Regulatory Remedies for Banking Crises: Lessons from Japan

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Abstract

In this paper, we utilize a hand gathered, bank specific database covering the period 1993 to 2007 to empirically examine the reactions of individual Japanese banks to governmental policies designed to end Japan's financial crisis. Our unique database allows us to examine the composition of Japanese bank lending across three sectors (commercial and industrial lending, residential real estate and non-residential real estate), as well as aggregate lending activity. Our empirical results suggest that substantial risk-based capital infusions (similar to the 2009 stress tests in the US) were effective at stimulating aggregate bank lending activity, whereas regulatory forbearance (in the form of changes in accounting valuation procedures) had only allocative effects on bank lending activity. Our analysis indicates that across the board capital infusions (similar to the TARP capital infusions in October 2008) were ineffective in impacting bank lending activity during the Japanese financial crisis. Moreover, we find that regulatory capital was a binding constraint on Japanese banks, inducing some to switch their charter and abandon their international operations in order to reduce their capital requirements. We draw parallels to the public policy programs implemented in the US during the 2007-2009 financial crisis and conclude that policies must be substantial in size and risk targeted to be effective.

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Abstract

In this paper, we utilize a hand gathered, bank specific database covering the period 1993 to 2007 to empirically examine the reactions of individual Japanese banks to governmental policies designed to end Japan's financial crisis. Our unique database allows us to examine the composition of Japanese bank lending across three sectors (commercial and industrial lending, residential real estate and non-residential real estate), as well as aggregate lending activity. Our empirical results suggest that substantial risk-based capital infusions (similar to the 2009 stress tests in the US) were effective at stimulating aggregate bank lending activity, whereas regulatory forbearance (in the form of changes in accounting valuation procedures) had only allocative effects on bank lending activity. Our analysis indicates that across the board capital infusions (similar to the TARP capital infusions in October 2008) were ineffective in impacting bank lending activity during the Japanese financial crisis. Moreover, we find that regulatory capital was a binding constraint on Japanese banks, inducing some to switch their charter and abandon their international operations in order to reduce their capital requirements. We draw parallels to the public policy programs implemented in the US during the 2007-2009 financial crisis and conclude that policies must be substantial in size and risk targeted to be effective.

Keywords: banking crisis, capital interventions, public injections, accounting changes, bank lending

JEL Classification Code: G15, G21, G28

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Periodically, banking panics lead to financial crises as witnessed by the global financial meltdown of 2007-2009, which was triggered by the bursting of the US housing price bubble and the resulting increase in mortgage delinquencies. Inevitably, a crisis leads to calls for regulatory policy changes that are designed to return the financial system to health. The 2007-2009 global financial crisis has witnessed a quick succession of regulatory experiments designed to restart global financial markets and recapitalize a banking system that had been depleted by loan losses and deteriorating asset values.

Many economists and financial pundits have drawn the parallel between the 2007-2009 crisis and Japan's lost decade of the 1990s, which was also triggered by the bursting of a real estate bubble and loan losses that depleted bank capital positions.[1] The parallel between the two crises extends beyond their initial roots in the real estate sector. There are public policy parallels in each government's reaction to the crisis. For example, in July 1999, Japan's Financial Services Agency (FSA) required Japanese banks to conduct rigorous self-assessments of their assets for comparison across depository institutions. Similarly, in February 2009, the 19 largest US financial institutions were subjected to stringent stress test examinations in order to compare each bank's credit losses and capital positions under several economic scenarios.[2] Furthermore, both Japanese banks and US banks were offered governmental programs to replenish their capital positions. For example, in the US, the Troubled Asset Relief Program (TARP) was introduced in

[1] For example, see Reinhart and Rogoff, (2008) and Hoshi and Kashyap (2009). Yorulmazer (2009) also compares the US and the Swedish banking crises.

[2] Although originally designed to be worst-case scenarios, during the months it took to implement the stress test, the economy deteriorated further so that the baseline scenario had already been breached by the date of publication of the results (March 7, 2009). For example, the consensus expected unemployment rate was 9.3% as of March 2009, rather than the 8.9% in the baseline scenario.

October 2008 to provide capital infusions to systemically important US banks.[3, 4] In Japan, public capital injections were designed to recapitalize the 19 systemically important Japanese banks, comprising the city banks, trust and long-term credit banks and 3 large regional banks.[5]

The objective of all of these public policy programs was to increase aggregate macroeconomic activity by stimulating bank lending activity. In this paper, we concentrate on three major public policy interventions undertaken in Japan during the acute phase of the Japanese banking crisis during 1997-1999 and draw parallels to public policy interventions in the US during 2008-2009.[6] In particular, we utilize a unique hand gathered, bank specific database to empirically examine the lending activity of individual Japanese banks in reaction to each public policy stimulus program.

We first consider the government's provision of capital infusions to systemically important banks. In Japan, these public injections of capital took place in 1998, similar to the TARP capital infusions that were initiated in 2008 in the US. The similarity between these two policy programs was that in both cases the amount of each bank's capital infusion was unrelated to the bank's risk exposure or level of undercapitalization. Indeed, many adequately capitalized US banks were forced to take TARP funds in October 2008 in order to avoid transmitting a negative signal about those undercapitalized banks that had no choice but to participate in the program. Our results suggest that these across the board capital infusions were ineffective in stimulating aggregate lending activity during the Japanese crisis.[7]

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[3] See Diamond, Kashyap and Rajan (2009) and Diamond and Rajan (2009) for a detailed analysis of the 2007-2009 US crisis.

[4] Bayazitova and Shivdasani (2009) show that TARP infusions had a positive impact on the equity valuations of recipient banks, particularly for those systemically important, troubled banks that were the first to receive capital infusions.

[5] The Japanese capital injections in 1998 were mostly in the form of subordinated debt, and amounted to 1,816 billion yen, of which 321 billion was in the form of preferred stock. See Hoshi and Kashyap (2009). Later injections disbursed funds mostly in form of preferred stock. For example, for the 1999 capital injection, 7,459 billion yen were disbursed to 15 major banks, out of which 6, 159 billion yen were in the form of preferred stock. The TARP injections were in the form of preferred stock.

[6] Although Japan's real estate bubble burst in the early 1990s, we consider public policy interventions beginning in 1997. Similarly, although the US banking crisis began in 2007, we consider policies undertaken in 2008 and 2009.

[7] The size of the blanket public injection program was insufficient to materially impact the recipient bank's insolvency risk. Philippon and Schnabl (2009) show that public capital injections are successful in stimulating bank lending only if they decrease the bank's risk of insolvency.

The second public policy intervention arose out of the failure of the first. In contrast to the 1998 program of blanket capital infusions, Japanese government public injections of bank capital starting in 1999 were targeted to undercapitalized banks at risk of becoming insolvent. This ongoing program was more substantial in size and set the level of capital infusions equal to each bank's nonperforming loan losses. Total risk-based public capital infusions in 1999 totaled 74.593 trillion yen as compared to only 18.156 trillion yen in 1998. The risk-based capital infusion program in Japan can be compared to the US Supervisory Capital Assessment Program in 2009, which tested the adequacy of each bank's capital in order to determine the level of required capital infusions.[8] Our empirical results suggest that risk-based capital infusions were effective in inducing Japanese banks to increase their lending activity. Therefore, although we find that direct public capital injections have a significantly positive effect on stimulating aggregate bank lending activity, the efficacy depends on how the public injections were conducted. The blanket public injection policy of 1998 failed to stimulate bank lending, whereas a stimulative effect was delivered by risk-based capital infusions starting in 1999 that mandated a rigorous examination of each bank's non-performing loans problems.[9]

The third public policy intervention in Japan was the provision of regulatory capital forbearance through the introduction of a land revaluation windfall. On March 31, 1998, the Diet (the Japanese parliament) passed the "Law Concerning the Revaluation of Land," which allowed Japanese banks to count 45% of the unrealized capital gains on their real estate holdings as Tier 2 capital for the purposes of meeting their bank capital requirements.[10] This revaluation essentially enabled Japanese banks to mark to market their real estate portfolio, which was previously held at book values that were decades old

[8] In the US, these capital infusions took two forms: public (the conversion of government-owned preferred stock into common stock to meet Tier 1 capital requirements) and private (the issuance of equity).

[9] Our results are consistent with those of Hoshi and Kashyap (2009) presenting the "Japan premium" (the Eurodollar Tokyo Interbank Borrowing Rate (TIBOR) minus 3-month LIBOR) as a measure of the risk of the Japanese banking system. They find that the Japan premium increased in the wake of the 1998 public injection, but declined after the 1999 injections. Peek and Rosengren (2001) also find that during periods of concrete action by the Japanese government, there is a reduction of the "Japan premium". In addition, Montgomery and Shimizutani (2009) find that the risk-based public injections were effective whereas the blanket infusions were not over the 1990-1999 period. Our results also highlight empirically the importance of systemic risk assessment as an important step in any policy to alleviate financial crises, as recommended by Acharya, Pedersen, Philippon and Richardson (2009).

[10] The Basel Capital Accords specify that banks must hold both Tier 1 capital, comprised mostly of bank equity, and Tier 2 capital, comprised of preferred stock, long-term subordinated debt, up to 1.25% in the form of general loan loss provisions, and the revaluations permitted to Japanese banks.

and lower than the prevailing land prices in Japan. Thus, all Japanese banks were allowed to increase the value of their assets by increasing the valuation of the land in their portfolios. The land revaluation allowance followed the format of an earlier equity revaluation allowance (introduced in 1986), which allowed only those Japanese banks with international operations to include 45% of the unrealized gains on securities as Tier 2 capital. However, because the land revaluation allowance was more broadly applicable (to all banks rather than just international banks for the equity revaluation allowance), our empirical analysis suggests that it had more of an impact on Japanese bank lending activity.

The 1998 land revaluation allowance (which was either positive or zero if there were no gains)[11] essentially provided both domestic and international Japanese banks with an infusion of Tier 2 capital for regulatory capital purposes. That is, there was no change in the bank's economic capital position, but regulators allowed banks to include previously ineligible asset values (land appreciation allowances) as Tier 2 capital for regulatory purposes.[12] This represented a one-time, permanent infusion of regulatory capital, since subsequent declines in land values did not have to be deducted from the bank's regulatory capital position. Moreover, to the extent that Japanese banks held considerable land holdings that had been obtained upon real estate loan foreclosures, the land revaluation law substantially enhanced the ability of Japanese banks to meet their Tier 2 capital requirements.

Parallel to the land revaluation allowance policy's accounting rule changes, on April 9, 2009, the US Financial Accounting Standards Board published FAS 157-4, which allowed banks to avoid market value accounting "when the volume or level of activity for the asset or liability have significantly decreased and identifying transactions are not orderly." This permitted US banks to avoid capital charges that would have resulted from valuing their financial assets and liabilities at the low prices prevalent during the crisis period. Our results indicate that this form of forbearance that propped up regulatory (but not economic) capital levels was ineffective in stimulating Japanese

[11] Banks had the discretion to choose whether or not to declare an allowance for land revaluation. Therefore, there were no instances of negative land revaluation allowances.

[12] This was similar to the infusion of capital in the form of supervisory goodwill that contributed to the thrift crisis in the US. See White (1991).

bank lending during the crisis. Instead of increasing total lending, this policy only had allocative effects. That is, Japanese bank lending shifted from residential real estate to non-residential lending without an aggregate increase in total lending.

In this paper, we also show that regulatory capital requirements can be binding constraints on bank behavior. In Japan, some banks responded to their capital constraints by switching their charter designations so as to ease regulatory capital requirements.[13] During the Japanese banking crisis, 62 banks switched their charters from international to domestic only, thereby cutting their capital requirements in half, as well as retaining access to the land revaluation allowance.[14] In this paper, we analyze the charter switching decision and show that banks with marginal shortfalls in regulatory capital switched charters so as to take advantage of the reduction in their capital requirements. Moreover, the restricted applicability of the equity revaluation allowance (i.e., only banks with international operations were eligible) reduced the tendency of banks to switch charters from international to domestic only.

Our empirical results are robust to a two-stage analysis that controls for the endogeneity of the switching decision. To account for the possible endogeneity in the charter switching decision, we first employ a probit regression to estimate the probability that a bank would switch its charter. We find that it was the bigger, better-capitalized banks that had an increased probability to switch their charter from international to domestic operations, whereas direct public injections dissuaded a bank from switching its charter.[15] We also control for the ability of the bank to take advantage of the mark-to-market accounting changes through both the equity and land revaluation allowances. Since the allowances effectively increased the bank's Tier 2 capital, there were limitations on the ability of the bank to benefit from the Tier 2 regulatory capital forbearance. Bank capital requirements limit the amount of eligible Tier 2 capital to be

[13] As will be discussed in Section 2, Japanese banks with only domestic operations had a 4% capital requirement in contrast to the 8% requirement for international banks.

[14] There was only one bank, Yasuda Trust, that switched (in March 2003) in the opposite direction, from domestic to international, but we could not obtain sufficient data about the bank's portfolio to include it in our sample.

[15] Kroszner and Strahan (1996) find that thinly capitalized thrifts were most likely to switch from a mutual to a stock charter in order to obtain access to private capital. This counterintuitive result obtains from their finding that thrift regulators allowed mutual-to-stock conversions of weak thrifts (and subsequently large dividend payouts) because they did not have funds to bail them out.

less than Tier 1 capital. Thus, Tier 2 capital must comprise less than half of a bank's total capital requirements. Our probit regression analysis shows that banks with more unused Tier 2 capacity were more likely to switch their charter so as to increase their regulatory capital position. Further, our two-stage analysis is consistent with our results that risk-based capital infusions were effective in stimulating bank lending activity during the Japanese banking crisis, whereas across the board capital infusions had no impact on aggregate bank lending. Regulatory forbearance, through suspension of mark-to-market accounting requirements via the land revaluation allowance, had only an allocative, not an aggregate impact on bank lending activity.

The paper proceeds as follows. Section 2 provides a brief review of the literature and a description of Japanese bank capital regulations and policies during the 1980s-2000s. Section 3 describes our hand-collected database and provides descriptive statistics. In Section 4, we present the results of our baseline model as well as endogenize the process of Japanese bank switching of charter and examine the two-stage regression results. The paper concludes in Section 5.

2. Japan's Lost Decade

2.1 Japanese Regulatory Policies Over the 1980-2000 Period

Prior to the adoption of the Basel Accords, the regulatory capital requirement in Japan was set at 4%, as calculated by capital divided by total assets less specific bad debt reserves. However, Japan had a two-tiered system that continues to this day. That is, Japanese banks that operate overseas branches were allowed to include 70% of unrealized gains on securities in their capital calculation, but were required to meet a 6% capital ratio.[16, 17] In contrast, domestic banks with no international branches could not include their unrealized gains on securities as capital, but were required to meet only a 4% ratio.

[16] Specific loan loss reserves, which write off specific individual loans, were excluded from both the numerator and the denominator of the capital ratio (though general provisions for loan losses and reserves were included in the numerator) for Japanese banks with international branches. Moreover, cross holdings of stocks were not deducted from the numerator.

[17] According to Himino (2005), Japan's international (city) banks would have been unable to meet the 6% capital requirement if they could not utilize reserves from their unrealized gains on securities (also known as hidden reserves).

Upon the agreement to adopt the Basel Accords in 1988, a four-year transitional period was initiated.[18] Basel I was fully implemented in Japan as of March 1993, with the exception that the Bank of Japan permitted only Japanese banks with international operations to include 45% of the unrealized gains on securities as Tier 2 capital (in a line item known as the equity revaluation allowance). Moreover, unrealized losses on securities and cross holdings of stocks of other financial institutions were deducted from Tier 1 capital for Japanese banks with international branches only. Capital requirements were calculated on a consolidated basis only. Most importantly, however, the 8% Basel capital requirement was not levied on domestic Japanese banks without international operations. These banks retained the 4% non-risk based requirement.

In 1993, the Japanese financial system was reformed so as to allow banks to underwrite corporate bonds through bank-owned subsidiaries. The Financial System Reform Act of 1992 (which took effect in April 1993) was designed to promote competition in Japanese financial markets. Takaoka and McKenzie (2006) find that the law achieved this result since underwriting commissions and yield spreads on corporate bonds fell dramatically with bank entry into the underwriting business. The two major reforms were: (1) permitting the consolidation of banking and securities firms through subsidiaries, and (2) allowing securities firms to participate in the market for securitizations.[19]

Hoshi and Kashyap (2009) date the start of Japan's financial crisis to the loan loss problems at the housing loan institutions (*jusen*) that were created in the 1970s. In 1991, non-performing loans at the *jusen* totaled 38% of their total loans.[20] Japan's Ministry of Finance and the large Japanese banks made several rescue attempts to prop up the insolvent *jusen*, all of which were unsuccessful, and by 1995, the *jusen* were liquidated. At around the same time, in response to the continuing banking crisis, the 10 million yen deposit insurance cap was eliminated and full deposit insurance was extended to all deposits for five years, until 2001. Between 2002 to 2004, only demand deposits

[18] During 1988 to 1990, Japanese banks were required to keep their risk-based capital levels at levels no lower than those as of the end of fiscal year 1987. During 1990-1992, the requirement was increased to 7.25%, and to 8% when Basel I took full effect in March 1993.
[19] For a complete list of deregulations packaged in Japan's financial liberalization programs, see Hoshi and Kashyap (2001).
[20] Hoshi and Kashyap (2009), page 11.

received full deposit insurance protection. Time deposits were insured up to a 10 million yen cap. As of fiscal year 2005, all deposits in Japanese banks were insured only up to 10 million yen, as was the case before 1995. Fueda and Konishi (2007) find that Japanese depositors discipline the banks when deposit insurance protection is incomplete by withdrawing their funds from risky banks and forcing these banks to restructure.

In March 1998, the Land Revaluation law was passed, allowing all Japanese banks (not just those with international branches as was the case for the equity securities revaluation allowance) to add 45% of their unrealized gains on land values to Tier 2 capital. In addition, risk-based capital requirements were extended to domestic Japanese banks without international branches, although the standard was 4%, not 8%. Because of the lower regulatory capital standard for domestic Japanese banks, general provisions and loan loss reserves could constitute only 0.625% of Tier 2 capital, as compared to the 1.25% level permitted for Japanese banks with international operations.[21] Table 1 summarizes the capital requirements for Japanese banks with and without international branches during this time period.

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As the banking crisis in Japan continued, in February 1998, the Japanese government initiated a program of public infusions of capital, allocating 13 trillion yen for recapitalizing banks and 17 trillion yen for protecting the depositors of failed banks. Table 2 shows that the most of the injections of subordinated debt were directed toward the systemically important city and trust banks. Moreover, the amount of capital was spread relatively evenly across the large banks. Despite this program, in 1998 two long-term credit banks, Long-term Credit Bank of Japan and Nippon Credit Bank failed and were nationalized. Thus, a second round of public capital infusions was undertaken during 1999, mostly in the form of preferred stock. As can be seen from Table 2, the 1999 program was far more substantial in size. Moreover, the level of each bank's capital injection was determined by the bank's non-performing loan levels.[22] During the

[21] In addition, until March 2009, capital adequacy requirements were calculated on both a consolidated and unconsolidated basis for Japanese banks with international branches, but only on an unconsolidated basis for domestic Japanese banks.

[22] Prior to 1993, Japanese banks were not required to report their non-performing loans in their financial statements. This requirement was gradually phased in until all banks began reporting non-performing loans after March 1998.

fiscal years 1998 and 1999, Japanese Government made public injections of about 10 trillion yen amounting to 2% of Japan's GDP in an attempt to boost Japanese bank capital adequacy ratios and stimulate bank lending activity. Given the slow recovery of the Japanese economy, public capital infusions continued through the 2000s (see Table 2). The Japanese government would periodically infuse capital to systemically important banks that faced a capital crunch due to non-performing loan losses.

In April 1999, mark-to-market requirements were extended to all securities held by Japanese banks. Moreover, tax deferred accounting became effective in Japan as of March 1999 permitting banks to increase their regulatory capital levels by including deferred tax assets (DTAs) in Tier 1 capital; see Skinner (2008). This was not a sign of financial health because the DTAs represented past loan losses that the banks would be able to deduct on their taxes if ever they became profitable.[23]

In April 1998 (and revised in October 1998), Japanese banks were formally subjected to penalties from violations of capital regulations in the form of Prompt Corrective Action (PCA). Prior to the adoption of PCA, capital requirements were used as managerial guidance for Japanese banks, but there were no formal penalties for noncompliance with capital standards. However, after the adoption of PCA, if a bank fell short of the minimum capital standard, it faced formal regulatory action. Bank capital ratios were divided into four classes, which mandated progressively stricter intervention as the capital ratio fell. For example, the first action class (requiring the deficient bank to submit and implement a management improvement plan with measures to enhance capital) was triggered if an international bank's capital fell between 4% to 8% or if a domestic bank's capital fell between 2% to 4%. If the international (domestic) bank's capital was between 2% to 4% (1% to 2%), dividend payouts and executive bonuses would be restricted. If the international (domestic) bank's capital was between 0% to 2% (0% to 1%), the bank was required to present plans to substantially increase capital enrichment or decrease business activity, or merge with another bank. Finally, if capital was entirely depleted, regulators would require the bank to discontinue operations. In

[23] However, Skinner (2008) finds a statistically significant negative effect on Japanese bank capital adequacy in the first year of adoption of the provision allowing the use of deferred tax assets (DTAs). That is, the lower the bank's capital adequacy level, the higher the DTAs, thereby suggesting that DTAs were used to bolster the bank's capital position. In 2003, stricter audit procedures stated that if the bank's capital position fell below 4% then it was not allowed to use five years of DTAs as capital.

December 2002, an early warning system was introduced in Japan so that bank regulators could monitor bank profitability and asset liquidity even if capital standards were met in order to detect unhealthy banks before they deteriorate into capital deficiency.

In October 2002, a program for financial revival was announced that required major banks to reduce their ratio of non-performing loans to total loans by half as of the end of fiscal year 2004. This program also codified the Bank of Japan's responsibilities to assist financial institutions in distress. In the event of a capital shortage or liquidity problem, the Bank of Japan would immediately offer the troubled bank "Special Support," which consisted of providing liquidity through special loans, public injections of funds, the placement of resident bank inspectors, and possible changes in the bank's management. Despite these policies, the Japanese banking system was weak and undercapitalized throughout the decade.

2.2 Structural Shifts in the Japanese Banking Industry

The structure of the Japanese banking industry has gone through several stages in recent decades. Evans et al. (1999) find that Japanese banks focused almost exclusively on market share maximization during the pre-Basel I period, thereby neglecting risk management and profit maximization strategies. The pursuit of growth at all costs set the stage for the chronic bad loans and undercapitalized state of the Japanese banking system during the 1990s. In contrast, European banks also experienced asset growth at the same time as did the Japanese banks, but their risk levels were lower and their capital levels were higher than those of Japanese banks (see Evans et al. (1999)).

The Japanese economy was highly dependent on bank loans for financing. For example, Kang and Stulz (2000) find that strong reliance on bank financing and the lack of alternative sources of funds in Japan contributed to the decline in firm value displayed by the loss of more than half of equity value for the typical firm on the Tokyo Stock Exchange during 1990 to 1993. Against this backdrop of Japan's bank-centered economy, the introduction of more stringent bank capital requirements had a substantial impact on bank credit creation and economic activity in Japan. Honda (2002) examines Japanese bank credit creation during the period of 1967-1994 and finds that the introduction of Basel I capital requirements reduced aggregate bank credit significantly.

Moreover, Watanabe (2007) finds evidence that Japanese banks cut back on their lending in response to a large loss in bank capital in fiscal year 1997.

The decline in bank lending during the Japanese banking crisis has been linked to capital constraints through several vehicles. First, Japanese banks typically held substantial equity positions and therefore reductions in stock prices eroded bank capital levels, thereby constraining the supply of bank loans. Horiuchi and Shimizu (1998) perform an empirical study to analyze whether the slowdown of credit supply by banks was a result of deterioration of equity capital. They find that although the loss of equity reserves led to a substantial decline in Japanese banks' capital base, the major Japanese banks were able to rebuild their capital positions by issuing subordinated debt. Moreover, Ito and Sasaki (2002) examine 87 major Japanese banks and find that during the post Basel I period, Japanese banks issued additional subordinated debt in order to replenish their Tier 2 capital positions, although the decline in Japanese equity prices made it expensive for banks to raise their Tier 1 capital levels. In contrast, Kim and Moreno (1994) relate the reduction in bank lending during the mid-1980s to mid-1990s to declines in Japanese bank capital levels due to falling stock prices. Since capital requirements were becoming more stringent during this period (with the introduction of Basel I), the reduction in bank capital levels became a binding constraint on lending activities for Japanese banks. However, Kim and Moreno (1994) also note that falling equity prices in Japan may reflect deteriorating economic conditions that also would have reduced the demand for bank loans during the crisis period.

The reduction in Japanese bank lending during the Lost Decade has been linked to capital constraints imposed by regulatory capital requirements such as the introduction of Basel I. Montgomery (2005) uses a time series and panel data of internationally active and domestically active Japanese banks during the period 1982 to 1999, and investigates whether implementation of Basel I encouraged banks to move away from heavily risk-weighted assets like corporate bonds and loans to unweighted assets like government bonds. She concludes that total regulatory capital requirements did not cause shifts in the composition of bank portfolios. However, she finds that internationally active banks' asset portfolios were sensitive to Tier 1 capital requirements. Thus, Japanese bank capital levels declined as the falling stock market led to decreased equity reserves at the

same time as regulatory capital requirements increased, resulting in reduced bank lending activity.

A second and perhaps more substantial cause of the decline in Japanese bank lending was a structural shift in the banking industry that impacted profitability. Hoshi and Kashyap (1999) find that the deregulation during the 1980s played a major role in the structural shift in Japanese banking.[24] Deregulation allowed large corporations to switch their funding sources from more costly bank loans to less expensive capital market financing. However, deregulation did not offer new investment opportunities for consumer savings, and thus households continued depositing their savings in banks. Moreover, the deregulatory policies maintained constraints on bank lending activity, thereby preventing Japanese banks from moving out of traditional activities into new lines of business. These developments together meant that Japanese banks retained funds sources (i.e., core deposits), while losing much of their traditional large business lending base. Japanese banks, in their search for new borrowers, therefore, increased their lending to small businesses and real estate lending. This increased real estate lending fueled the real estate bubble that built up in Japan during the 1980s.

Further, Uchida and Nakagawa (2007) find evidence of irrational herding behavior among Japanese banks in the domestic loan market during the buildup of the credit bubble in Japan during 1987-1989. They estimate that 5 trillion yen of the increased lending by city banks was due to irrational herding during this period. Moreover, they find evidence that regional banks engaged in herding behavior throughout the 1975 to 2000 period. This is consistent with the findings of Hoshi, Kashyap and Scharfstein (1991) documenting incentive and information problems in Japanese capital markets, driven by the main (*keiretsu*) bank system that restricted lending activity to firms with ties to the industrial group. Moreover, Peek and Rosengren (2005) find evidence of a misallocation of credit in Japan. They examine bank-lending behavior over the 1993-1999 period and find evidence of Japanese bank lending to weak borrowers in order to avoid writing off the loans. This "evergreening" process of rolling bad loans over is most prevalent for firms that are affiliated to a main bank. Dinc (2006) also

[24] Although corporate bond issuance in Japan remained heavily regulated, the liberalization of foreign markets during the early 1980s allowed Japanese firms to issue bonds, particularly warrant bonds, outside of Japan. Moreover, commercial paper began trading in Japan in 1987. See Hoshi and Kashyap (1999).

argues that the prevalent practice in Japan of banks playing a major role in corporate governance of other firms has made it more difficult to monitor bank managers and their lending behavior.

Thus, when the real estate bubble burst in the 1990s, Japanese banks were exposed to large increases in loan losses. Ueda (1998) finds that the shift toward small business and real estate lending sector during the latter part of financial reorganization of the 1980s resulted in the large amounts of nonperforming loans in the 1990s when Japanese real estate prices collapsed. These loans losses led to declines in Japanese bank capital positions. Caballero, Hoshi and Kashyap (2008) argue that most large Japanese banks were only able to comply with capital standards because regulators were lax in their inspections, i.e., provided regulatory forbearance to Japanese banks. Dekle and Kletzer (2002) also highlight the importance of government policies, although they contend that government deposit guarantees and regulatory forbearance were unable to prevent declines in economic growth.

A possible shortcoming of empirical studies that focus either on capital constraints (credit supply) or economic declines (credit demand) to explain Japanese bank lending activity is the identification problem, i.e., supply and demand effects may concurrently explain the apparent decline in bank lending that coincided with the introduction of Basel I. Hancock, et al. (1995) attempt to disentangle the loan supply effect (due to shifts in regulatory capital requirements) from the loan demand effect (due to loan losses and an economic contraction that reduced loan demand) using a vector-autoregression model and find that banks adjust their capital positions much more quickly than they adjust their loan positions. Moreover, credit-constrained banks reduced their lending by greater amounts than well-capitalized banks, suggesting that some, but not all, of the explanation for the post-Basel I credit crunch in the US can be traced to regulatory restrictions.

Peek and Rosengren (2000) address the endogeneity problem by utilizing the decline in Japanese commercial real estate prices as a natural experiment to test the extent to which a loan supply shock can affect real economic activity. Since the Japanese banking crisis was an exogenous shock relative to the US banking market, they examine Japanese bank lending behavior in the US to see if it responded to the depletion in the

bank's capital levels. They find that nonperforming loans and declining capital positions led Japanese banks to reduce their lending activity in the US. Thus, they find that loan supply shocks (e.g., increased capital requirements and loan losses) detrimentally impact economic conditions and that Japanese banks rationally responded to incentives and reduced their lending activity. This paper builds on that result and disaggregates the response of Japanese banks to capital constraints by examining differential reactions across types of banks and lending activities.

We also build on the results of Hoshi and Kashyap (2009) and Giannetti and Simonov (2009). Hoshi and Kashyap (2009) highlight the similarities between government interventions in the Japanese banking crisis and the US financial crisis of 2007-2009. They note the limitations of regulatory policies aimed at recapitalizing Japan's banks so as to stimulate bank lending activity.[25] Giannetti and Simonov (2009) explore the impact on aggregate bank lending activity of the direct public injections of 1998, 1999 and 2003. Further, they explore the impact of government recapitalization on borrowing firms' abnormal stock returns, finding that leveraged firms that are dependent on banks for financing gained the most from government injections of capital into Japanese banks. In this paper, we extend Giannetti and Simonov (2009) by exploring the impact of all major public policy programs implemented in Japan during the banking crisis. That is, we investigate the impact on Japanese bank lending activity associated with accounting changes (via the land and equity valuation allowances), as well as differentiating between blanket and risk-based public injection programs.

Acharya and Richardson (2009) discuss the importance of marking to market to reflect leverage and risks accurately on a real time basis, particularly during crisis periods. The literature, so far, has been silent about the impact of these indirect intervention measures primarily because of a lack of data to investigate their role in bank lending activity. By hand collecting data on the Japanese land and equity revaluation allowances, we can measure the impact of mark-to-market accounting rule changes on bank lending activity so as to determine its effectiveness as a public policy prescription to address financial crises.

[25] Kashyap, Rajan and Stein (2008) also note some drawbacks of public injections in general as a traditional remedy to banking crises.

Montgomery and Shimizutani (2009) note that the effectiveness of public policy intervention is different for domestic and international Japanese banks, due to differences in bank capital requirements. However, the type of bank charter (domestic or international) is treated as exogenous. In this paper, we find that Japanese banks circumvent capital constraints by switching their charter designation from international to domestic. In order to measure the responsiveness of Japanese bank lending activity to public policy programs, one must control for this charter shifting behavior.

3. Data and Descriptive Statistics

We hand collect a sample consisting of the financial statements of Japanese banks grouped into city, trust, long-term and regional banks. The regional banks are further grouped into two sub-groups: regional banks and regional banks of the second tier popularly referred to as "regional 2 banks."[26] Our original sample consisted of 17 city banks, 7 trust banks, 2 long-term banks, and 134 regional banks (69 regional banks, and 65 regional 2 banks). We only consider those banks that continue to exist throughout our sample period, which extends from the fiscal year for 1992 (beginning on April 1, 1992 and ending on March 31, 1993), through the fiscal year for 2006 (April 1, 2006 through March 31, 2007). If a bank merged during the sample period, following the methodology of Hancock and Wilcox (1992) Bernanke and Lown (1991), we construct a hypothetical consolidated bank whose pre-merger value for any given variable is the sum of pre-merger values for the banks involved in the merger deal. For example, Mitsubishi Tokyo UFJ Bank was established as a result of a merger between Tokyo Mitsubishi Bank and the UFJ Bank on January 1, 2006. In our sample, the constructed Mitsubishi UFJ Bank represents the merged entity throughout our sample period. We then delete from our sample any banks that failed before 31st March 2007.[27] Correcting for mergers and failures, we obtain a clean sample comprising 4 city banks, 4 trust banks, 2 long-term credit banks and 107 regional banks (62 regional banks and 45 regional 2 banks).

[26] In Japan, the second tier (regional 2) banks were originally established as mutual banks and were regulated separately from regional 1 banks. On February 1, 1989, 52 of 68 mutual banks were transformed to Banking Act regional banks and designated regional 2.

[27] Survivorship bias is not a concern here because we measure whether healthy Japanese banks responded to public stimulus policies.

Our data sources are twofold: one based on the Nikkei NEEDS Japanese database and another that is hand collected. We obtain financial variables (e.g., loans outstanding by industry or sector) from the unconsolidated bank financial data recorded in the Nikkei NEEDS database. In our analysis, we focus on three loan categories classified in the literature as bank-dependent loans: commercial and industrial loans, non-residential real estate loans, and residential real estate loans (see Peek and Rosengren, (1999), Peek, Rosengren and Tootell (2003)). To capture a bank's lending behavior in the previous year, we include lagged values of the loans, denoted as (*TOTLOAN(-1), CILOAN(-1), NONRESLOAN(-1), RESLOAN(-1)*), summarized in the vector **LOANLAG**.[28] We summarize the list of dependent and explanatory variables in Table 3.

INSERT TABLE 3 HERE

Another major component of our analysis utilizes the variables measuring each bank's capital level. Japanese banks are required to report their Tier 1 and Tier 2 capital levels in their annual reports.[29] Thus, we hand collect these variables from Japanese bank financial statements. Moreover, we hand collect data on each bank's land and equity revaluation allowances, as well as the bank's loan losses. We obtained approximately one thousand annual reports of individual banks for each bank-year observation archived in the Bank Library run by the Japanese Bankers' Association. To fill in missing values, we obtained the banks' securities reports archived at Keio University library. Both types of reports are archived only in a hard copy format requiring us to manually generate the current database that we utilize in this study. For data in the period after 1999, we checked the hand collected data against the Nikkei NEEDS database. In the case of any discrepancy, we consulted with bank managers. In all such instances, the data reported in the individual bank annual reports matched the estimates provided by the bank managers, and thus we adopted the data from the annual reports. Our final sample contains 116 banks (4 city banks, 3 trust banks, 2 long-term credit banks and 107 regional banks) and 1,583 annual data points over the 1993 through 2007 period. The list of banks in our final sample is provided in the data appendix.

[28] To conserve degrees of freedom, we used a single lag in our past loan values similar to Hoshi and Kashyap (2009).

[29] Individual bank capital levels are only available on NEEDS after 1999. Moreover, equity and land revaluation allowances were not available on NEEDS and therefore had to be hand collected.

One of the critical components of any analysis involving a bank's lending behavior is to control for the macroeconomic factors affecting loan demand using several variables collected from the Japan Statistical Yearbooks. We specify the vector **DEMAND** that includes time varying macroeconomic variables. First, we use the annual growth rates of Japan's Gross Domestic Product (*GDP*); for city, trust and long term banks, we use national GDP, whereas for regional banks, we use prefecture level GDP where the prefecture is selected based on the location of the regional bank's headquarters. Further, we control for macroeconomic factors using the *Index of Business Conditions* (*BUSINDEX*) collected from the Annual Survey of Corporate Behavior. *BUSINDEX* is a survey of Japanese businesses' forecasts of the future growth rate in consumer demand over the next year and next five years. Another variable used to control for macroeconomic factors is the *Consumer Confidence Index (CONSINDEX)* collected from the Monthly Consumer Confidence Survey in which urban consumers throughout Japan are asked to forecast their confidence about the economic conditions, particularly regarding their income growth and willingness to buy durable goods in future months and years. Both *BUSINDEX* and *CONSINDEX* are provided by the Economic and Social Research Institute of Japan. Finally, we include a set of annual dummy variables (*TIME DUMMIES*) summarized by the vector **YEAR** to control for the year-to-year variations in macroeconomic conditions and general economic environment.

CAPREQ is a vector summarizing each bank's capital position. While the reported Basel capital ratio provides a measure of a bank's capital position, to capture a bank's overall capital constraint, we include the difference between the reported Basel capital ratio and the target Basel capital ratio (*BISDIF*). A negative value indicates that a bank's reported capital ratio falls short of the target ratio mandated by the Basel Accord (8% for international banks) or the Ministry of Finance (4% for domestic banks), and therefore the bank is considered to be capital constrained. A value of zero or a positive value of the BISDIF variable indicates a bank meets or exceeds the target capital requirement.

In addition to the overall capital requirement, **CAPREQ** also includes variables consisting of Tier 2 regulatory capital forbearance policies, *LANDREVAL* (*EQREVAL*), which are measured as the allowances for land and equity securities revaluation divided

by total assets.[30] In addition, we include two variables that measure public injections: *BLANKETPUBINJ* and *RISKBASEDPUBINJ*. The former is calculated as the amount of public injections in 1998 as a share of total assets. The latter includes the amount of public injections in year 1999 and thereafter as a share of total assets. In Japan, the two major phases of public injections were initiated in 1998 and in 1999. However, we find that the 1998 program was poorly conceived in comparison to the 1999 injection. In the blanket program initiated in 1998, all major banks applied for and received an equal amount of capital that was fixed at a maximum of 100 billion yen. This amount was set in consultation with the then healthiest bank, Bank of Tokyo Mitsubishi. Hence as Hoshi and Kashyap (2009) argue, the maximum amount disbursed (1.8 trillion yen) was far less than the amount needed to restore bank capital.

In comparison, the 1999 injection was much larger (7.5 trillion yen) and it was given after the Financial Reconstruction Commission (FRC) evaluated each bank's application to ascertain whether the amount requested would be enough to cover each bank's non-performing loan problem.[31] Since 1999, the government has periodically propped up troubled, systemically important banks[32] with varying amounts of public injections although the aggregate amount is far less than the 1999 program (see Table 2).

INSERT TABLE 4 HERE

Descriptive statistics for the variables in our analysis are presented in Table 4, Panel A. Public injections were, on average, lower than the indirect infusions provided by equity revaluations or land revaluations. The public injections of 1998 averaged 0.003% of assets across all banks in our sample. The public injections in 1999 and thereafter were substantially bigger in size, averaging 0.025% across all the banks. In contrast, equity (land) revaluations averaged 0.29% (0.18%) of bank assets. This is partly due to the fact that public injections were limited to the major banks (city, trust and long-

[30] We utilize total assets as the denominator to normalize each bank's capital position as a basis of comparison, because risk-adjusted assets are not available for all banks.

[31] Hoshi and Kashyap (2009) state that the increase in size of public injections in 1999 was the result of the Japanese government's rigorous assessment of the banks' non-performing loans, thereby allowing them to better assess each bank's needs.

[32] The Act of Strengthening Financial Functions passed in 2004 allowed the Japanese government to inject funds into the banking system in 2007 (fiscal year 2006) without having to justify their systemic importance. However, since our sample ends in 2007 we do not utilize the 2007 public injections in our analysis. Thus, for our sample, all *RISKBASEDPUBINJ* in 1999 and thereafter are based on each bank's risk exposure and loan losses.

term) with only a handful of regional banks receiving capital infusions. Thus, public injections covered a limited number of banks in our sample, although for those banks, the amount of capital infusions was quite substantial – with a maximum capital injection of 4.8% of the bank's assets as compared to the maximum equity and land revaluation of 2.5% and 0.95% of assets, respectively.[33] However, another difference between direct public injections and the revaluation allowances is that the latter represented permanent, on-going infusions, whereas the public capital infusions were one-time episodes. Figure 1 compares the magnitudes of each of the public policy interventions across all Japanese banks.

INSERT FIGURE 1 AROUND HERE

In our model, we utilize the following bank characteristic control variables. **BANK** is a vector of bank specific variables that summarize the health of a particular bank under consideration. We include log of assets (*ASSET*) as a measure of bank size, and dummy (0, 1) variables that specify the type of a bank: city bank (*CITY*), trust bank (*TRUST*) long-term credit bank (*LONG-TERM*), regional bank (*REGIONAL*). The binary variable for the fifth category, regional 2 banks, is omitted. Moreover, we include a binary variable (*DOMESTIC*) to capture a bank's operational jurisdiction, such that *DOMESTIC* takes a value of 1 if a bank only has domestic operations and 0 if the bank has international operations in any given year. We also include a measure of loans made to failed enterprises as a share of the bank's beginning of the period asset (*LOANLOSS*).[34]

We follow Peek and Rosengren (2005) and specify the model of bank lending activity as a function of macroeconomic conditions, bank characteristics, public policy interventions and capital regulations as follows:

$$((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_5 CAPREQ_{i,t-1} + u_{i,t} \quad (1)$$

[33] In terms of coverage, land revaluations were broadest in scope being applicable to all Japanese banks, whereas only banks with international operations could take equity revaluations.

[34] The annual reports for the banks provide three possible measures of loan losses: loans to failed enterprises, loans whose interest payments have been suspended and loans whose interest payments have been suspended 3 months or more. While the data on the first category is available for the entire sample period, the data on the last two categories are only available since 1995 for all the banks in our sample. Given this restriction, we use loans to failed enterprises as a measure of loan losses incurred by a bank.

The dependent variable is the change in outstanding loans of a bank *i* to sector *j* between the periods *t* and *t-1* normalized by the total assets of bank *i* as of period *t-1*.[35] In our analysis, we consider four categories of dependent variables: aggregate loans (*TOTLOAN*), commercial and industrial loans (*CILOAN*), non-residential real estate loans (*NONRESLOAN*) and residential real estate loans (*RESLOAN*). On average, commercial and industrial loans, non-residential real estate loans and residential real estate loans jointly comprise 40% of total loans of the banks in our sample. Descriptive statistics of the sectoral allocation of loans is outlined in Table 3, Panel B. The largest loan segment for Japanese banks is residential real estate loans, although there is considerable commercial and industrial lending and non-residential real estate lending. We estimate the model over the 1993-2007 period.

4. Empirical Results

4.1. The Efficacy of Japanese Public Policy Interventions

INSERT TABLE 5 AROUND HERE

We test the impact of the three regulatory capital policy interventions using the variables *RISKBASEDPUBINJ, BLANKETPUBINJ, LANDREVAL* and *EQREVAL*. Table 4 presents the fixed effect regression results of the model specified in equation (1). Each column of Table 4 represents the estimation using each of the four dependent variables – total loans, commercial and industrial loans, non-residential mortgages and residential mortgage lending. The heteroskedasticity-robust standard errors are reported in the parentheses and are calculated using the Panel Corrected Standard Errors (PCSE) methodology suggested by Beck and Katz (1995). The results indicate that *RISKBASEDPUBINJ* had a significantly positive impact on aggregate bank lending across all loan types. The coefficients indicate that a 1% increase in the risk-based public injections received stimulate net outstanding loans (as a share of assets) by approximately 0.01% (coefficient significant at 1%). In contrast, the results from the across the board

[35] Because of the absence of data on new lending flows, we utilize the net change in outstanding loans in our analysis. Note that the relationship between change in outstanding loans and new loans can be expressed as New Loans = Change in outstanding loans + Charge offs + Transfer of real estate loans to other real estate owned due to foreclosures + Loan sales (refer to Peek and Rosengren 1995 for details). Examination of the change in bank portfolio holdings is appropriate since our focus is on regulatory capital constraints.

public injections *BLANKETPUBINJ* variable actually suggest that total bank lending declined.

In terms of sector-specific effects, risk-based public injections were most successful in stimulating commercial and industrial lending (coefficient positive and significant at 1%). The impact on loans made to non-residential real estate and the real estate sector is also positive though the coefficient is not significant at the 5% level.[36] In contrast, blanket public injections had no statistically significant impact on lending in any of the three sectors. Thus, the poorly designed public policy program of blanket injections applied to a small number of banks in 1998 was unsuccessful in accomplishing its goal of stimulating bank lending, although the program of risk-based capital infusions stimulated bank lending activity.[37] Thus, the results of our analysis presented in Table 5 show that risk-based direct infusions of capital had a stimulative effect on aggregate lending, as well as on each sector of lending[38].

In contrast, the size of both the equity and land revaluation allowances had no overall impact on aggregate lending – see column (1) of Table 5. However, the land revaluation allowance had an allocative effect, as shown in columns (3) and (4) of Table 5. Japanese banks increased their non-residential real estate lending and decreased their residential real estate lending (statistically significant at the 5% level or better) in response to the regulatory forbearance offered by Tier 2 capital infusions through land revaluation allowances.[39] Thus, Japanese banks did not expand their overall lending activity, but shifted from the residential mortgage sector to the non-residential real estate sector in response to regulatory capital arbitrage incentives[40].

[36] The coefficient on non-residential real estate loans is significant at 10%.
[37] The effectiveness of the 1999 capital infusion policy is due to both the methodology (risk-based) and the size (over $76 trillion yen). When the post-1999 capital infusions are analyzed separately from the 1999 program, we find increases in aggregate and sectoral lending activity, although the statistical significance is lower.
[38] Our results on aggregate lending are consistent with a recent study by Giannetti and Simonov (2009) finding that the risk-based public injections had a statistically significant positive impact on aggregate lending whereas the effect of the blanket injection is not significant.
[39] There is a slight increase in commercial and industrial lending, although it is not statistically significant at the 10% level.
[40] This sectoral reallocation of loans is consistent with the *debt concentration effect* postulated by Gande et. al. (2008). However, our micro evidence finds this effect in case of implicit bailouts engineered by the Land Revaluation Law rather than a direct bailout in the form of direct public injections.

Our regression results presented in Table 5 also indicate that the coefficient on *BISDIF*, each bank's excess over its capital requirement is statistically significant (at the 5% level or better) and positive for aggregate lending, and commercial and industrial loans, but was significantly negative (at the 5% level) for residential real estate loans. This demonstrates the reallocation of lending activity that is driven by bank capital constraints. Residential real estate lending is subject to lower capital requirements (50% risk weight) as compare to commercial and industrial lending (100% risk weight). Thus, Japanese banks that were more capital constrained (i.e., *BISDIF* is lower) reduced their business lending and shifted toward residential mortgage lending. In contrast, banks with excess capital (i.e., *BISDIF* is higher) reallocated their lending activity away from residential mortgages toward business lending. Moreover, the coefficient on *LOANLOSS* was statistically significant (at the 1% level) and negative for all loan types except residential real estate (for which the coefficient is positive, albeit not significant), consistent with the inability of banks with high loan losses to increase their aggregate lending. The significant (at the 1% level) and positive coefficient on lagged total lending (e.g., the *TOTLOAN(-1)* variable) is consistent with Japanese banks' rolling over of past due loans into future loans in order to avoid loan write-downs (see Section 2.2).

4.2 Controlling for Endogeneity

The results, presented in Table 5 obtained by estimating our basic model, equation (1), suggest that Japanese bank lending activity was capital constrained. That is, Japanese bank capital levels impacted the banks' lending behavior either in terms of the aggregate lending activity or in terms of their allocation across lending sectors. However, this result may be impacted by endogeneity. As discussed in Section 2, Japanese bank capital regulations are bifurcated depending upon whether the bank has international operations or not. More lenient capital standards are required of domestic banks as compared to Japanese banks with international operations. This dichotomy was retained even as Japan adopted the Basel capital standard, since some elements of the capital requirements were applied to banks with international branches and not to banks with only domestic operations. Banks with only domestic operations must comply with only a 4%, rather than the 8% minimum capital requirement for international banks.

INSERT TABLE 6 and 7 AROUND HERE

Table 6 shows that on average domestic banks with lower capital requirements had larger excess capital positions than international banks. Thus, in order to reduce their regulatory capital requirements, many Japanese banks switched from an international charter to a domestic only charter by relinquishing their foreign activities. Table 7 shows the extent of switching by Japanese banks during the banking crisis. This switching was endogenous to Japanese banks' attempts to deal with the financial crisis by reducing their regulatory capital constraints. To examine bank reactions to the regulatory intervention policies of the Japanese government, we model the endogenous decision to switch bank charter as a mechanism to relax regulatory capital constraints.

We hypothesize that banks with capital deficiencies were more likely to switch their charter. However, some of the public policy programs for international and domestic Japanese banks involved Tier 2 capital rather than Tier 1 capital. For example, the equity revaluation allowance represented an infusion of Tier 2 capital only into Japanese banks with international operations. Moreover, the land revaluation allowance represented a Tier 2 capital infusion for any Japanese bank that had positive land revaluations. However, this capital infusion would relax capital constraints only if the bank had no unused Tier 2 capital available – i.e., if the bank was Tier 2 capital-constrained. Under the Basel Accords, Tier 2 capital must be less than or equal to Tier 1 capital. Thus, a bank cannot use Tier 2 capital to meet more than the 4% minimum Basel requirement for Japanese banks with international operations or 2% for domestic Japanese banks. Table 8 shows that unused Tier 2 capital cushion was low on average, and therefore a potentially binding constraint on exploiting the land and equity revaluation allowances. Moreover, this constraint was most binding for international banks, which had higher unused Tier 2 capital positions than did domestic banks.[41] We therefore control for unused Tier 2 capital in our analysis.

INSERT TABLE 8 AROUND HERE

We calculate the amount of unused Tier 2 capital (*UNUSEDTIER2*) by subtracting the amount of Tier 2 capital designated as meeting the bank's Basel capital requirement from the total amount of a bank's Tier 2 capital, i.e., all securities eligible for

[41] This constraint was released, in part, by international banks' switching of their charters to domestic banks. See Table 7.

classification as Tier 2 capital minus Tier 2 capital actually used. The *UNUSEDTIER2* variable is normalized using the beginning of the period assets for each bank. The minimum value that this ratio can take is zero. A value of zero indicates that a bank has used all of its available capital that qualifies as Tier 2 in satisfying its capital requirements. A positive value for *UNUSEDTIER2* implies that the bank had excess Tier 2 capital that did not qualify for compliance with the Basel Capital Accord. The higher the value, the more constrained the bank is with regard to having sufficient Tier 1 capital to absorb all available Tier 2 capital. For example, if an international bank has Tier 2 capital of 5% of assets, but Tier 1 capital of only 3% of assets, then the bank's regulatory capital is deficient even though it has met the 8% total regulatory capital. Since Basel capital regulations require that Tier 1 capital be greater than or equal to Tier 2 capital, the bank's total capital position would be only 6% (3% of Tier 1 and 3% of Tier 2) and 2% of its Tier 2 capital would be unused. Such a bank may find it advantageous to switch its charter to a domestic only bank so as to reduce its capital requirement to 4% and therefore be in compliance with regulatory capital standards. Thus, *UNUSEDTIER2* is an important variable determining whether the bank would have changed its charter to circumvent stricter capital requirements. Table 8 shows the breakdown of *UNUSEDTIER2* for international and domestic Japanese banks.

In order to analyze the decision to switch bank charter to a domestic only bank, we utilize a probit model in a two-stage instrumental variables setting. The probit model is:

$$\Pr(Switcher_{i,t} = 1 \mid \overline{X}) = a_0 + a_1 \mathrm{BANK}_{i,t-1} + a_2 \mathrm{DEMAND}_{t-1} + a_3 \mathrm{YEAR}_t + a_4 \mathrm{LOANLAG}_{i,t-1} + a_5 \mathrm{CAPREQ}_{i,t-1} + a_6 \mathrm{INSTRUMENT}_{i,t-1} + u_{i,t} \quad (2)$$

where $\overline{X}$ denotes the vector of explanatory variables on the right hand side of equation (2). The dependent variable has a value of 1 in the years during and after a bank's switching its charter, and 0 in the years before a bank switches its charter, or throughout the period if the bank does not change its charter at all during the sample period. The explanatory variables summarized in the vectors **BANK, DEMAND, YEAR, LOANLAG** and **CAPREQ** are summarized in Section 3.

In addition, we include the vector **INSTRUMENT** that summarizes the set of instrumental variables used. We utilize three instrumental variables: *UNUSEDTIER2*,

*UNUSEDTIER2*EQREVAL*, and *UNUSEDTIER2*LANDREVAL*. These variables are chosen because the Tier 2 capital constraint is most relevant in determining whether the bank switched its charter to take advantage of the Japanese government's regulatory forbearance policies of the land and equity revaluations. These policies did not impact Tier 1 capital, although the total capital constraint is incorporated into the model using the *BISDIF* variable. To further justify our choice of instruments, Table 9 presents the correlation matrix. *UNUSEDTIER2* is positively correlated with the switching decision (significant at the 1% level), but is uncorrelated with all of the loan sector variables. Thus, we utilize the *UNSEDTIER2* along with *UNUSEDTIER2*EQREVAL* and *UNUSEDTIER2*LANDREVAL* (the two cross-product variables) as instruments.[42]

INSERT TABLES 9 and 10 AROUND HERE

Table 10 presents the first stage results of the probit analysis. The dependant variable is a binary variable, *SWITCHER*, which takes on a value of one if the bank switches from an international to domestic only charter, zero otherwise. The results of the probit analysis of the bank charter switch decision are consistent with switching by large, relatively well-capitalized banks in economically growing regions. That is, only if the bank's capital was within reach of meeting the capital requirements would the charter switch be effective, as indicated by the positive and significant (at the 1% level) coefficient on the *BISDIF* variable measuring the Basel capital ratio. Consistent with this decreased switching propensity for banks with greater deviations (either high or low) from bank capital requirements, banks with higher amounts of loan losses are less likely to switch (negative and significant (at the 1% level) coefficient on *LOANLOSS*).

Most importantly, the first stage probit results shown in Table 10 suggest that only those banks that could not benefit from the land and equity revaluations (i.e., they have *UNUSEDTIER2* capital) were most likely to switch charters. First, the positive and significant (at the 1% level) coefficient on *UNUSEDTIER2* variable shows that the greater the Tier 2 capacity, the greater the probability of a switch in charter. In addition, the positive and significant (at 5% level or greater) coefficient on *LANDREVAL* and *UNSEDTIER2*LANDREVAL* highlights the fact that banks with larger land revaluations

[42] *BISDIF* measures the overall capital effect in terms of the bank's deviation from Basel capital requirements. However, because the *BISDIF* variable is positively correlated with the amount of commercial and industrial loans directly (see Table 7), we cannot use it as an instrumental variable.

had no qualms about switching charter as they were allowed to utilize land revaluation excesses even under domestic charter. The propensity to switch charter for these banks was reinforced further if they had unused Tier 2 capital. In contrast, the negative and significant (at the 1% level) coefficient on the *UNUSEDTIER2*EQREVAL* variable suggests that banks with large equity revaluation allowances are less likely to switch to a domestic charter since they could only use this regulatory capital forbearance if they have Tier 2 capacity available *and* if they have international operations. Thus, the probit analysis shows that bank capital regulations impacted Japanese banks' decisions to switch their operations from international to domestic only.

In order to measure the impact of public policy interventions during the Japanese banking crisis, while controlling for the endogenous decision to switch charters, we estimate a two-stage system that incorporates the endogenous charter switch model equation (2), into a second stage regression as follows:

$$((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_5 CAPREQ_{i,t-1} + a_6 SWITCHER_{i,t-1} + u_{i,t} \quad (3)$$

The dependent variable is regressed on the control variables as outlined in (1) and the variables outlined in the vector **SWITCHER**. Following Wooldridge (2006), the two-stage least square methodology regresses the dependent variable on the controls and the predicted value of the **SWITCHER**[43] as estimated in equation (2).

INSERT TABLE 11 AROUND HERE

The two-stage model results are presented in Table 11. Similar to the earlier fixed effect regression results (Table 5), the blanket public injections in 1998 have a negative effect on aggregate lending. In contrast, risk-based public injections had a strong positive impact on aggregate lending as well as across the sectors. Moreover, the accounting rule changes (equity and land revaluations) have no impact on aggregate bank lending activity. Instead, only the land revaluation allowances have an allocative effect on bank lending, inducing a shift from residential to non-residential lending activity. These results are consistent with the OLS results presented in Table 5.

Endogenizing the switching decision demonstrates how Japanese banks exploited capital requirements. Both the OLS (Table 5) and two-stage (Table 11) results show that

[43] We would like to thank William Greene for suggesting this step in our methodology.

well-capitalized banks shifted from residential loans to commercial loans, and were able to increase their aggregate lending activity. In contrast, Japanese banks with large loan losses were forced to reduce their lending activity. Thus, our results are robust across model specifications, and suggest that Japanese bank capital levels, as indicators of bank solvency, impacted bank lending activity. Thus, public policies that stress bank solvency, as in the risk-based public injections that covered bank loan losses, were most efficacious in stimulating banking activity.

5. Conclusion

We utilize a unique, hand-gathered database of individual Japanese bank financial statements in order to assess whether three major regulatory capital interventions stimulated bank-lending activity during Japan's banking crisis. We find that public injections of capital into systemically important Japanese banks had a stimulative impact on bank lending, provided that the injections were based on each bank's loan losses and insolvency risk exposure.

Indirect intervention policies via accounting adjustments, such as land and equity revaluation allowances, did not have an impact on aggregate lending activity. However, the land revaluation allowance, which was substantial in size and applied to all Japanese banks, had an allocative effect on bank lending activity. That is, allowing the banks to declare past increases in land prices as a permanent component of Tier 2 capital enabled Japanese banks to shift their lending from residential mortgage lending to commercial lending and nonresidential real estate lending. This redistributive effect was exacerbated for banks that switched their charter from international to domestic only, thereby relaxing their Tier 2 regulatory capital constraints and allowing them to benefit from land revaluation allowances. Since these allowances were applied to all banks, they had a significant redistributive effect, whereas the restricted equity allowances (applied only to banks with international operations) did not.

We draw parallels with regulatory capital policies in the US, as well as provide a detailed survey of regulatory policies in Japan. Our results suggest that regulatory capital policies can be successfully used to stimulate overall economic activity if they are targeted to each individual bank's risk exposure. In a crisis, half measures are ineffective

and can actually be detrimental. Public policy programs must be substantial in size and carefully applied.

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Table 1: Summary of Japanese Bank Capital Requirements

	Until March 1997	From March 1998
International	· Banks are subject to the minimum standard of 8% with respect to the risk weighted Basel capital adequacy. · Unrealized gains on securities are included in Tier 2. · Net deferred tax assets are not included in regulatory capital.	· Banks are subject to the minimum standard of 8% with respect to the risk weighted Basel capital adequacy. · Unrealized gains on securities are included in Tier 2. · Land revaluation is included in Tier 2. · Net deferred tax assets are included in Tier 1.
Domestic	· Banks are subject to the minimum standard of 4% with respect to the simple leverage ratio (not risk adjusted). · Unrealized gains on securities are not included in regulatory capital. · Net deferred tax assets are not included in regulatory capital.	· Banks are subject to the minimum standard of 4% with respect to risk-weighted Basel I.. ·Unrealized gains on securities are not included in Tier 2. · Land revaluation is included in Tier 2. · Net deferred tax assets are included in Tier 1.

Table 2: Direct Public Capital infusions in Japan (Data is in 100 million yen)

Bank type	Bank name	Preferred stocks	Subordinated debts	Total
Panel A: Capital infusions during 1998				
City Banks	Dai-ichi Kangyo	990	0	990
	Sakura	0	1,000	1,000
	Fuji	0	1,000	1,000
	Mitsubishi	0	1,000	1,000
	Asahi	0	1,000	1,000
	Sanwa	0	1,000	1,000
	Sumitomo	0	1,000	1,000
	Daiwa	0	1,000	1,000
	Tokai	0	1,000	1,000
Trust Banks	Mitsui Trust	0	1,000	1,000
	Mitsubishi Trust	0	500	500
	Yasuda Trust	0	1,500	1,500
	Toyo Trust	0	500	500
	Chuo Trust	320	280	600

	Nippon Trust	0	0	0
	Sumitomo Trust	0	1,000	1,000
Long-term Credit Banks	Industrial Bank of Japan	0	1,000	1,000
	Long-Term Credit Bank of Japan	1,300	466	1,766
	Nippon Credit Bank	600	0	600
Regional Banks	Ashikaga	0	300	300
	Yokohama	0	200	200
	Hokuriku	0	200	200
Total		3,210	14,946	18,156

Panel B: Capital infusions during 1999

City Banks	Dai-ichi Kangyo	7,000	2,000	9,000
	Sakura	8,000	0	8,000
	Fuji	8,000	2,000	10,000
	Asahi	4,000	1,000	5,000
	Sanwa	6,000	1,000	7,000
	Sumitomo	5,010	0	5,010
	Daiwa	4,080	0	4,080
	Tokai	6,000	0	6,000
Trust Banks	Mitsui Trust	2,503	1,500	4,003
	Mitsubishi Trust	2,000	1,000	3,000
	Toyo Trust	2,000	0	2,000
	Chuo Trust	1,500	0	1,500
	Sumitomo Trust	1,000	1,000	2,000
Long-term Credit Banks	Industrial Bank of Japan	3,500	2,500	6,000
Regional	Yokohama	1,000	1,000	2,000
Total		61,593	13,000	74,593

Panel C: Capital infusions during 2000

Long-Term Credit Bank	Long-Term Credit Bank of Japan	2,400	0	2,400
Regional	Hokkaido	450	0	450
	Ashikaga	1,050	0	1,050
	Hokuriku	750	0	750
	Ryukyu	400	0	400
Regional 2	Hiroshima Sogo	200	200	400
	Kumamoto Family	300	0	300
Total		5,550	200	5,750

Panel D: Capital infusions during 2001				
Long-term credit	Aozora Bank	2,600	0	2,600
Regional	Chiba Kogyo	600	0	600
Regional 2	Higashinippon	200	0	200
	Kofuku	80	40	120
	Yachiyo	350	0	350
Total		3,830	40	3,870
Panel E: Capital infusions during 2002				
Regional	Kinki Osaka	600	0	600
Regional 2	Gifu	120	0	120
	Wakayama	120	0	120
	Fukuoka City	700	0	700
	Kyushu	300	0	300
Total		1,840	0	1,840
Panel F: Capital infusions during 2004				
City	Resona	19,600	0	19,600
Regional	Kanto Tsukuba	0	60	60
Total		19,600	60	19,660
Panel G: Capital infusions during 2007				
Regional	Kiyo	315	0	315
Regional 2	Howa	90	0	90
Total		405	0	405

TABLE 3: Summary of the explanatory variables We provide a summary of the explanatory variables that are included in our regressions summarized in the three equations outlined below. Note that the variables have been grouped into vectors according to their role in affecting bank-lending behavior.

(1) $((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_4 CAPREQ_{i,t-1} + u_{i,t}$

(2) $\Pr(Switcher_{i,t} = 1 | \overline{X}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 CAPREQ_{i,t-1} + a_5 INSTRUMENT_{i,t-1} + u_{i,t}$

(3) $((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 CAPREQ_{i,t-1} + a_5 SWITCHER_{i,t-1} + u_{i,t.}$

This table extends to the next page.

DEPENDENT VARIABLES		
VARIABLE NAME	**DESCRIPTION**	
TOTLOAN	Net change in outstanding total loans as a share of beginning of the period assets.	
CILOAN	Net change in outstanding commercial and industrial loans as a share of beginning of the period assets.	
NONRESLOAN	Net change in non-residential real estate loans as a share of beginning of the period assets.	
RESLOAN	Net change in residential real estate loans as a share of beginning of the period assets.	
EXPLANATORY VARIABLES		
VECTOR	**VARIABLES INCLUDED IN THE VECTOR**	**DESCRIPTION**
BANK	ASSET	Log of beginning of the period assets
	CITY	A binary variable that takes the value "1" for city banks, and "0" otherwise
	TRUST	A binary variable that takes the value "1" for trust banks, and "0" otherwise
	LONG-TERM	A binary variable that takes the value "1" for long-term banks, and "0" otherwise
	REGIONAL	A binary variable that takes the value "1" for regional banks, and "0" otherwise
	DOMESTIC	A binary variable that takes the value "1" for banks with a domestic charter, "0" otherwise
	LOANLOSS	Loans to failed enterprises as a share of beginning of the period assets
DEMAND	GDP	Percentage changes in the annual Gross Domestic Product. For city, trust and long-term banks, we look at national GDP, for regional banks we look at the prefecture level GDP where the bank is headquartered.
	BUSINDEX	Index of Business Conditions,
	CONSINDEX	Consumer Confidence Index
YEAR	Annual time dummies	Binary variables for each of the years in the sample
LOANLAG	TOTLOAN(-1)	Change in total outstanding loans as a share of beginning of the period assets, lagged one period.
	CILOAN(-1)	Change in outstanding commercial and industrial loans as a share of beginning of the period assets, lagged one period.
	NONRESLOAN(-1)	Change in outstanding non-residential real estate loans as a share of beginning of the period assets, lagged one period

	RESLOAN(-1)	Change in outstanding residential real estate loans as a share of beginning of the period assets, lagged one period.
CAPREQ	BISDIF	Difference between the reported Basel capital ratio and the target Basel capital ratio
	BLANKETPUBINJ	Public injections in 1998 as a share of beginning of the period assets
	RISKBASEDPUBINJ	Public injections in 1999 and thereafter as a share of beginning of the period assets
	EQREVAL	Unrealized gains on equity as a share of beginning of the period assets
	LANDREVAL	Unrealized gains on land holdings as a share of beginning of the period assets
SWITCHER	SWITCHER	Binary variable that takes a value "1" in the years during and after a bank's switching its charter, and "0" in the years before a bank switches its charter, or throughout the period if the bank does not change its charter at all during the sample period
INSTRUMENTS	UNUSEDTIER2	Unused tier 2 capital calculated as the difference between the capital that qualifies as tier 2 and the amount of capital actually included as tier 2 in calculating the capital adequacy ratio. The variable is expressed as a share of beginning of the period assets.
	UNUSEDTIER2*EQREVAL	Cross product of UNSEDTIER2 and EQUITY REVALUATION
	UNUSEDTIER2*LANDREVAL	Cross product of UNSEDTIER2 and LAND REVALUATION

Table 4: Descriptive Statistics - The sample of comprises of 4 city banks, 3 trust banks and 2 long-term banks, 62 regional banks and 45 regional banks that belong to the second tier. Mean, Median, Standard deviation, Maximum and Minimum is calculated over the sample period 1993 to 2007. The data on public injections begin in 1998 when the first round of public injections took place. The public injections were targeted at the major banks (city, trust and long-term) and only a few regional banks were the beneficiaries. The data on land revaluation is available from 1999 when most banks that availed of the Law Concerning the Revaluation of Land updated their balance sheets to reflect land revaluation. From a balance sheet perspective, public injections and land revaluations are taken as zero for the preceding years. Equity revaluations, on the other hand, have been allowed in Japan to be calculated as a part of bank capital since the adoption of the Basel Accord in 1988. However, while both international and domestic banks are allowed to count land revaluations as a part of tier II capital, only international banks have the option of including equity revaluation in their calculation of tier II capital. Hence for the domestic banks and the banks that switched charter to domestic any time during our sample period, equity revaluation is counted as zero.

	Mean	**Median**	**Standard Deviation**	**Max**	**Min**	**Number of Observations**
PANEL A: The descriptive statistics of explanatory variables used in our regressions						
ASSET (in log)	14.57	14.53	1.21	19.06	12.3	1740
GDP (percentage change from previous year	1.35%	1.37%	1.99%	8.46%	-5.03%	1740
CONSINDEX	92.7	91.1	5.76	102	81.3	1740
BUSINDEX	.87	1	.81	1.8	-1.1	1740
LOANLOSS (as a share of beginning of the period asset)	.6%	.45%	.68%	12.4%	0%	1632
BISDIF (in percentage)	3.26%	3.26%	2.66%	17.13%	-7.23%	1657
BLANKETPUBINJ (as a share of beginning of the period asset	.003%	0.00%	.038%	1%	0.00%	1740
RISKBASEDPUBINJ (as a share of beginning of the period asset	.025%	0.00%	.24%	4.78%	0.00%	1740
EQREVAL (as a share of beginning of the period asset)	.29%	0.00%	.53%	2.49%	0.00%	1740
LANDREVAL (as a share of beginning of the period asset)	.18%	0.00%	.17%	.95%	0.00%	1740
DOMESTIC (binary variable)	.69	1	.47	1	0	1740
SWITCHER (binary variable)	.33	0	.47	1	0	1740
UNUSEDTIER2 (as a share of beginning of the period asset)	.27%	0.00%	2.77%	6.25%	0.00%	1738
UNSEDTIER2*EQREVAL	.046%	0.00%	.69%	1.58%	0.00%	1738
UNUSEDTIER2*LANDREVAL	.014%	0.00%	2.46%	0.00%	.08%	1738
PANEL B: Distribution of Loans (as a percentage of total loans)						
CILOAN	13.38%	13.06%	5.35%	31.66%	1.28%	1740
NONRESLOAN	10.08%	9.09%	5.05%	56.79%	2.03%	1740
RESLOAN	16.2%	15.22%	8.48%	69.97%	3.06%	1718

Figure 1: Direct Public Injections, Equity Revaluation and Land Revaluation as a percentage of assets during the sample period 1993-2007-We plot the amount of total public injections, equity revaluations and land revaluations as a percentage of assets for each Japanese bank in our sample.

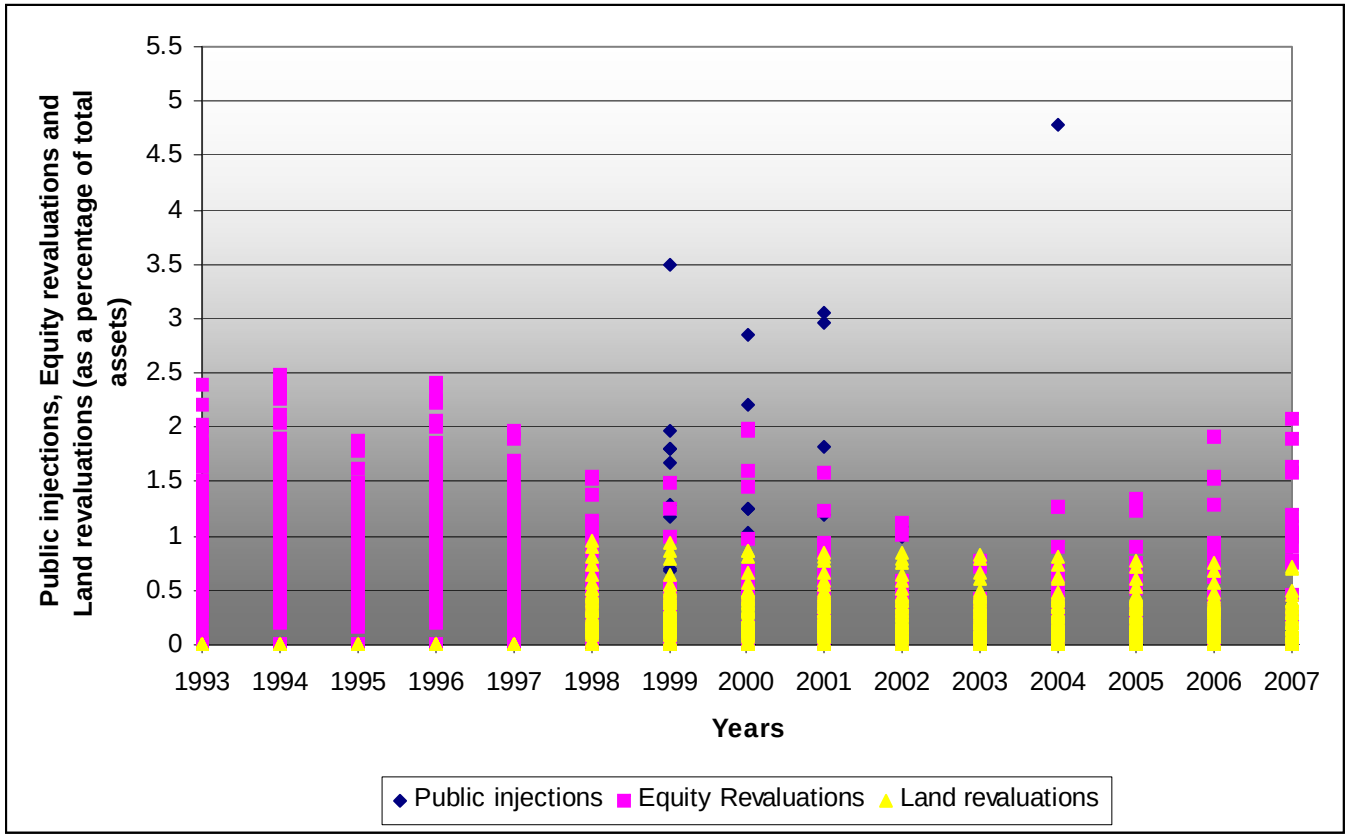

Table 5: Fixed Effect Estimation of the effect of regulatory capital remedies on changes in outstanding loans- The dependent variables in our regressions are the changes in outstanding loans, aggregate and by sectors, as a share of beginning of the period asset. We use fixed effect regression techniques and run the following regression: $((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2\ DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_4\ CAPREQ_{i,t-1} + u_{i,t}$
The variables list is summarized in Table 3. Our estimation also controls for bank-type dummies, annual dummies and the bank operations dummy that controls for the area of bank operations-international or domestic, though the coefficients are not shown in the table. The heteroskedasticity-consistent standard errors are in parentheses. *, **, *** indicate significance at 10%, 5% and 1% levels respectively.

	TOTLOAN	**CILOAN**	**NONRESLOAN**	**RESLOAN**
CONSTANT	-0.08	-0.007	-0.005	-0.024
	(0.097)	(0.025)	(0.022)	(0.03)
ASSET	-0.0042***	-0.0003**	-0.001***	0.0001
	(0.001)	(0.0002)	(0.0002)	(0.0002)
GDP	0.0003	.00004	.000003	.00003
	(0.0002)	(.00006)	(.00006)	(.00008)
CONSINDEX	0.0008	0.0002	.00009	0.0002
	(0.0007)	(0.0002)	(0.0002)	(0.0002)
BUSINDEX	0.047**	-0.003	0.006	0.003
	(0.019)	(0.005)	(0.004)	(0.006)
LOANLOSS	-0.012***	-0.001***	-0.001***	.00008
	(0.0013)	(0.0003)	(0.0003)	(0.0003)
BISDIF	0.001**	0.0002***	.00007	-0.0002**
	(0.0003)	(.00006)	(.0006)	(.0001)
TOTLOAN(-1)	0.252***	0.014**	0.012**	-0.0008
	(0.026)	(0.006)	(0.006)	(0.007)
CILOAN(-1)	-0.002	0.045	0.0014	0.003
	(0.04)	(0.029)	(0.008)	(0.007)
NONRESLOAN(-1)	-0.039**	-0.038**	0.244***	0.046**
	(0.017)	(0.016)	(0.027)	(0.021)
RESLOAN(-1)	0.132***	-0.006	-0.03**	0.472***
	(0.045)	(0.012)	(0.012)	(0.024)
BLANKETPUBINJ	-0.042**	0.006	-0.003	0.005
	(0.02)	(0.004)	(0.006)	(0.004)
RISKBASEDPUBINJ	0.01***	0.002***	0.0012*	0.0012
	(0.003)	(0.0005)	(0.001)	(0.001)
EQREVAL	-0.002	-.0001	-0.0005*	0.0002
	(0.0012)	(0.0003)	(0.0003)	(0.0004)
LANDREVAL	-0.004	0.0002	0.002**	-0.003***
	(0.003)	(0.001)	(0.001)	(0.001)
NO. OF OBSERVATIONS	1583	1583	1583	1583
ADJUSTED R-SQUARED	43.7%	27.5%	19.4%	44.3%

Table 6: Cross-section averages of the difference between the reported BIS ratio and the minimum required BIS ratio (BISDIF) as mandated by the Basel Accord and the Ministry of Finance over time: The greater BISDIF, the lower the bank's capital constraint, i.e., the less constrained a bank is with respect to its regulatory capital asset.

	INTERNATIONAL BANKS						DOMESTIC BANKS					
	Mean	**Median**	**Standard Deviation**	**Maximum**	**Minimum**	**Number of banks**	**Mean**	**Median**	**Standard Deviation**	**Maximum**	**Minimum**	**Number of banks**
1993	.61	.54	.57	2.72	-.72	74	.57	.075	1.58	5.22	-.44	42
1994	.68	1.14	.54	3.41	.46	73	.71	.316	1.06	4.65	-.54	43
1995	.61	1.53	2.09	4.56	-3.92	73	.62	.283	1.05	4.86	-.717	43
1996	.54	1.12	1.94	4.29	-3.86	71	.75	.344	1.21	4.84	-.75	45
1997	.78	1.34	2.06	3.95	-3.78	69	.89	.385	1.34	5.08	-.81	47
1998	1.72	1.45	1.91	6.7	-3.29	36	1.86	.71	2.285	7.84	-1.15	80
1999	2.65	2.11	1.78	6.65	.88	26	3.85	4.03	1.917	7.87	-.53	90
2000	3.31	3.05	1.4	6.85	1.24	19	3.45	3.71	2.72	8.19	-7.23	97
2001	3.97	3.76	1.31	7.39	1.71	19	4.61	4.72	2.1	8.4	-5.45	97
2002	3.68	3.37	1.47	8.41	2.15	16	5.09	4.82	1.822	12.99	-.025	100
2003	2.9	2.56	.82	4.57	2.02	15	4.92	4.798	1.86	13.05	-1.22	101
2004	2.81	2.5	.79	4.47	1.85	14	4.86	4.99	2.15	16.11	-1.45	102
2005	3.81	3.59	1.07	6.26	2.22	14	5.17	5.17	2.13	17.13	-.495	102
2006	3.85	3.97	.86	5.54	2.54	14	5.47	5.41	1.88	14.7	.49	102
2007	3.89	3.59	.94	5.65	2.77	14	5.9	5.76	1.95	15.98	-1.7	102

Table 7: Comprehensive List of Banks that Switched Charter during our sample period of 1993 to 2007- For our analysis, a bank that switches charter any time during a fiscal year *(t-1, t)* is listed as having changed charter in March of year *t.* For example, Resona Bank that switched charter to domestic during the fiscal year 1999-2000 is stated as having switched to domestic in March 2000. This table extends to the next page.

Bank Type	Bank Name	International to Domestic (Year of Switching)	Domestic to International (Year of Switching)	Bank Type	Bank Name	Domestic to International	International to Domestic
City Banks				Regional Banks -contd			
	Resona	March 2000			Yamanashi Chuo	March 1998	
Long-Term Banks					Hokuriku	March 1998	
	Shinsei Bank	March 2000			Hokkoku	March 1999	
	Nippon Credit Bank	March 1998			Fukui	March 1998	
Trust Banks					Suruga	March 1999	
	Chuo Trust	March 2000			Shimizu	March 1998	
	Yasuda Trust[44]	March 2000	March 2003		Ogaki Kyoritsu	March 2002	
Regional Bank					Juroku	March 2004	
	Minato	March 1993			Mie	March 1998	
	Hokkaido	March 1996			Hyakugo	March 1999	
	Aomori	March 1998			Kyoto	March 1999	
	Akita	March 1998			Osaka	March 1996	
	Yamagata	March 1998			Senshu	March 1997	
	Iwate	March 1998			Ikeda	March 1997	
	77	March 1999			Nanto	March 1998	
	Toho	March 1998			Kiyo	March 1998	
	Ashikaga[45]	March 1998			Sanin Godo	March 2002	
	Joyo	March 2003		Regional 2 Banks			
	Musashino	March 1998			Hokuyo	March 1998	
	Chiba Kogyo	March 1998			KitaNippon	March 1998	
	Tokyo Tomin	March 2000			Keiyo	March 1998	
	Yokohama	March 1999			Aichi	March 1998	
	Daishi	March 2000			Nagoya	March 1999	
	Hokuetsu	March 1998			Chukyo	March 1998	

[44] Yasuda Trust is the only bank that switched back from domestic to international charter during our sample period (March 2003). However, we exclude Yasuda Trust from our final sample as data for residential real estate loans, one of our primary dependant variables, is missing for the entire sample period.
[45] Ashikaga Bank is dropped from our final sample since data is missing after 2003.

Awa	March 1998	Daisan	March 1998
Hyakujushi	March 1999	Biwako	March 1998
Shikoku	March 1998	Ehime	March 1998
Fukuoka	March 2000		
Saga	March 1998		
Juhachi	March 2000		
Shinwa	March 1998		
Higo	March 1998		
Oita	March 1998		
Hiroshima	March 1999		
Miyazaki	March 1998		
Kagoshima	March 1998		
Ryukyu	March 1998		
Okinawa	March 1998		
NishiNippon City	March 2002		

Table 8: Unused Tier II capital as a share of asset- According to the Basel capital regulations, Tier 2 capital cannot exceed 50% of Tier 1 capital. The *UNUSEDTIER2* variable is defined as the amount of Tier 2 capital designated as meeting the bank's Basel capital requirement minus the total amount of a bank's Tier 2 capital, i.e., all securities eligible for classification as Tier 2 capital minus Tier 2 capital actually used. The *UNUSEDTIER2* variable is normalized using the beginning of the period assets for each bank. The minimum value that this ratio can take is zero. A value of zero indicates that a bank has used all of its available capital that qualifies as Tier 2 in satisfying its capital requirements. A positive value for *UNUSEDTIER2* implies that the bank had excess Tier 2 capital that did not qualify for compliance with the Basel Capital Accord. The higher the value, the more constrained the bank is with regard to having sufficient Tier 1 capital to absorb all available Tier 2 capital.

Unused tier 2 capital as a share of assets – international and domestic banks												
	INTERNATIONAL BANKS						DOMESTIC BANKS					
	Mean	**Median**	**Standard Deviation**	**Maximum**	**Minimum**	**Number of banks**	**Mean**	**Median**	**Standard Deviation**	**Maximum**	**Minimum**	**Number of banks**
1993	0.00	0	.0059	.0045	0	73[46]	0	0	0	0	0	43
1994	.0024	0	.0147	.1118	0	73	0	0	0	0	0	43
1995	.0012	0	.0072	.0574	0	73	0	0	0	0	0	43
1996	0.00	0	.0004	.0003	0	71	0	0	0	0	0	45
1997	.004	0	.0184	.13	0	69	0	0	0	0	0	47
1998	.0095	0	.0037	.0191	0	35[47]	.0045	0	.0374	.334	0	81
1999	.002	0	.0055	.0227	0	26	.0004	0	.0037	.035	0	90
2000	.0004	0	.0011	.0038	0	19[48]	.0133	0	.0858	.625	0	97
2001	.0004	0	.0009	.0029	0	19	.0094	0	.0594	.4381	0	97
2002	.0005	0	.0011	.0036	0	16	.0026	0	.0139	.131	0	100
2003	.0014	0	.0036	.0146	0	15	.0024	0	.0075	.0651	0	101
2004	.0025	0	.0037	.0095	0	14	.0054	0	.0278	.233	0	102
2005	.0017	0	.0027	.0074	0	14	.0012	0	.0021	.0102	0	102
2006	.001	0	.0019	.0063	0	14	.0009	0	.0018	.0082	0	102
2007	.0099	0	.0025	.0093	0	14	.0008	0	.0025	.0198	0	102

[46] Minato bank switched in 1993 so for purposes of our sample, is considered a domestic bank for the entire sample period.
[47] Ashikaga bank also changed status to domestic in 1998 but it is not included in our sample as it failed during our sample period.
[48] Yasuda trust changed status in 2000 but is not included in our sample as residential real estate loan data is missing.

Table 9: Correlation Matrix

***, **, * indicate significance at 1%, 5% and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) ASSET	1															
(2) BISDIF	.042*	1														
(3) C&I LOAN	-.224***	.027	`1													
(4) DOMESTIC	-.503***	.427***	.05**	1												
(5) EQREVAL	.372***	-.3***	.044*	-.747***	1											
(6) GDP	-.032	.017	.021	-.019	.05**	1										
(7) LANDREVAL	-.126***	.317***	-.011	.253***	-.282***	-.103***	1									
(8) LOANLOSS	.098***	-.179***	-.207***	.119***	-.183***	-.12***	.079***	1								
(9) NONRESLOAN	-.044*	.02	-.068***	.0013	.0085	.013	-.006	-.09***	1							
(10) PUBINJ	-.075***	-.029	.0001	.0502**	-.042*	.014	.018	.058**	-.013	1						
(11) RESLOAN	-.097***	.015	.088***	.075***	-.062**	-.011	-.044*	-.069**	.166***	-.025	1					
(12) SWITCHER	.194***	.538***	.005	.422***	-.283***	-.018	.171***	-.043*	-.035	-.058**	.084***	1				
(13) TOTLOAN	-.105***	-.017	.246***	-.047*	.073***	.045*	-.121***	-.268***	.263***	-.04	.6***	-.0501**	1			
(14) UNUSEDTIER2	.13***	-.12***	-.05	-.032	-.02	-.021	-.043*	.403***	-.109	-.007	-.034	.095***	-.22	1		
(15) UNUSEDTIER2*EQREVAL	.132***	-.077***	.004	-.082***	.115***	-.032	-.049*	.051**	-.027	-.005	-.033	-.023*	-.09	.402***	1	
(16) UNUSEDTIER2*LANDREVAL	.079***	.001	-.205**	.059**	-.087***	-.02	.256***	.094***	-.034	-.013	-.001	.116***	-.091	.127***	-.01	1

Table 10: 1st stage probit estimation of the probability of switching- The dependent variable takes a value 1 for the bank-year observations when a bank changes its charter from international to domestic and is 0 otherwise. We run the following regression:

$\Pr(Switcher_{i,t} = 1 | \overline{X}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_5 CAPREQ_{i,t-1} + a_6 INSTRUMENT_{i,t-1} + u_{i,t}$

The variables list is summarized in Table 3. Our estimation also controls for bank-type dummies, annual dummies and the bank operations dummy that controls for the area of bank operations-international or domestic, though the coefficients are not shown in the table. The heteroskedasticity-consistent standard errors are in parentheses. *, **, *** indicate significance at 10%, 5% and 1% levels respectively.

	$\Pr(Switcher_{i,t} = 1 \mid \overline{X})$
CONSTANT	-50.135***
	(4.885)
ASSET	1.951***
	(0.233)
GDP	0.061
	(0.04)
CONSINDEX	0.195***
	(0.0314)
BUSINDEX	-2.266***
	(0.408)
LOANLOSS	-0.318**
	(0.133)
BISDIF	0.117***
	(0.032)
TOTLOAN(-1)	-1.202
	(1.413)
CILOAN(-1)	-1.246
	(2.283)
NONRESLOAN(-1)	-0.927
	(1.129)
RESLOAN(-1)	10.89***
	(4.215)
BLANKETPUBINJ	-1.73*
	(0.916)
RISKBASEDPUBINJ	-0.071
	(0.172)
EQREVAL	0.45
	(0.315)
LANDREVAL	2.23***
	(0.848)
UNSEDTIER2	0.658***
	(0.21)
UNUSEDTIER2*EQREVAL	-0.728***
	(0.271)
UNUSEDTIER2*LANDREVAL	3.08**
	(1.215)
NO. OF OBSERVATIONS	1583
MCFADDEN R-SQUARED	73.9%
LR STATISTIC	1532.65
PROB (LR STATISTIC)	0.00

Table 11: 2SLS Regression of the effect of regulatory capital remedies on changes in outstanding loans with endogeneous charter switching decision- We endogenize the decision by many Japanese banks to switch charter from international to domestic and evaluate the impact of regulatory policy changes after controlling for the decision to switch. The dependent variable is the change in outstanding loans- aggregate and sector-wise- as a share of beginning of the period assets. We run the following regression:

$((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_5 CAPREQ_{i,t-1} + a_6 SWITCHER_{i,t-1} + u_{i,t}$

The variables list is summarized in Table 3. Our instrument is the predicted value of switching that we estimate from our first stage probit regression and the predicted value of switching interacted with LANDREVAL following Wooldridge (2006). Our estimation also controls for bank-type dummies, annual dummies and the bank operations dummy that controls for the area of bank operations-international or domestic, though the coefficients are not shown in the table. The heteroskedasticity-consistent standard errors are in parentheses. *, **, *** indicate significance at 10%, 5% and 1% levels respectively.

	TOTLOAN	**CILOAN**	**NONRESLOAN**	**RESLOAN**
CONSTANT	-0.066	-0.0083	-0.008	-0.021
	(-0.098)	(0.0247)	(0.022)	(0.030)
ASSET	-0.005***	-0.0003	-0.001**	-0.0001
	(-0.001)	(0.0002)	(0.0002)	(0.0003)
GDP	0.00022	0.00004	0.00001	0.00002
	(0.00024)	(0.0001)	(0.0001)	(0.0001)
CONSINDEX	0.001	0.0002	0.0001	0.0002
	(-0.001)	(0.0002)	(0.0002)	(0.0002)
BUSINDEX	0.046**	-0.0032	0.006	0.003
	(-0.019)	(0.0047)	(0.004)	(0.006)
LOANLOSS	-0.012***	-0.0009***	-0.001***	0.0001
	(-0.001)	(0.0003)	(0.0003)	(0.0003)
BISDIF	0.001**	0.0002***	0.0001	-0.0002**
	(0.000)	(0.0001)	(0.0001)	(0.0001)
TOTLOAN(-1)	0.251***	0.0145**	0.013**	-0.001
	(-0.026)	(0.0060)	(0.006)	(0.007)
CILOAN(-1)	-0.001	0.0452	0.001	0.003
	(-0.040)	(0.0285)	(0.008)	(0.008)
NONRESLOAN(-1)	-0.039**	-0.0382**	0.240***	0.048**
	(-0.017)	(0.0161)	(0.027)	(0.021)
RESLOAN(-1)	0.131***	-0.0057	-0.030**	0.473***
	(-0.045)	(0.0119)	(0.013)	(0.024)
BLANKETPUBINJ	-0.041**	0.0060	-0.003	0.005
	(-0.020)	(0.0040)	(0.006)	(0.004)
RISKBASEDPUBINJ	0.011***	0.0021***	0.001*	0.001*
	(-0.003)	(0.0005)	(0.001)	(0.001)
EQREVAL	-0.002	-0.0001	-0.0005*	0.0002
	(-0.001)	(0.0003)	(0.0003)	(0.0004)
LANDREVAL	-0.004	0.0002	0.002***	-0.003***
	(-0.003)	(0.0007)	(0.001)	(0.001)
SWITCHER	0.003	-0.0002	-0.001	0.001
	(-0.002)	(0.0006)	(0.001)	(0.001)
NO. OF OBSERVATIONS	1583	1583	1583	1583
ADJUSTED R-SQUARED	43.5%	27.5%	19.4%	44.1%

Data Appendix: In this appendix, we provide the comprehensive list of banks included in our sample. In the footnote, we describe the details of the mergers that took place during our sample period. We also list the banks that failed anytime during our sample period. This table extends to the next two pages.

PANEL A: COMPREHENSIVE LIST OF BANKS INCLUDED IN OUR SAMPLE

CITY BANKS	TRUST BANKS	LONG-TERM CREDIT BANKS	REGIONAL BANKS	REGIONAL2 BANKS
Mizuho[49]	Mitsubishi Trust[50]	Nippon Credit Long Term	Hokkaido	Hokuyo
Mitsubishi[51]	Sumitomo Trust	Shinsei Long Term	Aomori	Sapporo
Resona[52]	Chuo Mitsui Trust[53]		Michinoku	Yamagata Shiawase
Mitsui[54]	Yasuda Trust[55]		Akita	Kirayaka
			Shonai	Kitanippon
			Yamagata	Sendai
			Iwate	Fukushima
			Tohoku	Daito
			77	Towa
			Toho	Tochigi
			Gunma	Ibaragi
			Joyo	Keiyo
			Kanto Tsukuba[56]	Higashinippon
			Musashino	Tokyo Sowa
			Chiba Kogyo	Kanagawa
			Chiba	Daiko
			Tokyo Tomin	Nagano
			Yokohama	Toyama Daiichi
			Daishi	Fukuho
			Hokuetsu	Shizuoka Chuo
			Yamanashi Chuo	Gifu
			Hachijuni	Aichi
			Hokuriku	Nagoya
			Toyama	Chukyo
			Hokkoku	Daisan
			Fukui	Biwako
			Shizuoka	Taisho

[49] Mizuho was formed by a merger of Daiichi Kangyo (city bank) with Fuji (city bank) and Industrial Bank of Japan (Long-term credit bank) in 2003.

[50] Mitsubishi Trust UFJ was formed by a merger of Mitsubishi Trust (trust bank), UFJ Trust (trust bank) and Nippon Trust (trust bank). Mitsubishi Trust acquired Nippon Trust in 2002 and Mitsubishi Trust and UFJ Trust merged in 2006.

[51] Mitsubishi Tokyo UFJ was formed by a merger of Mitsubishi (city bank) with Tokyo (city bank) and UFJ (city bank). Mitubishi merged with Tokyo in 1997 and then merged with UFJ in 2006.

[52] Resona Financial Group was formed by a merger of Asahi (city bank) with Daiwa (city bank) in 2003. Resona FG has Resona (city bank) and Saitama Resona (city bank) as their subsidiaries. Resona and Saitama Resona continue to form the hypothetical Resona after the merger.

[53] Chuo Mitsui Trust was formed by a merger of Mitsui Trust (trust bank) and Chuo Trust (trust bank) in 2001.

[54] Mitsui Sumitomo was formed by a merger of Sakura (city bank) with Sumitomo (city bank) and Wakashio (regional 2 bank). Sakura merged with Sumitomo in 2002. Wakashio was acquired in 1999.

[55] Yasuda Trust was ultimately dropped from our sample due to lack of residential real estate loan data.

[56] Kanto Tsukuba was formed by a merger of Kanto (regional bank) and Tsukuba (regional 2 bank) in 2004.

			Suruga	Minato[57]
			Shimizu	Shimane
			Ogaki Kyoritsu	Tomato
			Juroku	Momiji[58]
			Mie	Saikyo
			Hyakugo	Tokushima
			Shiga	Kagawa
			Kyoto	Ehime
			Kinki Osaka[59]	Kochi
			Senshu	Fukuoka City
			Ikeda	Saga Kyoei
			Nanto	Nagasaki
			Kiyo[60]	Kumamoto Family
			Tajima	Howa
			Tottori	Miyazaki
			Sanin Godo	Minami Nippon
			Chugoku	Okinawa Kaiho
			Hiroshima	Yachiyo[61]
			Yamaguchi	
			Awa	
			Hyakujushi	
			Iyo	
			Shikoku	
			Fukuoka	
			Chikuho	
			Saga	
			Juhachi	
			Shinwa[62]	
			Higo	
			Oita	
			Miyazaki	
			Kagoshima	
			Okinawa	
			Ryuku	
			NishiNippon City[63]	
PANEL B: BANKS THAT FAILED ANYTIME DURING OUR SAMPLE PERIOD HENCE NOT INCLUDED IN THE FINAL SAMPLE				
CITY BANKS	**TRUST BANKS**	**LONG-TERM CREDIT BANKS**	**REGIONAL BANKS**	**REGIONAL2 BANKS**
Hokkaido Takushoku[64]				Tokuyo City [65]
				Niigata Chuo[66]

[57] Minato was formed by the merger of Hanshin (regional 2 bank) and Midori (regional 2 bank) in 2000.
[58] Momiji was formed by the merger of Hiroshima Sogo (regional 2 bank) and Setouchi (regional 2 bank) in 2004.
[59] Kinki Osaka was formed by a merger of Osaka (regional bank) and Kinki (regional 2 bank) in 2000.
[60] Kiyo was formed by the merger of Kiyo (regional bank) and Wakayama (regional 2 bank) in 2007.
[61] Yachiyo was formed by the merger of Yachiyo (regional 2 bank) and Kokumin (regional 2 bank) in 2000.
[62] Shinwa was formed by the merger of Shinwa (regional bank) and Kyushu (regional 2 bank) in 2004.
[63] Nishi nippon City as formed by the merger of NishiNippon (regional bank) and Fukuoka City (regional 2 bank) in 2005.
[64] Failed in 1997
[65] Failed in 1997

	Chubu[67] Ishikawa[68] Namihaya[69] Hanwa[70]

[66] Failed in 2001
[67] Failed in 2002
[68] Failed in 2002
[69] Failed in 1999
[70] Failed in 1997