre-merger entities.[22] Since consolidated statements were required only after 1999, we use data from parent-only statements.

We do not include two banks that were nationalized during our sample period (Long-Term Credit Bank of Japan and Nippon Credit Bank), since their provision and write-off behavior is so different from the other banks and do not represent actions of an on-going enterprise.

Disclosure of non-performing loans for Japanese banks began in March 1993, but the government changed the definition of NPL twice over the years of our sample to include more categories. (Details on changes in the definitions are in the data appendix, available from the authors.) In this paper, we use a definition that is consistent throughout the sample period: a non-performing loan is a loan to a bankrupt or quasi-

[21] Banks from Denmark, France, and Sweden do not report write-offs. For these countries, we derive write-offs as $WO_t = LLR_{t-1} + LLP_t - LLR_t$.

[22] Bank mergers include Bank of Tokyo-Mitsubishi, Chuo-Mitsui Trust Banks, Sumitomo-Mitsui Bank, and UFJ Bank. For example, for Bank of Tokyo-Mitsubishi, which was formed by the merger of Mitsubishi Bank and Bank of Tokyo in 1996, the data from 1992 to 1996 are created by adding those for Mitsubishi Bank and Bank of Tokyo.

bankrupt firm, or a loan overdue for 6 months. We also conduct robustness tests that use broader measures of non-performing loans.

Japanese banks write off loans in three ways: (1) by charging against their loan loss reserves, (2) by directly writing off in the income statement as "loan loss charges," or (3) by directly writing off in the income statement as a part of "other current expenses." The amount of write-offs in method (1) can be measured by applying the relation $WO_t = LLR_{t-1} + LLP_t - LLR_t$. While the amount of write-offs in method (2) is identifiable as a single item in the income statement, method (3) is not identifiable since the write-offs are aggregated as "other expenses." Our write-off series combines "derived" write-offs from loan loss reserves (from the *Yuka Shoken Hokokusho* reports) plus "direct" write-offs from the income statement (methods 1 and 2 above). For completeness, we also discuss the results of tests using only derived write offs from loan loss reserves (method 1 only).

Data on capital infusions to the banking system are from the website of the Deposit Insurance Corporation Japan.[23]

V. Are the Japanese city and trust banks similar?

Two different types of major Japanese banks exist: city banks and trust banks. While city banks, which are regular commercial banks, engage in banking business only, trust banks have both banking and trust businesses.[24] Over the period of our study, there are no legal differences in the banking business of these two types of banks, though trust banks' lending is typically long-term. For the trust business, trust banks receive and

[23] http://www.dic.go.jp.

[24] Daiwa Bank is the one city bank that is allowed to do trust business, however, its trust business has always been very small. As a result, we keep Daiwa with other city banks for the analysis.

manage funds on behalf of beneficiaries. Since trust assets belong to the beneficiaries and not the shareholders, the bank's trust business is not subject to accounting rules set by the commercial code. Instead, trust banks keep separate books for their trust accounts. In this study, we only use data that cover the banking business of the trust banks.[25] We exclude assets, loans and income related to their trust business.[26]

The loan loss reserve inventory model implies that banks' provision and write-off behaviors vary across the business cycle. Since it is difficult if not impossible to match exactly cycles across countries, any apparent differences between banks from different countries found with time series data estimates could be due to the business cycle as well as other factors. As a result, cross-country bank comparisons should be conducted using averages across the business cycle.

As all banks within a given country are subject to the same business cycle, time series estimates with banks from one country are not subject to this bias. In addition, time series data allow us to test more carefully for a link between government assistance and provisions and write-offs. (We will later see that across the Japanese banks the 11 year averages for government assistance are so small that they do not provide any explanatory power over the whole period.) Time series data also provide a direct test of whether capital constrained banks more tightly link their loan loss provisions to pre-provision income. (Averages may hide different behavior in capital constrained years.)

The time series inventory model is:

[25] As far as we can tell, the BankScope data set combines together the commercial and trust activities of the Japanese trust banks.

[26] Trust banks do make loans in their trust account, and the NPL in such loans (we call them "trust loans") became subject to disclosure since 1993. There is no loan loss provision for trust loans, and the write-off of NPL is directly charged against trust fees. Also there are internal loans made from the trust account to the banking account. Since interest rates charged by the trust account are typically higher than call money rates, the internal loans can be considered as subsidies to the trust accounts from the bank accounts.

$$LLP_{i,t} = \beta_0 + \beta_1 WO_{i,t} + \beta_2 \Delta(WO)_{i,t} - \beta_3 LLR_{i,t-1} + \beta_4 GDPGrowth_t + \beta_5 Aid_t + \beta_6 PPI_{i,t} + \varepsilon$$
$$WO_{i,t} = \beta_7 + \beta_8 NPL_{i,t} + \beta_9 Loans_{i,t} + \beta_{10} GDPGrowth_t + \beta_{11} Aid_t + \beta_{12} PPI_{i,t} + \mu \quad (7)$$

Where *GDPGrowth* is defined as the annual percentage growth in GDP, *Aid* equals capital infusions divided by loans, *PPI* equals pre-provision income divided by loans, and all other variables are defined as above.

We begin our comparison of Japanese banks by looking at proxies for the incentive to evergreen. When we rank the 12 Japanese banks by average levels of equity investment to loans (see Table 1) we find that all of the trust banks have greater equity investments than all of the city banks.

Within Japan, we have two additional proxies for a bank's incentive to evergreen. The ratio of fees-to-loan interest income and the ratio of net fees-to-total loans yield similar rankings across the Japanese banks, with the trust banks at the top and city banks at the bottom. Thus, we anticipate that trust banks have greater incentives to evergreen non-performing loans than do city banks.

Table 2 provides summary statistics for the city and trust banks. The table reports the mean, median, and standard deviation of each variable across the two sets of banks. The far right column reports the results of a t-test for whether the city and trust bank means are equal. The first result to note is that 13 of the 15 t-tests are significant at the 1% significance level, one is significant at the 5% level, and one is not significantly different. Japanese city and trust banks are not similar.

The first four rows provide evidence on banks' incentives to evergreen. Rows 1-4 show that trust banks have significantly higher equity investments (10.1% versus 6.1%), higher capital ratios (6.3 versus 5.2), higher fee-to-loan interest income (22.2% versus 11.2%), and higher net fees-to-loans (0.4% versus 0.2%). With the exception of the

lower capital ratios at city banks, each of these findings is consistent with trust banks having greater incentives to evergreen non-performing loans.

Rows 5-10 show that trust banks have relatively higher levels and standard deviations of non-performing loans, write-offs and loan loss provisions. NPL are 5.8% versus 3.4%, while WO are 2.1% versus 0.9%. These results, indicating a poorer quality loan portfolio, are consistent with the long run effects of trust banks evergreening more than city banks.

Figure 1 illustrates the time series behavior of loan loss provisions at city and trust banks. Trust banks' provisions are both greater than city banks' provisions and more variable. In March 1998 and 1999 the Japanese government provided capital infusions to banks. As a percent of loans these infusions were greater (but not significantly so, see line 15) at trust banks. Banks used these infusions to provision for and write off non-performing loans that they had been evergreening. After the infusions, trust and city banks' provisioning and write-offs are similar.

Rows 11 and 12 show that trust banks have lower net interest income (0.8% versus 1.5%) and loans/total assets (52.2% versus 61.1%). To the extent that these banks face similar funding costs and charge similar loan rates, the lower net interest income at the trust banks may be due to their receiving interest payments on new loans from principal on loans they evergreen to non-performing borrowers. On an evergreened loan, the borrower pays the same total interest but owes greater debt to the bank. This reduces the bank's net interest income on its loans.

Row 13 shows that trust banks have higher loan loss reserves (3.6% versus 2.3%), but Row 14 shows that trust banks' reserves are smaller relative to average write-offs (1.7

versus 2.3). Despite higher average write-offs and a higher variability in write-offs, the trust banks maintain a lower cushion of reserves.

On all measures except Tier 1 capital, which is offset by their lower loan loss reserves to write-offs, trust banks appear to be more likely to evergreen and to evergreen more than city banks.

Table 3 reports time series, cross sectional panel regressions based on equation 7 above. These panel regressions use 11 years of data for each of the 12 banks (stacked). The regressions are estimated with fixed effects and cross section weights. Panel A reports the loan loss provision equation estimates and Panel B the write-off equation estimates. Models 1 and 2 differ only in that Model 2 includes controls for pre-provision income. The regressions allow for different slope coefficients between city and trust banks.

Loan loss provisions (Panel A) at city banks are positively related to write-offs, but not to other variables that inventory theory predicts should affect provisions. The coefficient estimate in Model 1 suggests that city bank provisions, controlling for other factors, equal approximately 61.2% of write-offs. Provisions at trust banks are not related to write-offs.[27] The trust bank provision to write-off relation is insignificantly different from zero. It equals 0.1305 (0.6129 - 0.4824) in Model 1 and 0.0658 (0.6062 - 0.5368) in Model 2. Instead, provisions at trust banks are linked one-for-one with government aid. We cannot reject that (Aid + Trust*Aid = 1) in both regressions.[28]

[27] When write offs are defined as only write-offs out of reserves, excluding write-offs taken directly out of the income statement, neither set of banks has a significant relation between provisions and write-offs.

[28] When Aid is defined as deferred taxes, both types of banks show weak (10 percent level) positive relations; when defined as land revaluations, neither type shows significant relations, when defined as total government aid, only trust banks show a strongly positive significant (1 percent level) relation.

The relation between loan loss provisions and pre-provision income is insignificantly different from zero for both types of banks. We cannot reject that (PPI + Trust*PPI = 0). The data suggest, though, that the relation for trust banks is weakly more positive than for the city banks (the Trust*PPI coefficient is significant at the 10 percent level). For both types of banks, the LLP to PPI relation does not differ across high versus low Tier1 ratio banks, contrary to expectations that the capital constrained banks more tightly link provisions and income.

It seems reasonably safe to infer that trust banks do not follow the inventory model in setting their loan loss provisions. Instead, they increase provisions when they receive government aid or when their pre-provision income allows it. City bank provisions show a significant link with write-offs.

In Panel B, neither type of bank relates write-offs to non-performing loans or total loans as inventory theory predicts. Write-offs at city banks are positively linked one-for-one with government aid, and negatively related to GDP growth. The negative GDP coefficient estimate in Model 1 suggests that a 1 percent increment in average GDP growth is associated with a fall in average city bank write-offs of 25%.[29] Write offs at trust banks have a one-to-one link to government aid,[30] but no link to GDP growth (we cannot reject that GDP + Trust*GDP = 0).[31]

Only the high capital ratio trust banks show a (weak) significant relation between write offs and pre-provision income. We can reject that (PPI + Trust*PPI=0) for the high

[29] Average city bank write-offs/loans are 0.0090. (-0.0023*1.00)/0.0090 = -0.2500, or -25%.
[30] We cannot reject that the coefficient estimates for (Aid + Trust*Aid = 1.0) in either model. When Aid is defined as deferred taxes or total aid (capital infusions plus deferred taxes plus land revaluations) both city and trust banks show a similar significant positive relation. When it is defined as land revaluations, both types show a significant positive relation, but the impact is larger for the trust banks. This effect is probably driven by the fact that only one trust bank revalued its land.
[31] These results do not change when WO excludes the write offs taken directly from the income statements.

capital ratio trust banks. We cannot reject that (PPI + Tier1Ratio<5*PPI + Trust*PPI=0) for the low capital trust banks, or that (PPI + Tier1Ratio<5*PPI = 0) for the low capital city banks. Again, contrary to expectations, we do not find that the capital constrained banks have stronger links between write-offs and pre-provision income.

When we define non-performing loans as total reported non-performing loans (the current definition is uniform throughout the period, only including loans to bankrupt or quasi-bankrupt firms and loans overdue for 6 months), the coefficient on NPL is positive and significant at the 5 percent level in both models (the NPL coefficient equals 0.0855 (.0419) in Model 1). The Trust*NPL coefficient is never significantly different from zero. Expanded classifications of what is included in NPL over the period boost total reported NPL and thus no doubt cause this correlation as write-offs generally rise over the period as well.

An evergreening model appears to explain the write-offs of both city and trust banks. Both types of Japanese banks write off non-performing loans when they receive government aid to do so. In addition, city bank write-offs follow the business cycle (higher in years of slow growth), and high capital trust bank write-offs are weakly related to pre-provision income. Overall, the data suggest strong differences between Japanese trust and city banks. They are not uniform.

VI. Are the Japanese city and trust banks similar to banks in other relationship banking countries?

Table 4 provides summary statistics for relationship banks outside Japan and Japanese banks. The table reports the mean, median and standard deviations for the 16

relationship banks, and the means for the 7 Japanese city and 5 Japanese trust banks (taken from Table 2). The far right columns provide the test statistics for a t-test for whether the relationship bank means equal the Japanese bank means.

Row 1 shows that Japanese banks have significantly higher values of equity investments to assets, 6.1% for city and 10.2% for trust banks compared to 1.4% for relationship banks. In addition, they have significantly lower capital (Row 2), with an average Tier 1 ratio of 5.3 (city) and 6.4 (trust) compared to 7.6 for relationship banks. Both differences suggest that the Japanese banks have stronger incentives to evergreen loans.

We next inquire whether the reported performance of the banks is the same for each of the three key measures of the financial performance of loans. Rows 3 and 6 show no differences in the value and standard deviation of non-performing loans between relationship and city banks, the variable that may be most easily under-reported by a bank with a complicit regulator.[32] The value and variation of trust bank NPL, however are significantly higher than for the relationship banks (mean is 5.8% versus 3.4%).

Rows 4-5 and 7-8 show that both sets of Japanese banks have significantly higher values and standard deviations of write-offs and loan loss provisions than for the relationship banks. For example, mean (standard deviation) write-offs are 0.9% (0.01) for Japanese city banks, 2.1% (0.02) for Japanese trust banks, and 0.6% (0.004) for the relationship banks. The higher standard deviations for the Japanese banks are due to large jumps in provisions in March 1996 and March 1999 and in write-offs in March

[32] If Japanese banks were in dire financial condition, and if Japanese regulators were complicit in hiding the banks' true financial condition, the reported values for Japanese banks may understate the true values. We have no evidence that relationship banks were in dire straits and suspect that their data may more accurately reflect their actual performance.

1997 and 1999. These patterns are consistent with the Japanese banks making more evergreen loans, hiding them, and temporarily interrupting their evergreening when government aid was provided.

Rows 9 and 10 may provide additional evidence that Japanese banks evergreen their loans. Row 9 shows that relationship banks have a significantly greater ratio of net interest income to loans (3.4% compared to 1.5% for the city and 0.8% for the trust banks). Row 10 shows that relationship and Japanese trust banks have equal ratios of loans to assets. The city banks have higher loans to assets. Lower net interest income at Japanese banks may be due to their receiving interest payments on new loans from principal on loans they evergreen to non-performing borrowers.

Row 11 shows that the ratio of loan loss reserves to loans at relationship banks (2.9%) is higher than at city banks (2.0%) but lower than at trust banks (3.6%). Row 12 shows that the relationship banks have enough reserves to cover 5.0 years of average write-offs (the ratio of loan loss reserves to write-offs), while the Japanese city (trust) banks have only enough reserves to cover 2.3 (1.7) years of average write-offs. If Japanese banks evergreen loans, they do not truthfully declare all non-performing loans to be non-performing, and they do not provide for them. By not providing for their non-performing loans they have lower loan loss reserves. The lower loan loss reserve cushion at Japanese banks makes them more vulnerable to income or credit quality shocks, which increases their incentives to evergreen.

In sum, all Japanese banks appear to have stronger incentives to evergreen than the other relationship banks, and the data are consistent with them making more evergreen loans.

III.1.B. Multivariate Tests using Cross-Sectional Data

The univariate tests show that international Japanese banks are different from other international relationship banks. Are these differences due to different economic conditions, regulatory interventions, or different management practices? If they are due to different management practices the coefficients in the provision and write-off regressions will differ between Japanese banks and other relationship banks. If they are due to different economic conditions or regulatory intervention the coefficients can be the same but the average values of the regressors must be different. The univariate tests show that the average values of the regressors differ. We now test whether the coefficients also differ.

We test for differences between the relationship and Japanese banks by estimating the provision and write-off regressions from the loan loss reserve inventory model, allowing for separate intercept and slope coefficients for the Japanese banks. Because our Japanese time series results suggest significant differences between Japanese city and trust banks, we separately compare each type of Japanese bank against the relationship banks. And, because we are comparing banks from multiple countries, we use the business cycle version of the model. For each relationship bank an observation is an average for the years 1994-2001. For each Japanese bank an observation is an average for the years 1991-2001. Since the two equations are estimated for the same set of banks, we use the seemingly unrelated regression (SUR) method to control for both heteroskedasticity and contemporaneous correlation across the residuals.

Table 5 reports the loan loss provision regression and write-off regression results that follow from the inventory model.

$$LLP_i = \beta_0 + \beta_1 WO_i + \beta_2 \sigma(WO)_i - \beta_3 LLR_i + \varepsilon$$
$$WO_i = \beta_4 + \beta_5 NPL_i + \beta_6 Loans_i + \mu \qquad (8)$$

We include separate country intercepts (estimated intercepts not reported), and a binary variable (JP), with the value one for Japanese banks, times each regressor. This method allows the Japanese banks to have different slope coefficients to reflect different behavior. Since we estimate the regression with one observation per bank, the results relate to the cross sectional pattern of bank behavior averaged over the sample period.

Models 1 and 2 include the relationship and city banks, models 3 and 4 the relationship and trust banks. The relationship bank country intercepts (values not reported) are significantly different from each other at the one percent significance level in each specification. In all Table 5 specifications, all proxies for government assistance to the Japanese banks are never significantly different from zero, so they are excluded to preserve degrees of freedom.[33]

In Models 2 and 4 we also include GDP Growth and a proxy for the level of regulatory intervention to control for different country-level effects. Our proxy for regulatory regimes, Heritage, is the Index for Banking and Finance from the Heritage Foundation's Index of Economic Freedom series. The index considers government ownership of banks, restrictions on the ability of foreign banks to open branches, government influence over the allocation of credit, government regulations, and freedom

[33] The lack of significance for the Japan capital infusion coefficient is most likely due to averaging. While capital infusions reached as high as 3.7% of loans for one bank in March 1999, the average across the 11 years for all the banks is only 0.2%. There is one exception to the lack of significance. When total government aid is included in the write-off equation with just PPI (and not GDP Growth or Heritage), then the government aid coefficient estimate is negative and just significant at the 10 percent level.

to offer any and all types of financial services. The variable ranges from 1 to 5, with higher numbers indicating more government interference. The average value across the other relationship countries is 2.3. Japan's average value over the period is 2.8. The expected relation between regulatory interference and LLP and WO is indeterminate. A highly involved regulatory body could enforce rules strictly, leading to relatively generous provisioning and active write-offs, or could practice forbearance, leading to relatively lax provisioning and slow write-offs.

In the loan loss provision regressions (Panel A), the JP coefficient estimates in Models 1 and 2 are never significantly different from zero, indicating that the Japanese city banks behave similarly to the relationship banks. The estimates suggest that loan loss provisions for both relationship and Japanese city banks are positively related to write-offs and the standard deviation of write-offs, and negatively related to beginning loan loss reserves. These patterns are consistent with predictions of the inventory model. In Model 2, we see no link between provisions and GDP growth or pre-provision income, but a positive relation with our proxy for regulation. Across countries, more intensive regulatory oversight is associated with higher loan loss provisions.[34]

Models 3 and 4 in Panel A suggest strong differences in relationship and Japanese trust bank behavior. Japanese trust bank provisions are more strongly positively associated with write-offs. We cannot reject a one-for-one relationship between trust bank provisions and write-offs, while we can for the other relationship banks. Contrary to the significant positive link between provisions and the standard deviation of write-offs for the relationship and city banks, the Japanese trust banks have a significant negative

[34] When included separately, both the Heritage and GDP Growth coefficients have positive significant coefficient estimates in the loan loss provision estimates, for both city and trust banks.

relation. We reject that $(\sigma WO + JP * \sigma WO) = 0$ at the 10 percent level in Models 3 and 4. Across Japanese trust banks, the banks with the most variable write-offs have the lowest loan loss provisions.

The Panel B results for write-offs are similar, indicating little difference between the relationship and city banks, but major differences between relationship and trust banks. Model 1 suggests a stronger relation between write-offs and NPL for the city banks at the 10 percent level, but the significance disappears when we add the other controls. In Models 3 and 4, we get strong evidence that the trust bank write-offs have a stronger link to NPL, and mixed evidence of a difference with Loans (significant at the 1 percent level in Model 3 and insignificant in Model 4).[35] No evidence is found of a link between write-offs and GDP growth, the Heritage proxy for regulation, or PPI.

The conclusion from these estimates is that there is no significant difference in the loan loss provision behavior of the Japanese city banks and the other relationship banks. In general, their write-off behaviors are also similar. The only exception is in some specifications where the Japanese city banks show stronger links to non-performing loans.

The relationship and Japanese trust banks are starkly different, with the differences consistent with the trust banks evergreening and interrupting their evergreening. In most cases, the trust bank coefficient estimates significantly differ from the relationship bank estimates. Japanese trust banks have greater average write-offs than

[35] When NPL is defined to include total reported non-performing loans, the JP*NPL coefficient estimates are larger and more significant (e.g., the Model 1coefficient is 0.3117(.031)). When WO is defined as just write-offs taken out of reserves, the beginning LLR coefficient for the Japanese banks becomes larger and more significant for both sets of banks. Nothing else changes for the city banks. For the Trust banks, the JP coefficient estimates in the LLP equation become larger. In the WO equation, the JP*NPL coefficient estimate is no longer significant.

relationship banks, and they link their provisions more closely to their write-offs. This difference may be due to the much higher loan loss reserves of relationship banks, which was noted in the univariate analysis above. Relationship banks can easily meet their average annual write-offs with no additional provisions. Japanese trust banks are less able to do so. As a result, the average provisions at Japanese banks exceed those at relationship banks.

VII. Discussion of the results

The above results indicate that the Japanese banks are neither uniform nor unique. The data patterns are consistent with all three factors (the economy, regulatory intervention, and incentives) playing a role.

The effect of macroeconomic conditions shows up most strongly in the time series data. Across Japanese banks, write-offs are negatively associated with changes in GDP. Otherwise, the effect of the weak economy shows up in the values – with relatively higher average non-performing loans and write-offs at the Japanese banks than at the relationship banks.

Government assistance also had a significant impact on the time series of Japanese bank behavior. The data are consistent with the Japanese banks in general, and the trust banks in particular, interrupting their evergreening behavior over this time period. Trust banks' loan loss provisions and write-offs are tied one-for-one with capital infusions from the government; they have relatively high non-performing loans, write-offs, and provisions; and the standard deviations of these variables are relatively high.

The city banks also show some evidence of interrupting their evergreening, with write-offs tied one-for-one with capital infusions.

The data are also consistent with different incentives to evergreen leading to different behavior, at least with respect to comparisons of Japanese trust banks with banks in other relationship countries. Japanese city bank behavior, as reflected in regression coefficient estimates, is indistinguishable from the behavior of banks in other relationship countries. (The only exception is a stronger link between write-offs and non-performing loans at the Japanese city banks in one specification that is probably driven by a lower loan loss reserve cushion at the city banks.) Japanese trust bank behavior is sharply different from both Japanese city banks and other relationship banks. Among these 3 sets of banks, the trust banks have the strongest incentives not to enforce a hard budget constraint. The data are consistent with them making more evergreen loans.

If the evidence consistent with interrupting evergreening at the Japanese banks is true, the next logical question is whether or not the trust (and city) banks have succeeded in cleaning up their bank portfolios. While we cannot get direct evidence on this, the indirect evidence is not encouraging. Table 6 reports beginning and ending averages for the three types of banks. While the relationship banks cut non-performing loans almost in half over the period, the city banks almost doubled non-performing loans and the trust banks ended with approximately the same level. Note, when we look at total reported non-performing loans, the ending period averages are 0.0958 for the city banks and 0.1323 for the trust banks.

While reserves fell at the relationship banks, so did their write-offs, so the loan loss reserve cushion rose from 2.5 to 5.7. For the Japanese banks, both reserves and

write-offs rose, with the reserve cushion falling to 1.9 for the city banks and 2.3 for the trust banks. Finally, despite all the government assistance and capital infusions, the Japanese city banks ended the period with an only slightly higher average Tier 1 ratio, while the trust bank Tier 1 ratio fell slightly. The relatively low capital ratios and loan loss reserve cushions for both the city and trust banks suggest that they are still vulnerable to income and credit quality shocks.

VIII. Conclusion

In the 1990s, the Japanese banks were notable because of their poor performance: low income combined with increasing problem loans and write-offs. Explanations for this poor performance include the long period of weak macroeconomic performance, regulatory interference, and incentive effects on management practices.

The purpose of this paper is to see if the Japanese banks are uniform or unique. We compare Japanese city and trust banks with each other and with banks from other relationship banking countries. The data show significant differences across all three types of banks in the magnitudes of the non-performing loans, loan loss provisions and write-offs. These differences are consistent with effects from all three explanations. The behavior of the Japanese trust and the other relationship banks is also significantly different, suggesting an important role for incentives. Interestingly, the behavior of Japanese city banks and other relationship banks is almost indistinguishable, suggesting that apart from the shocks of a weak economy and regulatory intervention, the Japanese city banks are similar to banks in other relationship banking countries.

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Appendix A – Sample Banks

RELATIONSHIP BANKS

Denmark
Danske Bank
Jyske Bank

France
Credit Lyonnais
Credit Agricole Indosuez
Credit Industriel et Commercial

Germany
Bayerische Hypo-und Vereinsbank
Dresdner Bank
Commerzbank

Spain

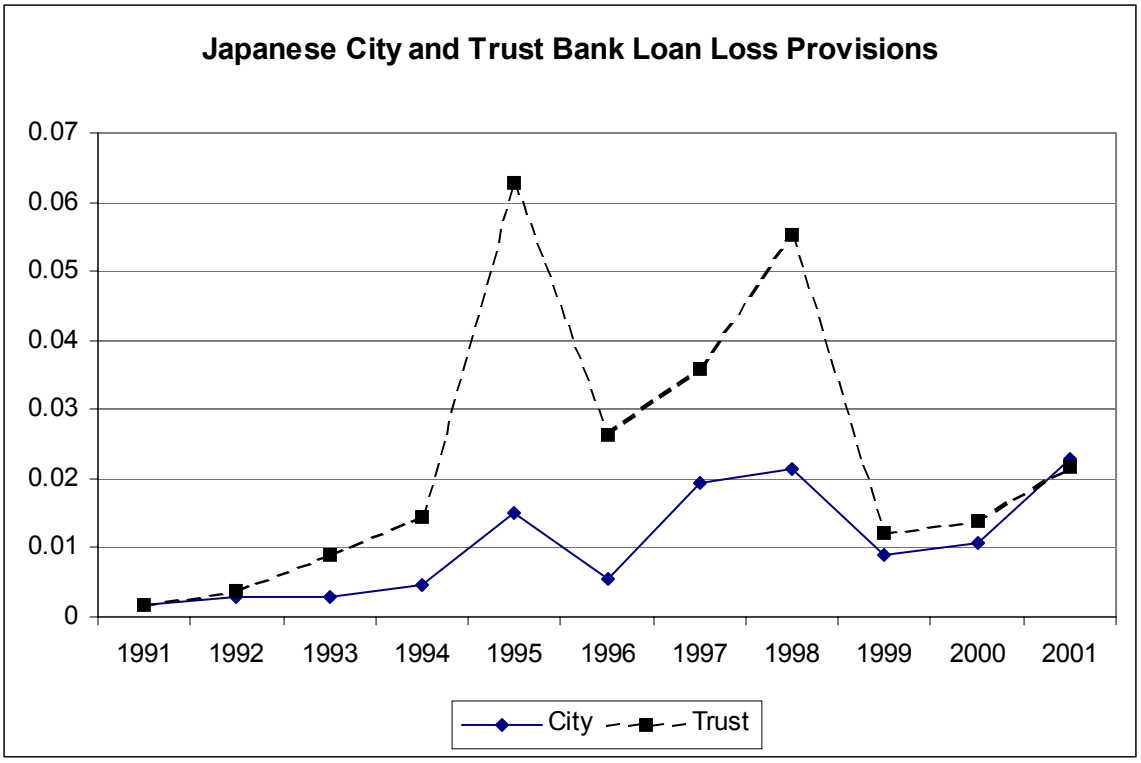
Santander Central Hispano
Banco Bilbao Vizcaya Argentaria
Banco Esp. de Credito, BANESTO
Banco Popular Espanol
Banco de Sabadell

Sweden
Svensk Handelsbanken
Skandinaviska Enskild Banken AB
Nordea Bank Sweden

JAPANESE BANKS

Sumitomo Mitsui Banking Corp.
Bank of Tokyo Mitsubishi
UFJ Bank
Fuji Bank
Dai-Ichi Kangyo Bank
Industrial Bank of Japan
Mitsubishi Trust and Banking Corp.
Sumitomo Trust and Banking Corp
Chuo Mitsui Trust and Banking Corp.
Daiwa Bank
UFJ Trust Bank Ltd.
Yasuda Trust and Banking Corp.

Figure 1



Note: Graph reports average annual loan loss provisions for the 7 Japanese city and 5 trust banks. Data points in 1995, for example, refer to numbers from the March 1996 fiscal year end financial statements.

Table 1 – Ratio of Equity Investments to Loans, Japanese Banks

Japanese Bank	*Equity Inv./Loans*
Chuo Mitsui Trust and Banking	0.2354
Yasuda Trust and Banking	0.2081
UFJ Trust Bank	0.2022
Mitsubishi Trust and Banking	0.1761
Sumitomo Trust and Banking	0.1543
Daiwa Bank	0.1308
Industrial Bank of Japan	0.1133
Fuji Bank	0.0963
Bank of Tokyo Mitsubishi	0.0961
UFJ Bank	0.0957
Sumitomo Mitsui Banking	0.0897
Dai-Ichi Kangyo Bank	0.0835

Note: Table reports average ratio of equity investments to total loans for Japanese banks over 1991-2001.

Table 2: Summary Statistics for the Japanese Banks

	JAPANESE CITY BANKS (7)			JAPANESE TRUST BANKS (5)			City-Trust=0
	Mean	**Median**	**St. Dev.**	**Mean**	**Median**	**St. Dev.**	**T-test**
1. EqInv/Assets	0.0614	0.0602	0.0101	0.1016	0.1101	0.0162	-5.325***
2. Tier 1	5.2662	5.2000	0.2179	6.3687	6.3091	0.2401	-8.293***
3. Fee/Int Income	0.1124	0.1103	0.0228	0.2227	0.2289	0.0841	-3.361***
4. Net Fees/Loans	0.0022	0.0021	0.0003	0.0047	0.0047	0.0017	-3.881***
5. NPL/Loans	0.0342	0.0328	0.0048	0.0582	0.0588	0.0074	-6.857***
6. LLP/Loans	0.0105	0.0106	0.0022	0.0234	0.0226	0.0046	-6.534***
7. WO/Loans	0.0090	0.0090	0.0022	0.0216	0.0216	0.0050	-5.990***
8. σ NPL/Loans	0.0124	0.0142	0.0049	0.0276	0.0253	0.0105	-3.393***
9. σ LLP/Loans	0.0089	0.0084	0.0029	0.0213	0.0189	0.0051	-5.387***
10. σ WO/Loans	0.0100	0.0097	0.0018	0.0243	0.0250	0.0044	-7.846***
11. NII/Loans	0.0156	0.0164	0.0025	0.0082	0.0077	0.0048	3.155***
12. Loans/Assets	0.6115	0.6246	0.0415	0.5222	0.5243	0.0227	4.331***
13. LLR	0.0200	0.0199	0.0010	0.0362	0.0341	0.0059	-7.259***
14. LLR/WO	2.3173	2.1999	0.4606	1.7031	1.6256	1.2098	2.7556**
15. CapInf/Loans	0.0016	0.0017	0.0009	0.0022	0.0018	0.0015	-0.797

Note: Table reports Mean, Median, and Standard Deviation for the variables across the 7 Japanese city and 5 Japanese trust banks. All variables are calculated as averages over 1991-2001 (i.e., one observation per bank). EqInv = equity investments, Tier 1 Ratio = risk weighted capital ratio, Fee/Int. Income = fee income over loan interest income, Net Fees = fee revenues – fee costs, LLP=loan loss provisions, WO= write-offs, NPL = non-performing loans, NII/Loans = net interest income/Loans, LLR = loan loss reserves, Loans = total loans, CapInf = capital infusions from the government. Difference in means is tested with a 2-sided t-test, assuming unequal variances. *, **, *** Denote significant differences at the 10, 5, and 1 percent levels respectively.

Table 3: Time Series Cross-Section Panel Regressions: Japanese Banks Only

$$LLP_{i,t} = \beta_0 + \beta_1 WO_{i,t} + \beta_2 \Delta(WO)_{i,t} - \beta_3 LLR_{i,t-1} + \beta_4 GDPGrowth_t + \beta_5 Aid_t + \beta_6 PPI_{i,t} + \varepsilon$$
$$WO_{i,t} = \beta_7 + \beta_8 NPL_{i,t} + \beta_9 Loans_{i,t} + \beta_{10} GDPGrowth_t + \beta_{11} Aid_t + \beta_{12} PPI_{i,t} + \mu$$

Panel A: Loan Loss Provision Equation

	Model 1	**Model 2**
WO	0.6129	0.6062
	(.0031)***	(.0041)***
Trust*WO	-0.4824	-0.5368
	(.0752)*	(.0529)*
ΔWO	0.0000	-0.0000
	(.3793)	(.2331)
Trust* ΔWO	0.0000	0.0000
	(.3440)	(.2095)
LLR(t-1)	-0.0931	-0.1024
	(.5271)	(.4833)
Trust*LLR(t-1)	0.0510	0.0543
	(.8161)	(.8037)
Aid	-0.0928	-0.0781
	(.6539)	(.7468)
Trust*Aid	1.2473	1.1715
	(.0036)***	(.0090)***
GDP Growth	-0.0003	-0.0003
	(.7019)	(.5577)
Trust*GDP Growth	0.0021	0.0015
	(.1725)	(.3238)
PPI	---	-0.1628
		(.2450)
Tier 1 Ratio < 5*PPI	---	0.0124
		(.947)
Trust*PPI	---	0.4577
		(.0855)*
Adjusted R2	0.3112	0.3410

Table 3 Panel B: Write-Off Equation

	Model 1	Model 2
NPL	0.0674	0.0490
	(.3612)	(.5235)
Trust*NPL	0.1404	0.1305
	(.3721)	(.3853)
Loans	-0.0014	-0.0023
	(.9485)	(.9217)
Trust*Loans	0.0801	0.0825
	(.3318)	(.2885)
Aid	1.0089	1.0957
	(.0000)***	(.0000)***
Trust*Aid	-0.3300	-0.6056
	(.5098)	(.1948)
GDP Growth	-0.0023	-0.0020
	(.0002)***	(.0018)***
Trust*GDP Growth	0.0023	0.0006
	(.2446)	(.7273)
PPI	---	0.0992
		(.4345)
Tier 1 Ratio < 5 * PPI	---	-0.3062
		(.0692)*
Trust*PPI	---	0.5696
		(.0512)*
Adjusted R2	0.5481	0.5495

Note: Table reports results from cross section time series panel regressions with 11 years (1991-2001) of data for 7 city and 5 Japanese trust banks. Panel regressions estimated with fixed effects and cross section weights. WO= write-offs/total loans, NPL = non-performing loans/total loans, Loans = total loans/total assets, LLR = loan loss reserves /total loans. Trust = 1 for the 5 Japanese trust banks. GDP Growth = average annual GDP growth rate for Japan. Aid = Japanese government provided capital infusion (preferred shares and subordinated loans/loans). PPI = pre-provision income/loans. Tier 1 Ratio < 5 = 1 for bank years where Tier 1 ratio is less than 5.0. P-values are reported in parentheses below the coefficient estimates. *, **, and *** Denote significance at the 10, 5, and 1 percent levels respectively.

Table 4: Summary Statistics for the Relationship and Japanese Banks

	RELATIONSHIP BANKS (16)			JAPANESE BANKS		Rel-City=0	Rel-Trust=0
				CITY (7)	TRUST (5)		
	Mean	Median	St. Dev.	Mean	Mean	T-Test	T-Test
1. EqInv/Assets	0.0136	0.0094	0.0126	0.0614	0.1016	-8.835***	-11.132***
2. Tier 1 Ratio	7.6366	7.5106	1.9209	5.2662	6.3687	3.213***	2.576***
3. NPL/Loan	0.0348	0.0296	0.0232	0.0342	0.0582	0.0670	-3.504***
4. WO/Loans	0.0064	0.0065	0.0028	0.0090	0.0216	-2.171**	-6.487***
5. LLP/Loans	0.0065	0.0063	0.0023	0.0105	0.0234	-3.885***	-7.911***
6. σ NPL/Loans	0.0136	0.0101	0.0112	0.0124	0.0276	0.2696	-2.560***
7. σ WO/Loans	0.0048	0.0043	0.0028	0.0100	0.0243	-4.491***	-9.336***
8. σ LLP/Loans	0.0033	0.0031	0.0017	0.0089	0.0216	-5.846***	-7.887***
9. NII/Loans	0.0344	0.0289	0.0176	0.0156	0.0082	4.177***	5.351***
10. Loans/Assets	0.5419	0.5314	0.0965	0.6115	0.5222	-2.418***	0.752
11. LLR/Loans	0.0292	0.0289	0.0113	0.0200	0.0362	2.122**	-1.810*
12. LLR/WO	5.0364	4.6242	2.3790	2.3173	1.7031	2.9622***	4.145***

Note: Table reports Mean, Median, and Standard Deviation for the variables across the 16 Relationship and 7 Japanese city banks. All variables are calculated as averages over 1994-2001 for the relationship and 1991-2001 for the Japanese banks (i.e., one observation per bank). LLP=loan loss provisions, WO= write-offs, NPL = non-performing loans, NII = net interest income, LLR = loan loss reserves, Loans = total loans, EqInv = equity investments. Difference in means is tested with a 2-sided t-test, assuming unequal variances. *, **, *** Denote significant differences at the 10, 5, and 1 percent levels respectively.

Table 5: SUR Regressions, Relationship and Japanese Banks

$$LLP_i = \beta_0 + \beta_1 WO_i + \beta_2 \sigma(WO)_i - \beta_3 LLR_i + \varepsilon$$
$$WO_i = \beta_4 + \beta_5 NPL_i + \beta_6 Loans_i + \mu$$

Panel A: Loan Loss Provision Equation

	REL + CITY		REL + TRUST	
	Model 1	**Model 2**	**Model 3**	**Model 4**
WO	0.2641	0.1912	0.2615	0.1846
	(.059)*	(.195)	(.065)*	(.212)
JP*WO	0.3170	0.3012	0.9024	1.0044
	(.403)	(.465)	(.001)***	(.001)***
LLR(Beg.)	-0.0541	-0.0606	-0.0540	-0.0605
	(.016)**	(.016)**	(.018)**	(.018)**
JP*LLR(Beg)	-0.3316	-0.3672	0.1603	0.5655
	(.319)	(.277)	(.832)	(.553)
σ WO	0.3417	0.3788	0.3418	0.3789
	(.001)***	(.001)***	(.002)***	(.002)***
JP* σ WO	0.0304	0.0368	-0.7028	-0.7924
	(.933)	(.918)	(.004)***	(.009)***
PPI	---	-0.008	---	-0.0081
		(.470)		(.460)
	---	-0.0488	---	-0.1803
JP*PPI		(.867)		(.556)
GDP Growth	---	0.0003	---	0.0003
		(.358)		(.363)
Heritage	---	0.0025	---	0.0025
		(.000)***		(.000)***
Adj. R2	0.8266	0.7965	0.9726	0.9669

Table 5 Panel B: Write-Off Equation

	REL + CITY		REL + TRUST	
	Model 1	**Model 2**	**Model 3**	**Model 4**
NPL	0.0339	0.0245	0.0344	0.0242
	(.482)	(.602)	(.509)	(.630)
JP*NPL	0.4078	0.1040	0.6106	0.2653
	(.050)*	(.474)	(.0004)***	(.005)***
Loans	-0.0065	-0.0013	-0.0066	-0.0013
	(.339)	(.859)	(.372)	(.871)
JP*Loans	-0.0363	-0.0139	0.1862	-0.0129
	(.130)	(.539)	(.000)***	(.789)
PPI	---	-0.0255	---	-0.0256
		(.203)		(.233)
	---	-0.5836	---	0.1008
JP*PPI		(.245)		(.859)
GDP Growth	---	0.0000	---	0.0000
		(.937)		(.946)
Heritage	---	0.0025	---	0.0025
		(.244)		(.274)
Adj. R2	0.4232	0.3665	0.8942	0.8828

Note: Table reports results from seemingly unrelated regressions (SUR) with 16 Relationship and 7 Japanese city banks in Model 1, and 16 Relationship and 5 Japanese trust banks in Model 2. All variables are calculated as averages over 1994-2001 for the relationship and 1991-2001 Japanese banks (i.e., one observation per bank). Separate country intercepts included in each specification. WO= write-offs/total loans, NPL = non-performing loans/total loans, Loans = total loans/total assets, LLR(Beg.) = loan loss reserves/loans at fiscal year end 1994 for the relationship and March 1992 for the Japanese banks, GDP Growth = average annual GDP growth rate for that bank's country over the sample period, Heritage = average value of the Index for Banking and Finance from the Heritage Foundation's Index of Economic Freedom series for that bank's country over the sample period. JP = 1 for the Japanese banks. P-values are reported in parentheses below the coefficient estimates. *, **, and *** Denote significance at the 10, 5, and 1 percent levels respectively.

Table 6: Beginning and End of Period Averages

	Relationship Banks	Japanese City Banks	Japanese Trust Banks
NPL/Loans			
Beginning	0.0564	0.0285	0.0710
Ending	0.0250	0.0526	0.0688
LLR/Loans			
Beginning	0.0413	0.0081	0.0090
Ending	0.0227	0.0283	0.0333
Write offs/Loans			
Beginning	0.0165	0.0004	0.0011
Ending	0.0040	0.0148	0.0143
LLR/WO			
Beginning	2.50	20.25	8.18
Ending	5.67	1.91	2.32
Tier 1 Ratio			
Beginning	8.33	5.02	6.53
Ending	7.14	5.21	5.89

Note: Table reports averages across 16 relationship, 7 Japanese city, and 5 Japanese Trust banks at the beginning of the sample period (1994 for the relationship banks and 1991 for the Japanese banks), and at the end of the sample period (2001 for all banks). NPL = nonperforming loans, LLR = loan loss reserves, WO = write offs, Tier 1 Ratio = risk weighted capital ratio.