FOREIGN DIRECT INVESTMENT AND REGULATORY REMEDIES FOR BANKING CRISES: LESSONS FROM JAPAN

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ABSTRACT

Can regulatory interventions alleviate financial crises? If so, which ones work? We draw inferences from the Japanese banking crisis of the 1990s using a hand-gathered database of bank loans gathered from original sources. Our results indicate that whereas risk-based capital infusions in Japan (similar to those following the 2009 Supervisory Capital Assessment Program (stress tests) in the US), were successful in stimulating aggregate lending by Japanese banks, earlier blanket infusions, (comparable to the 2008 Troubled Asset Relief Program (TARP) in the US) were not effective. Moreover, changes in accounting rules in Japan that revalued bank assets (similar to the relaxation of mark-to-market requirements for banks in the US) did not increase aggregate Japanese bank lending, but rather reallocated it. Capital constraints during the crisis also induced many Japanese banks to close their overseas branches and switch their charters from international to domestic. This endogenous charter switch reversed the process of foreign direct investment (FDI) for many Japanese banks. Therefore, we use the Japanese banking crisis as a natural experiment to test FDI theories and find empirical support for the relative access hypothesis, but not for the industrial organization approach or for the relative wealth hypothesis.

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

JEL Classification Code: G15, G21, G28

FOREIGN DIRECT INVESTMENT AND REGULATORY REMEDIES FOR BANKING CRISES: LESSONS FROM JAPAN

From time to time**,** banking panics lead to financial crises, as in 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. Such crises lead to calls for regulatory changes to restore the health of the financial system. The 2007-2009 global financial crisis triggered a quick succession of regulatory experiments designed to restart global financial markets and recapitalize a banking system depleted by loan losses and deteriorating asset values.

Many economists and financial pundits have drawn the parallel between the 2007-2009 crisis and what has come to be known as Japan's "lost decade" of the 1990s, which was also triggered by the bursting of a real estate bubble followed by loan losses that depleted bank capital positions.[1,2] In this paper, we add to this literature and empirically assess the efficacy of Japanese public policy interventions using a hand-gathered database of Japanese bank lending activity. Banking crises have real macroeconomic implications when financial distress and capital constraints impede bank lending, thereby reducing both real investment activity and the financing of transactions. Thus, public policy interventions designed to remedy banking crises typically focus on reactivating bank lending. The reforms implemented by the Japanese government during the lost decade were no exception. In this paper, we use disaggregated bank lending data to determine which public policies were effective in stimulating aggregate bank lending.

We concentrate on three major public policy interventions undertaken in Japan during the acute phase of the Japanese banking crisis (1997-1999), and draw parallels to public policy interventions in the US in 2008 and 2009.[3] First, in 1998, the Japanese Ministry of Finance provided blanket public injections of capital to 19 major Japanese banks. This program was similar to the Troubled Asset Relief Program

(TARP) implemented in the US in October 2008 in that both programs provided the same amount of capital to each bank regardless of its insolvency risk.[4]

The second major public policy intervention analyzed in this paper is the March 1998 change in Japanese accounting regulations providing for a land revaluation windfall designed to increase bank capital levels. This is similar to the rule change (FAS 157-4) passed by the US Financial Accounting Standards Board on April 9, 2009 by which banks are allowed 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."[5]

Finally, the third major public policy intervention undertaken in Japan was a series of large, risk-based capital infusions that began in 1999 targeting capital deficiencies detected via rigorous self-assessments of asset valuations and volatility at major Japanese banks. Similarly, in February 2009, the 19 largest US financial institutions were subjected to stringent stress tests that compared each bank's credit losses and capital positions under several economic scenarios. In contrast to the earlier blanket capital infusions, these capital injections were risk-based, since they remedied each bank's capital deficiency and hence reduced its insolvency risk.

Although the objective of all of the above-mentioned public policy programs was to increase aggregate macroeconomic activity in Japan by stimulating Japanese bank lending, casual empiricism suggests that only the risk-based capital injections were successful. This is evidenced by the annual rate of change of total lending by the Japanese banking system. Our data show that aggregate Japanese bank lending *decreased* by 0.53% between 1998 and 1999 but that it *increased* 2.92% from 1999 to 2000. Our empirical analysis is consistent with this observation, as we find evidence that only the risk-based capital infusions (beginning in 1999), not the blanket capital injection or the land revaluation policies of 1998, were successful in stimulating aggregate lending in Japan. Support for large, risk-based capital injections as a remedy for banking crises is also found in Hoshi & Kashyap (2009), Gianetti & Simonov (2009) and Montgomery & Shimizutani (2009). However, these papers do not incorporate analysis of either the revaluation allowances or the decision by Japanese banks to switch bank charters.[6] Thus, they suffer from

potential endogeneity problems since Japanese banks shifted their operations by switching their charters from international to domestic in order to alleviate some of the detrimental effects of the crisis. This ability to switch charters undermined the potential of public capital infusions to stimulate aggregate bank lending because it allowed banks to relax their capital constraints through regulatory arbitrage.

We extend the literature by analyzing charter switching and incorporating it into the analysis of the efficacy of public policy interventions during the Japanese banking crisis. A bank charter switch also constitutes a natural experiment which allows us to enhance our understanding of the process of foreign direct investment (FDI). The Japanese banking industry consists of firms with both international and domestic branches, the so-called international banks, and those with branches only in Japan, the domestic banks. Capital requirements are substantially higher for international banks than for domestic banks (see Section 2.1); hence, the Japanese banks that expand abroad via FDI must hold relatively high levels of capital. During the banking crisis of the 1990s, as capital constraints tightened, this cost of expanding abroad rose without any systematic increase in benefits.[7] This exogenous, crisis-related shift in FDI costs makes it possible to use the Japanese banking crisis as a natural experiment to shed light on how firms assess the costs and benefits of FDI.

Internalization theory outlines the benefits of multinational expansion, delineating ownership, location and internalization motives for FDI (Dunning, 1988). However, expanding abroad also increases management costs. Thus, the optimal extent of foreign expansion is the result of a trade-off between its costs and benefits. Most empirical studies look at acquisitions to evaluate the relationship between firm performance and multinational activity.[8] In this paper we examine the process of disinvestment, or de-internalization, by Japanese banks during the financial crisis of the 1990s.

Internalization theory predicts that FDI activity should decline as internalization costs increase without concomitant increases in benefits. Our empirical analysis supports this theoretical prediction. We explicitly measure the de-internalization incentives involved in switching a Japanese bank's charter from international to domestic by the bank's disinvestment of its international branches in order to reduce capital costs. We find evidence of de-internalization when the financial crisis increased bank capital

costs, suggesting that capital constraints impact the optimal trade-off and drive real business organizational structure. Moreover, we examine endogenous Japanese bank charter switching and differentiate between three separate approaches to internalization theory: (1) the industrial organization approach which argues that multinational expansion is the result of a trade-off between its long-term costs and benefits, (2) the relative wealth approach in which each investor's relative wealth determines whether foreign assets are successfully acquired, and (3) the relative access approach in which capital costs and availability act as binding constraints on FDI activity. Our empirical analysis finds support for the third hypothesis, but not for the first two.

We proceed as follows. In Section 2, we provide a brief review of the internalization literature and of our hypotheses, as well as a description of Japanese bank capital regulations and policies leading to Japan's lost decade. In Section 3, we describe our database and provide descriptive statistics. In Section 4, we present the results of our baseline model, and our two-stage regression model of the impact of regulatory measures that incorporates our analysis of the de-internalization process inherent in Japanese bank charter switching. Finally, we present our conclusions in Section 5.

2. THE JAPANESE BANKING INDUSTRY AND INTERNALIZATION THEORY

2.1 Japanese bank capital regulations and the lost decade

Japan's economy relies heavily on bank financing because of the relative paucity of alternative sources of funds.[9] Bank regulators impose minimum capital requirements to provide a cushion against bank insolvency and maintain the safety and soundness of the banking system. Capital requirements reflect Japan's two-tiered banking system. Banks with only domestic branches are required to hold 4% of their risk-based assets in the form of capital. Japanese banks with both domestic and international branches are required to meet the Basel international bank capital requirement and hold total capital in the amount of 8% of their risk-based assets.[10] Since capital is the most expensive source of funds for a bank, expanding internationally entails considerable costs of capital.

In 1993, the Japanese financial system was reformed to allow banks to underwrite corporate bonds through bank-owned subsidiaries, thereby allowing large corporations to switch their funding

sources from more costly bank loans to less expensive capital market financing (see Hoshi & Kashyap, 1999). However, deregulation did not offer new investment opportunities for consumer savings so households continued to deposit their savings in banks. Thus, Japanese banks retained deposit sources of funds while losing much of their traditional large-business lending base. In the search for new borrowers, Japanese banks increased their lending to small businesses and to the real estate sector. The resulting increase in real estate lending fueled the Japanese land valuation bubble of the 1980s.[11]

Hoshi & Kashyap (2009) date the inception of Japan's lost decade to loan loss problems at housing loan institutions, *jusen*, created in the 1970s. As of 1991, non-performing *jusen* loans totaled 38% of their total loans.[12] The Ministry of Finance and the largest Japanese banks made several rescue attempts to prop up the insolvent *jusen* through forced mergers, all of which were unsuccessful, and by 1995, all *jusen* were liquidated.

2.1.1 Blanket capital infusions: 1998 and 2008.

Japanese public policy responses to the banking crisis were initially quite weak and largely took the form of regulatory forbearance. As the crisis dragged on, however, the government developed three major policy interventions. First, in February 1998, the Japanese government initiated a program of public infusions of capital, initially allocating a total of 13 trillion yen for recapitalizing banks and 17 trillion yen for protecting the depositors of failed banks. The public capital injections were designed to recapitalize Japanese banks by providing a blanket sum of 100 billion yen to each viable city bank. Despite this program, two long-term credit banks, Long-term Credit Bank of Japan and Nippon Credit Bank, failed in 1998 and were nationalized.

Similarly, the blanket capital infusions under the Troubled Asset Relief Program (TARP) undertaken in the US in 2008 were unable to end the financial crisis.[13] An important similarity between the blanket capital infusions in Japan in 1998 and the TARP infusions in 2008 was that in both cases the amount of each bank's capital infusion was unrelated to its risk exposure or level of undercapitalization. Indeed, many adequately capitalized US banks were forced to take TARP funds in October 2008 to avoid exposing the actual at-risk banks. In Japan, the amount of the blanket capital infusions was set in

consultation with the then healthiest bank, Bank of Tokyo Mitsubishi. Some argue that this is why the amount disbursed was far less than the amount needed to restore each bank's capital levels (see Hoshi & Kashyap, 2009). Although we cannot rule out the possibility that the relatively small size of the 1998 blanket capital infusions in Japan undermined their effectiveness, Philippon & Schnabl (2009) show that, in general, public capital injections are successful in stimulating bank lending only if they decrease the bank's risk of insolvency. This is consistent with Giannetti & Simonov (2009) who find that aggregate lending increased whenever banks at risk of failure were provided funds, whereas blanket injections did not significantly increase bank lending because they did not reduce the risk of bank failure.

2.1.2 Mark-to-Market accounting rule changes: 1998 and 2009.

March 31, 1998 saw the passage of 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.[14] This revaluation essentially enabled Japanese banks to mark-to-market their real estate portfolio, previously held at book values that were decades old and lower than the prevailing cost of land in Japan, even after the price declines of the early 1990s. Thus, all Japanese banks were allowed to increase the value of their regulatory capital by including an allowance for the revaluation of the land in their portfolios.[15] The land revaluation allowance followed the format of an earlier equity revaluation allowance introduced in 1986, which allowed Japanese banks to include 45% of the unrealized gains on equity securities as Tier 2 capital. However, the equity revaluation allowance was granted only to those Japanese banks that had international operations. In contrast, the land revaluation allowance was applicable to all Japanese banks.

The land revaluation allowance, which was either positive or zero if there were no gains,[16] essentially provided both purely 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. Land revaluation allowances thus represented an ongoing, permanent infusion of regulatory capital, since subsequent declines in land values did not have

to be deducted from the bank's regulatory capital position. This policy was similar in nature to the 2009 relaxation of mark-to-market accounting requirements in the US, regulatory forbearance policies permitting 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.

2.1.3 Risk-Based capital infusions: 1999 and 2009.

In contrast to the 1998 program of blanket capital infusions, Japanese government public injections of bank capital starting in 1999 were designed to recapitalize banks at risk of becoming insolvent. Risk-based public capital infusions in 1999 totaled 7.593 trillion yen, as compared to only 18.156 trillion yen in blanket capital injections provided in 1998, with each bank receiving funds based on its level of nonperforming loans. 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 its level of required capital infusions.

Several studies have compared the blanket capital injections of 1998 to the risk-based capital infusions of 1999. For example, Hoshi & Kashyap (2009) show that risk in the Japanese banking system, which they measured using the "Japan premium," the Eurodollar Tokyo Interbank Borrowing Rate (TIBOR) minus 3-month LIBOR, increased in the wake of the 1998 public injection, but declined after the 1999 injections. In addition, Montgomery & Shimizutani (2009) find that the risk-based public injections were effective, whereas the blanket infusions were not over the 1990-1999 period. We contribute to this literature by using a disaggregated loan database to test the impact of these public policies on bank lending.

2.2 Internalization theory and Japanese bank charter switching

The unfolding crisis also had a negative impact on the foreign operations of Japanese banks because of the two-tiered capital requirements that impose higher capital standards on international banks than on domestic banks. Banking crises increase these costs as banks become more capital constrained because their assets lose value and recapitalization becomes more expensive. If optimal internalization weighs the benefits and costs of FDI, then any increase in costs should shift the equilibrium to a lower

level of multinational activity. We use the Japanese banking crisis as a natural experiment to test whether increased capital costs induced international banks to de-internalize their operations. Indeed, during the Japanese banking crisis, 62 banks switched their charters from international to domestic, thereby cutting their capital requirements in half.[17] As the costs of bank capital increased and the returns to banking decreased during the crisis, Japanese banks de-internalized their operations and eliminated their multinational presence.

However, under the industrial organization view of FDI, there are fundamental and longstanding advantages to internalization that would persist throughout financial crises. For example, Dunning (1973) notes that if there are coordination benefits, whether from locational, ownership or internalization factors, that exceed organizational costs, then FDI has long-term value for the firm. Moreover, any increase in capital costs due to crisis-related capital constraints would be reversed after the crisis. Thus, it is unclear why Japanese banks would jettison the long term gains of FDI because of a transitory increase in capital costs. Indeed, Dunning & Narula (1996) argue only permanent shifts in the fundamental benefits of internalization lead multinational firms to retrench and eliminate their international operations, namely: (1) the growing importance of firm-specific, knowledge-intensive inputs into the production process, (2) reductions in international impediments to trade, and (3) the ability of firms to form cross-border alliances. Under this industrial organization approach to FDI, a temporary increase in capital costs would not be sufficient to induce firms to permanently de-internalize their operations.

This debate is reminiscent of the puzzling relationship between FDI and exchange rates. Froot & Stein (1991) note a strikingly high correlation between foreign exchange rates and FDI over the decades of the 1970s and 1980s. Under the industrial organization approach to internalization theory, capital is mobile globally, and thus the level of multinational expansion should be independent of exchange rates and capital costs. However, impediments to capital mobility may result since there are information asymmetries regarding the return to FDI, and investors with greater relative wealth can bid more aggressively for foreign assets. Since exchange rates generate cross-border fluctuations in the relative wealth of investors, foreign bidders will be more likely to successfully acquire foreign firms if their

currency appreciates, thereby generating a positive relationship between exchange rates and the level of FDI.

However, during the 1990s, this relationship broke down for Japanese FDI in the US. In noting that Japanese FDI in the US declined throughout the 1990s even as the yen appreciated against the US dollar, Klein, Peek & Rosengren (2002) point to the collapse of the Japanese banking sector which impaired access to credit for Japanese investors in foreign assets. Froot & Stein (1991) assumed that all firms have equal access to capital, although wealthier investors can outbid less wealthy rivals for foreign assets. In contrast, Klein, Peek & Rosengren (2002) note that all investors do not have equal access to sources of funds to finance international expansion. Japanese firms that are dependent on their banks for financing will be impacted by the financial condition of their main bank lender. Thus, if the bank's financial condition deteriorates, causing the bank to restrict its lending activity, the firm's ability to bid for foreign assets will be reduced, and hence its expansion across borders will be restrained. In this paper, we use the natural experiment of Japanese bank charter switching during the banking crisis to differentiate among these three major theories of FDI: (1) the industrial organization approach, e.g., Dunning (1973); (2) the relative wealth hypothesis, e.g., Froot & Stein (1991); and (3) the relative access hypothesis, e.g., Klein, Peek & Rosengren (2002). We test the following hypotheses:

Hypothesis 1 – The Industrial Organization Approach: Optimal internalization is not impacted by short-term capital constraints and increases in capital costs.

Finding that Japanese banks did not respond to the increase in capital costs resulting from the crisis by switching their charters from international to domestic would provide support for the industrial organization approach. .

Hypothesis 2 – The Relative Wealth Hypothesis: Any public policy intervention that increases the relative wealth of a Japanese bank should increase its level of international expansion.

Finding that banks receiving public support of any level are less likely to switch their charters from international to domestic would provide support for the relative wealth hypothesis. Thus, de-internationalization should be less likely when a bank receives blanket capital infusions, risk-based capital

infusions and/or revaluation allowances. The efficacy of these public policy interventions in promoting foreign activities should be related entirely to the amounts received, not to the mechanisms of the capital infusions.

Hypothesis 3 – The Relative Access Hypothesis: Successful international acquisitions require access to capital markets. Thus, de-internalization is a direct response to capital constraints resulting from insolvency risk.

Finding that increases in the tightness of capital constraints increases the likelihood of de-internalization would provide support for the relative access hypothesis. In Section 4, we analyze the bank charter switching decision in order to test these three hypotheses. We differentiate among them by performing a probit estimation of the probability of switching. If the probability of switching is independent of bank financial conditions and capital constraints, our results support Hypothesis 1. If it is inversely related to the size of the three public policy interventions, our results are consistent with Hypothesis 2.

In order to test Hypothesis 3, we define several variables to measure capital constraints. First, we calculate the difference between a bank's 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 Japan's Financial Services Agency (4% for domestic banks), and hence that the bank is capital constrained. A value of zero or a positive value of the *BISDIF* variable indicates a bank meets or exceeds the target capital requirement.

Our second measure of capital constraints is the variable *UNUSEDTIER2*. The Basel Accords distinguish between Tier 1 and Tier 2 capital. *BISDIF* measures the adequacy of total capital (Tier 1 plus Tier 2), but does not reflect the requirement that Tier 2 capital must be less than or equal to Tier 1 capital. Infusions of Tier 2 regulatory capital (e.g., the land revaluation allowance) relax a bank's capital constraints only if its Tier 2 is less than its Tier 1 capital ratio, i.e., if it is Tier 2 capital-constrained.

We calculate the amount of unused Tier 2 capital (*UNUSEDTIER2*) by subtracting the amount of Tier 2 capital used by a bank to meet its Basel capital requirement from the total amount of its 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 each bank's assets at the beginning of the period. 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 regulatory capital requirements. A positive value for *UNUSEDTIER2* implies that the bank had excess Tier 2 capital that did not qualify for regulatory capital under the Basel Capital Accord. A high value of *UNUSEDTIER2* means that a bank has insufficient Tier 1 capital to absorb all its 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 technically has met the 8% total (Tier 1 plus Tier 2) capital requirement. The reason for this is that since Basel capital regulations require that Tier 1 capital be greater than or equal to Tier 2 capital, the bank's total capital position, for Basel capital adequacy purposes, would be only 6% (3% of Tier 1 and 3% of Tier 2) and 2% of its Tier 2 capital would be unused. Land revaluations would not help such a bank to meet its capital requirements. International banks with unused Tier 2 capital are thus unable to exploit the revaluation allowances and may find it advantageous to switch to a domestic charter to reduce their capital requirements to 4%, and therefore comply with regulatory capital standards. For instance, if the bank in our example switched to a domestic charter, its capital position of 6% (3% of Tier 1 and 3% of Tier 2) would be more than adequate to meet the domestic bank capital requirement of 4%.

We use *UNUSEDTIER2* to test whether capital constraints impact the probability of a bank charter switch. A finding that the probability of de-internalization is directly related to the level of capital constraints (as measured by *BISDIF* and *UNUSEDTIER2*) supports Hypothesis 3 – the relative access hypothesis. In Section 4, we show that banks with marginal shortfalls in regulatory capital switched charters so as to take advantage of the reduction in their capital requirements, thus providing support for Hypothesis 3, the relative access hypothesis, but not for the other two hypotheses.

3. THE DATA AND VARIABLE DEFINITIONS

3.1 Data description

We collected financial statements from Japanese city, trust, long-term credit and regional banks.[18] Our original sample consisted of 17 city banks, 7 trust banks, 2 long-term credit banks, and 134 regional banks (69 regional banks, and 65 regional 2 banks). We only considered banks that were in business during our entire sample period of April 1993 to March 2007. We use the methodology of Hancock & Wilcox (1993) and Bernanke & Lown (1991) to handle mergers and construct a hypothetical consolidated bank by summing the merger partners. We note that survivorship bias is not a concern, because our focus is on whether healthy Japanese banks responded to public stimulus policies. We supplemented and then compared the data we gathered from financial statements with the Nikkei NEEDS database. Whenever the NEEDS database differed from data in the financial statements, we consulted individual bank managers to resolve the discrepancy. Our final sample consists of 116 banks (4 city banks, 3 trust banks, 2 long-term credit banks and 107 regional banks) and 1,740 annual data points over the 1993-2007 period.

3.2 Variable and model description

We follow Peek & Rosengren (2005) and model bank lending activity as depending on macroeconomic conditions, bank characteristics, public policy interventions and capital regulations:

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

The dependent variable is the change in bank *i* ' s outstanding loans to sector *j* between *t* and *t-1* normalized by the total assets of bank *i* in *t-1*.[19] 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*). We include the remainder of loans under the category *OTHER*, which includes loans to agricultural firms, mining companies, construction, the wholesale/retail sector, finance and insurance companies, utilities, and services firms. We list the dependent and explanatory variables in Table 1 and the summary statistics in Table 2. For example, descriptive statistics of the sectoral allocation of loans is outlined in Table 2, Panel B. The largest loan

segment for Japanese banks is residential real estate loans, although there is considerable lending to the commercial and industrial sectors and for non-residential real estate.

"Tables 1 and 2 go about here"

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**. To conserve degrees of freedom, we follow Hoshi & Kashyap (2009) and restrict our analysis to a single period lag.

One of the critical components of any analysis involving a bank's lending behavior is to control for the macroeconomic factors affecting loan demand so as to disentangle the impact of changes in demand from that of changes in supply. We specify the vector **DEMAND** to include time-varying macroeconomic variables. First, we use the annual growth rates of Japan's Gross Domestic Product (*GDP*); for city, trust and long-term credit banks, we use national GDP, whereas for regional banks, we use the GDP of the prefecture of the regional bank's headquarters. Further, we control for macroeconomic variations 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 upcoming year and the following five years. Another macroeconomic control variable 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 economic conditions, projected income growth and willingness to buy durable goods in the near future. Both *BUSINDEX* and *CONSINDEX* are provided by the Economic and Social Research Institute of Japan. In addition, the quarterly TANKAN survey measures lending attitudes of Japanese banks. This variable (denoted *LENDATTITUDE*) is calculated as a "diffusion index" that provides the percentage gap between the number of clients that experience an easy access to credit and those that find it harder to get credit. A negative value indicates a general perception of tightening credit, and a positive value the opposite. Finally, we include a set of annual dummy variables (*TIME DUMMIES*) summarized by the vector **YEAR** to control for year-to-year variations in macroeconomic conditions.

CAPREQ is a vector summarizing each bank's capital position. We include *BISDIF,* the difference between the bank's capital ratio and its target, as described in Section 2.2. In addition to the overall capital requirement, **CAPREQ** also includes variables reflecting Tier 2 regulatory capital forbearance policies, *LANDREVAL* and *EQREVAL*, which are measured as the allowances for land and equity securities revaluation divided by total assets. We also include variables that measure the two programs of public injections (normalized by total assets), denoted *BLANKETPUBINJ* and *RISKBASEDPUBINJ.*

Descriptive statistics for the explanatory variables are presented in Table 2, Panel A. Public injections were, on average, lower than the indirect infusions provided by equity revaluations or land revaluations. The blanket public injections of 1998 averaged 0.003% of the assets of the banks in our sample. The risk-based public injections averaged 0.025% of a bank's assets. In contrast, equity (land) revaluations averaged 0.29% (0.18%) of bank assets. Land revaluations were available to all Japanese banks, whereas only banks with international operations could take equity revaluations.[20] Risk-based public injections covered a limited number of banks in our sample, although their amount was quite substantial – the highest amounted to 4.8% of bank assets, as compared to maximum equity and land revaluations of 2.5% and 0.95% respectively.

BANK is a vector of bank specific variables that summarize individual bank characteristics. 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*), with the regional 2 banks omitted. Moreover, we include a binary variable (*DOMESTIC*) which 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 the share of loans made to failed enterprises as a fraction of the bank's total assets at the beginning of the period (*LOANLOSS*).

4. EMPIRICAL RESULTS

4.1. The efficacy of Japanese public policy interventions

We test the impact of the three regulatory capital policy interventions (blanket public capital injections, risk-based capital infusions and the two revaluation allowances) using the variables *BLANKETPUBINJ, RISKBASEDPUBINJ, LANDREVAL* and *EQREVAL*. Table 3 presents the fixed effect OLS regression results of the model specified in equation (1). The columns of Table 3 represent the estimates for each of the five dependent variables: total loans, commercial and industrial loans, non-residential mortgages, residential mortgages and other lending. The heteroskedasticity-robust standard errors are in parentheses and are calculated using the Panel Corrected Standard Errors (PCSE) methodology suggested by Beck & Katz (1995).

"Table 3 goes about here"

The results indicate that *RISKBASEDPUBINJ* has a significantly (at the 0.1% level) positive impact on aggregate bank lending; a 1% increase in risk-based capital infusions (as a percentage of bank assets) increases bank lending by 1.04% of the bank's total assets. In contrast, the policy of across the board public injections, *BLANKETPUBINJ,* results in a significant (at the 5% level) decrease in total bank lending. The impact of both the equity and land revaluation allowances on aggregate lending is statistically insignificant.

To interpret the economic significance of our results, note that a coefficient estimate of 0.0104 (Table 3) on the variable *RISKBASEDPUBINJ* implies an average *increase* in total lending of 17.77 million yen per bank, or an economically significant average increase in lending of 2.6% of bank assets.[21] On the other hand, the -0.0424 coefficient of *BLANKETPUBINJ* in Table 3 implies that total lending by an average bank in our sample *declined* by 8.69 million yen per bank following the 1998 blanket capital infusions, a decline of 1.27% of an average bank's assets.[22] The results in Table 3 therefore imply that the combined effects of the decline in loans following the blanket public injection and of the increase in

loans following risk based public injections is a net increase in lending of 9.08 million yen for an average bank in our sample, or a net increase in loans of 1.33% of assets.

Risk-based public injections were most successful in stimulating commercial and industrial lending (the coefficient of *RISKBASEDPUBINJ* is positive and significant at the 0.1% level in the CILOAN column) and other lending (the coefficient of *RISKBASEDPUBINJ* is significant at the 5% level in the OTHER column). The impact on loans made to non-residential real estate (RESLOAN) is also positive and significant at the 10% level. In contrast, blanket public injections (*BLANKETPUBINJ*) had no statistically significant impact on lending in any of the loan sectors except for a significant (at the 5% level) decline in lending to other sectors. Thus, the results presented in Table 3 show that risk-based direct infusions of capital had a positive effect on total lending and on lending to many sectors, whereas blanket public injections did not. In contrast, the equity (EQREVAL) and land (LANDREVAL) revaluation allowances had no overall impact on aggregate lending – see column (1) of Table 3. However, the land revaluation allowance had an allocative effect, as Japanese banks increased their non-residential real estate lending and decreased their residential real estate and other lending (i.e., the coefficients in the last row and the last three columns in Table 3 are statistically significant at the 5% level or better).[23]

The success of the later risk-based capital infusions could have been in some indirect way related to earlier blanket public injections and land revaluation allowances. Only four banks received blanket injections, but no subsequent risk-based injections. None of these four banks were regional banks, and the amounts of blanket injections ranged between 0.6% and 1% of bank assets. In contrast, 25 regional banks in our sample did not receive blanket public injections in 1998, but did receive risk-based injections of public capital, ranging from 0.4% to 5.6% of bank assets. Using this distribution of capital infusions across banks, we disentangle the impacts of the two policy interventions and re-estimate our model: (1) by controlling for banks that received one capital infusion but not the other, and (2) for the regional bank group separately. Our results (not shown, but available upon request) are consistent with the results presented in Table 3. That is, the impact on banks receiving only the original blanket public injections was a statistically significant (at the 5% level) decline in aggregate bank lending activity, whereas those

banks receiving only risk-based capital injections experienced a statistically significant (at the 1% level) increase in aggregate bank lending activity. Moreover, we find when we estimate our model for the regional bank group separately that the statistically significant negative coefficient on the *BLANKETPUBINJ* variable is driven by regional banks decreasing their lending. Because only three regional banks received blanket capital infusions in 1998, there was concern in the regional banking sector that the Japanese government would refuse to bail them out, and thereby regional banks reduced their lending activity. Thus, the retrenchment in aggregate lending in 1998 was driven mostly by uncertainty about the government's policy towards regional banks. This was resolved when risk-based capital infusions covered each bank's capital shortfall and encouraged all banks to increase their lending. In contrast, although all city banks received equal amounts of capital infusions in 1998, there was no significant impact on their lending because the policy did not reduce market uncertainty, since all the recipient banks were considered too big to fail.

The results in Table 3 also indicate that the coefficient of *BISDIF*, which measures the extent to which a bank exceeded its capital requirement, is statistically significant (at the 5% level or better) and positive for aggregate lending, commercial and industrial loans, and other lending, but is significantly negative (at the 5% level) for residential real estate loans. This shows that Japanese banks that were more capital constrained (i.e., for which *BISDIF* was lower) reallocated their lending from commercial and industrial lending (100% Basel risk weight) toward residential real estate lending which was subject to lower capital requirements (50% Basel risk weight). On the other hand, banks with excess capital (i.e., for which *BISDIF* was higher) reallocated their lending activity away from residential mortgages toward business lending. Moreover, the coefficient on *LOANLOSS* is statistically significant (at the 1% level or better) and negative for all loan types except residential real estate (for which the coefficient is positive but not significant). This shows that banks with high loan losses were unable to increase their aggregate lending and their lending to high risk sectors, and instead focused on the lower risk residential real estate sector. The significant (at the 0.1% level) and positive coefficient of lagged total lending (e.g., the

TOTLOAN(-1) variable) is consistent with Japanese banks rolling over past due loans into future loans in order to avoid loan write-downs (see Peek & Rosengren , 2005; Caballero, Hoshi & Kashyap, 2008).

4.2 Testing the FDI hypotheses: Japanese bank de-internalization

The results presented in Table 3 suggest that Japanese bank lending activity was impacted by capital constraints. That is, the extent of Japanese banks' capitalization impacted both their aggregate lending activity and how they allocated their lending across sectors. In this section, we use this result to test the three FDI hypotheses described in Section 2.2. That is, we examine whether the extent of Japanese bank foreign activities, as measured by the probability of switching the bank's charter from international to domestic, is unrelated to the rise in capital costs due to the financial crisis, as suggested by industrial organization theory (Hypothesis 1), related to public policy interventions as predicted by the relative wealth hypothesis (Hypothesis 2), or related to capital constraints as per the relative access hypothesis (Hypothesis 3). We analyze the decision to switch bank charter from an international to a domestic bank, utilizing a probit model in a two-stage instrumental variables setting as follows:

$$\Pr(Switcher_{i,t} = 1 \mid \overline{X}) = a_0 + a_1 \mathrm{BANK}_{i,\,t-1} + a_2\, \mathrm{DEMAND}_{t-1} + a_3 \mathrm{YEAR}_t + a_4\, \mathrm{LOANLAG}_{i,\,j,\,t-1}$$

$$+ a_5\, \mathrm{CAPREQ}_{i,\,t-1} + a_6\, \mathrm{INSTRUMENT}_{i,\,t-1} + u_{i,\,t} \qquad (2)$$

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 switches its charter, and 0 in the years before it does so or if it never changes its charter. The explanatory variables summarized in the vectors **BANK, DEMAND, YEAR, LOANLAG** and **CAPREQ** are described in Table 1.

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 Tier 2 capital constraints are the most relevant in determining whether the bank switched its charter to take advantage of the Japanese policies of land and equity revaluations.

"Table 4 goes about here"

To further justify our choice of instruments, Table 4 presents the correlation matrix. *UNUSEDTIER2* is positively correlated with the switching decision (significant at the 0.1% level), but is uncorrelated with all of the loan sector variables. Thus, we use *UNSEDTIER2* along with the two cross-product variables, *UNUSEDTIER2*EQREVAL* and *UNUSEDTIER2*LANDREVAL,* as instruments.[24]

"Table 5 goes about here"

Table 5 presents the first stage results of the probit analysis of a bank's decision to switch its charter. The results do not support Hypothesis 1 – the industrial organization hypothesis. That is, the probability of switching (de-internalizing) increases as the bank's asset levels increase (*ASSET*) and as consumer confidence (*CONSINDEX*) improves. Moreover, a bank is more willing to give up its international operations when prospects for its Japanese business are declining, as shown by the statistically significant (at the 0.1% level) negative coefficient of *BUSINDEX*. This is inconsistent with the industrial organization hypothesis since the *BUSINDEX* variable represents a short-term, crisis-related fluctuation which is unrelated to long-term value creation.

The results in Table 5 are also inconsistent with Hypothesis 2 – the relative wealth hypothesis. For example, the positive and significant (at the 0.1% level) coefficient of *ASSET* suggests that wealthier banks are <u>less</u> likely to expand internationally since they have a higher probability of switching their charters from international to domestic. Moreover, the negative and significant (at the 1% level) coefficient on the *LOANLOSS* variable suggests that banks that experience larger losses (greater wealth declines) are <u>less</u> likely to switch their charter, contrary to what is predicted by the relative wealth hypothesis. Finally, Table 5 shows that *RISKBASEDPUBINJ* does not significantly impact the probability that a bank will switch to a domestic charter, although the coefficient of *BLANKETPUBINJ* is statistically significant (at the 5% level) and negative, suggesting that banks that receive more blanket capital infusions are less likely to switch to a domestic charter. Thus, the overall evidence is inconsistent with Hypothesis 2.

However, the results in Table 5 are consistent with Hypothesis 3 – the relative access hypothesis. The probability of switching is positively and significantly related (at the 0.1% level) to the capital constraint variables, *BISDIF* and *UNUSEDTIER2*. Most importantly, the first stage probit results shown in Table 5 suggest that those banks that could not benefit from the land and equity revaluations because they had unused Tier 2 capital, were most likely to switch charters. The positive and significant (at 5% level or greater) coefficient on *LANDREVAL* and *UNSEDTIER2*LANDREVAL* highlights the fact that banks with larger land revaluations were more likely to switch charters if they had unused Tier 2 capital. In contrast, the negative and significant (at the 1% level) coefficient of the *UNUSEDTIER2*EQREVAL* variable suggests that banks with large equity revaluation allowances were less likely to switch to a domestic charter since they could only benefit from this measure if they had Tier 2 capacity available *as well as* international operations. Thus, the probit analysis suggests that the decision to switch from an international to a domestic charter was related to capital constraints, a finding consistent with Hypothesis 3 – the relative access hypothesis.

4.3 Two-Stage analysis

We incorporate the determinants of the decision to switch banking license described in equation (2) into a two-stage system as follows:

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

The two-stage least squares methodology regresses the dependent variable on the control variables as defined in Table 1and the predicted value of the **SWITCHER,** as estimated in equation (2) (see Wooldridge, 2006).[25]

"Table 6 goes about here"

Results of the two-stage model are presented in Table 6. Similar to the earlier fixed effect regression results (Table 3), blanket public injections (BLANKETPUBINJ) had a statistically significant (at the 5% level) negative effect on aggregate lending. In contrast, risk-based public injections

(RISKBASEDPUBINJ) had a strong (significant at the 0.1% level) positive impact on aggregate lending, as well as across the sectors (i.e., significant at the 10% level or better for all loan types). Moreover, equity (EQREVAL) and land (LANDREVAL) revaluations had no impact on aggregate bank lending. The land revaluation (but not the equity revaluation) shifted bank lending from residential real estate and other lending to non-residential lending. These results are consistent with the OLS results presented in Table 3.[26] Thus, our results are robust across model specifications, and suggest that risk-based capital injections increased aggregate bank lending, whereas blanket public injections and accounting rule changes were ineffective.

5. POLICY IMPLICATIONS AND CONCLUSIONS

We use a unique database that was hand collected from the financial statements of 116 Japanese banks to assess whether three major regulatory capital interventions were able to stimulate bank lending during Japan's banking crisis. We find that public injections of capital into major Japanese banks stimulated bank lending if the injections were based on each bank's loan losses and insolvency risk exposure. Thus, the major implication for public policy is that regulators who want to stimulate aggregate bank lending should provide capital infusions that are targeted to each bank's risk exposure and are substantial enough to reduce their insolvency risk.

Indirect intervention policies via accounting adjustments, such as land and equity revaluation allowances, did not have an impact on aggregate Japanese bank lending. However, the land revaluation allowance, which was substantial in size and applied to all banks, reallocated lending across sectors. Allowing banks to count past increases in land prices as a permanent component of Tier 2 capital induced them to shift from residential mortgage and other lending to nonresidential real estate lending. Since these allowances were given to all banks, they had a significant redistributive effect, whereas the restricted equity allowances, which only applied to banks with international operations, did not.

Our results offer empirical support for the view that systemic risk assessment is an important step in any policy that seeks to alleviate financial crises, as recommended by Acharya, Pedersen, Philippon & Richardson (2009). If bank lending is constrained by capital limitations and insolvency risk, then bank

regulators can forecast future macroeconomic shocks using early warning systems based on insolvency risk measures. This is consistent with the results of Allen, Bali & Tang (2010), who find that increases in risk taking by banks forecast macroeconomic declines almost one year before they occur. The results presented in this paper suggest that regulators can stabilize macroeconomic conditions by judiciously applying risk-based capital infusions. We draw parallels with crisis intervention policies employed in the US. We conclude that blanket capital infusions are ineffective and can actually be detrimental. Public policy programs must be substantial in size and targeted to reduce the risk of bank insolvency.

The Japanese banking crisis also offers a natural experiment to investigate the motivation for foreign direct investment (FDI). During the crisis, 62 Japanese banks switched their charters from international to domestic by closing their overseas branches. We find that this shift was a response to capital constraints, since capital requirements for domestic Japanese banks are half those of international Japanese banks. This finding is inconsistent with an industrial organization approach to FDI in which fundamental long-term value is created by internalizing a firm's operations across borders. Evidence of Japanese bank de-internalization in response to temporary, crisis-related increases in capital costs is inconsistent with this value-added view of FDI. Similarly, our empirical results provide no support for the relative wealth hypothesis that relates the level of FDI to investor wealth differentials. Thus, our analysis of the natural experiment of Japanese bank charter switching demonstrates an important role for capital constraints in internalization theory.

FDI has important public policy implications as multinational activity has the potential to allocate global resources more efficiently and to increase economic output and productivity worldwide. If, as our results suggest, capital constraints are an impediment to FDI, then the removal of international capital controls and the development of vibrant and efficient capital markets are important public policy goals.

NOTES

[1] Hoshi & Kashyap (2009) provide an in-depth analysis of the nature of the crises showing that the parallel between the two crises extends beyond their initial roots in the real estate sector.

[2] We believe that both the Japanese and US crises were global in scope, in part because the US and Japan are the two largest economies in the world. Moreover, the process of Japanese bank charter switching spread the real banking effects of the crisis from Japan to the rest of the world via the closing of Japanese bank branches abroad. This global view of Japan's lost decade is supported by Peek & Rosengren (2000) who show that reductions in Japanese bank lending activity in the US during the lost decade had a detrimental impact on real economic activity in the US. However, the lessons from the Japanese crisis may not be directly applicable to the 2007-2009 crisis given its extraordinarily broad scope, which even spread to low income countries which were not integrated into the global financial economy.

[3] Although Japan's real estate bubble burst in the early 1990s, Japanese public policy interventions only began in earnest in 1998. Similarly, although the US banking crisis began in 2007, we consider the policies undertaken in 2008 and 2009, after it became obvious that other policies (such as liquidity provision) were not remedying the crisis.

[4] In 1998, each of the 12 major Japanese city banks received 100 billion yen in capital infusions, whereas in 2008 each of 25 large US financial firms received $25 billion in the initial TARP allocations.

[5] For details, see FAS 157-4: *Determining Fair Value When the Volume and Level of Activity for the Asset or Liability Have Significantly Decreased and Identifying Transactions That Are Not Orderly.*

[6] Moreover, these studies did not utilize our disaggregated bank database. In fact, Giannetti & Simonov (2009) utilize an event study methodology that does not take into account the size and source of each public injection of capital.

[7] Capital costs are impacted by frictions such as the tax subsidy of debt (Smith & Stulz, 1985), managerial risk aversion under asymmetric information (Breeden & Viswanathan, 1990; DeMarzo & Duffie, 1992), the classic debt overhang problem (Myers, 1977) and collateral constraints (Kehoe & Levine, 1993; Rampini & Viswanathan, 2010). These frictions are exacerbated for opaque banking firms with access to a government safety net from deposit insurance, lender of last resort privileges and TBTF bailout protection. Allen, Bali & Tang (2010) find that increases in aggregate levels of bank risk taking increase fundamental economic and financial uncertainty, which increase the cost of capital during crises.

[8] For examples of empirical studies examining international acquisitions, see Wilkins (1990), Dunning & Narula (1996), Allen & Pantzalis (1996), Kipping (1999), Anand & Delios (2002), Tschoegl (2002), Ghemawat (2003), Ahuja & Katila (2004), Reuer, Shenkar & Ragozzino (2004). A notable exception is Klein, Peek & Rosengren (2002), which attributes to the decline in Japanese investments in the US to changes in real foreign exchange rates.

[9] Kang & Stulz (2000) attribute the loss of more than half of equity value for the typical firm on the Tokyo Stock Exchange during 1990 to 1993 to the banking crisis.

[10] The dichotomization of Japanese banking into international and domestic may have been encouraged by the original Basel Accord signed in 1988. A major objective of Basel I was to level the international playing field, in direct response to the perceived lower capital requirements for Japanese banks which presumably gave them a competitive advantage. Since this did not apply to Japanese banks that had only domestic operations, the Ministry of Finance allowed them to retain lower capital requirements in exchange for a ban on international operations, whereas international banks had to comply with higher Basel capital requirements. However, even prior to the adoption of the Basel capital requirements, international Japanese banks were required to hold more capital than domestic banks. Their minimum ratio was set at 6% of total assets, as compared to 4% for domestic banks. However, only international banks were allowed to use 70% of unrealized gains on equity securities (so-called hidden reserves, or the equity revaluation allowance) in order to meet their capital requirements. According to Himino (2005), Japan's international (city) banks were dependent upon their hidden reserves to meet the 6% capital requirement. Dichotomous capital regulations were adopted by the Basel Committee in November, 2010

and domestic banks without cross-border operations were exempted from new higher capital requirements.

[11] Uchida & Nakagawa (2007) and Hoshi, Kashyap & Scharfstein (1991) 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.

[12] Hoshi & Kashyap (2009), page 11.

[13] However, Bayazitova & Shivdasani (2009) show that TARP infusions had a positive impact on the equity valuations of recipient banks, particularly for the large banks that were the first to receive capital infusions.

[14] 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.

[15] Land revaluation allowances apply to land owned for business purposes, i.e., occupied by buildings, employee housing, and held for employees' welfare.

[16] 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 as of the regulatory date of revaluation.

[17] In our sample period, only one bank, Mizuho Bank (formerly known as Yasuda Trust), switched in March 2003 from domestic to international, but this was in the context of a general reorganization and consolidation of its domestic and international divisions.

[18] There are two groups of regional banks. Regional 2 banks were originally established as mutual banks and were regulated separately from regional 1 banks in Japan. On February 1, 1989, 52 of 68 mutual banks were transformed to Banking Act regional banks and designated regional 2 banks. By April 1, 1992, all remaining mutual banks completed their transformations to regional 2 banks under the Banking Act.

[19] 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 & Rosengren (2000) for details).

[20] 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. Moreover, land revaluations were permanent infusions (until the land was sold and removed from the bank's books), whereas equity revaluations were revised each year based on share prices.

[21] The *RISKBASEDPUBINJ* independent variable is measured as a proportion of the log of total assets. From Table 2, the average of the 1og of total assets in our sample is 14.57, implying an average asset size of 6.84 trillion yen. Multiplying the average asset size to the coefficient estimate (0.0104) times the average rate of risk-based capital injections (0.025%) yields an average increase in total lending of 17.77 million yen per bank related to the risk-based capital injections, which implies an average increase in bank loans by 2.6% of an average bank's assets in our sample. If we only consider those banks that received a positive infusion of risk based capital, then their average increase in loans amounts to 3.86% of their assets.

[22] Multiplying the coefficient estimate (-0.0424) by the average rate of blanket capital infusions (0.003%) times the average asset size (6.84 trillion yen) yields an average decrease in aggregate lending of 8.69 million yen per bank, which implies, an average decline in loans of 1.27% of assets. For banks that receive positive blanket infusions of capital, the average decline in loans is 1.74% of bank assets

[23] This sectoral reallocation of loans is consistent with the debt concentration effect postulated by Gande, John & Senbet(2008).

[24] *BISDIF* measures the overall capital effect in terms of the bank's deviation from Basel capital requirements. However, because *BISDIF* is positively correlated with the amount of commercial and industrial loans (see Table 4), we cannot use it as an instrumental variable.

[25] We would like to thank Professor William Greene for suggesting this methodology.
[26] We perform a similar decomposition of our sample into regional banks only and according to whether a bank received one type of capital infusion, but not the other, and obtained results similar to those presented in Table 6. In particular, our results are consistent with a retrenchment in lending activity by troubled regional banks that are more likely to switch charters in response to capital constraints. Results are available upon request.

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TABLE 1: VARIABLES SUMMARY

DEPENDENT VARIABLES

VARIABLE NAME	DESCRIPTION
TOTLOAN	Net change in outstanding total loans as a share of beginning of period assets.
CILOAN	Net change in outstanding commercial and industrial loans as a share of beginning of period assets.
NONRESLOAN	Net change in non-residential real estate loans as a share of beginning of period assets.
RESLOAN	Net change in residential real estate loans as a share of beginning of period assets.
OTHER	Net change in loans other than C&I and real estate loans as a share of beginning of period assets

EXPLANATORY VARIABLES

VECTOR	VARIABLES	DESCRIPTION
BANK	ASSET	Log of beginning of 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 credit 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 period assets
DEMAND	GDP	Percentage changes in annual Gross Domestic Product, national GDP for city, trust and long-term banks, prefectural GDP for regional banks.
	BUSINDEX	Index of Business Conditions,
	LENDATTITUDE	Diffusion Index of lending attitudes of banks as perceived by their clients.
	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 period assets, lagged one period.
	CILOAN(-1)	Change in outstanding commercial and industrial loans as a share of beginning of period assets, lagged one period.
	NONRESLOAN(-1)	Change in outstanding non-residential real estate loans as a share of beginning of period assets, lagged one period
	RESLOAN(-1)	Change in outstanding residential real estate loans as a share of beginning of 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 period assets
	RISKBASEDPUBINJ	Public injections in 1999 and thereafter as a share of beginning of period assets
	EQREVAL	Unrealized gains on equity as a share of beginning of period assets
	LANDREVAL	Unrealized gains on land holdings as a share of beginning of 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 period assets.
	UNUSEDTIER2*EQREVAL	Cross product of UNSEDTIER2 and EQUITY REVALUATION
	UNUSEDTIER2*LANDREVAL	Cross product of UNSEDTIER2 and LAND REVALUATION

TABLE 2: DESCRIPTIVE STATISTICS: Variable descriptions are in Table 1.

	Mean	Median	Std. Dev.	Max	Min	# of Obs.
PANEL A: EXPLANATORY VARIABLES						
ASSET	14.57	14.53	1.21	19.06	12.3	1740
GDP	1.35%	1.37%	1.99%	8.46%	-5.03%	1740
CONSINDEX	92.7	91.1	5.76	102	81.3	1740
BUSINDEX	0.87	1	0.81	1.8	-1.1	1740
LENDATTITUDE	4.78	3.75	10.02	19.25	-18.75	1740
LOANLOSS	0.6%	0.45%	0.68%	12.4%	0%	1632
BISDIF	3.26%	3.26%	2.66%	17.13%	-7.23%	1657
BLANKETPUBINJ	0.003%	0.000%	0.038%	1%	0.000%	1740
RISKBASEDPUBINJ	0.025%	0.000%	0.24%	4.78%	0.000%	1740
EQREVAL	0.29%	0.00%	0.53%	2.49%	0.00%	1740
LANDREVAL	0.18%	0.00%	0.17%	0.95%	0.00%	1740
DOMESTIC	0.69	1	0.47	1	0	1740
SWITCHER	0.33	0	0.47	1	0	1740
UNUSEDTIER2	0.27%	0.00%	2.77%	6.25%	0.00%	1738
UNSEDTIER2*EQREVAL	0.046%	0.00%	0.69%	1.58%	0.00%	1738
UNUSEDTIER2*LANDREVAL	0.014%	0.00%	2.46%	0.00%	0.08%	1738
PANEL B: LOAN SHARE						
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

TABLE 3: IMPACT OF REGULATORY CAPITAL REMEDIES (OLS WITH FIXED EFFECTS) - 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: $((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_4 CAPREQ_{i,t-1} + u_{i,t}$
Our estimation controls for bank-type dummies and the bank operations dummy that controls for the area of bank operations-international or domestic (in the vector BANK). In addition, we also control for annual dummies (in the vector YEAR), though the coefficients of these binary variables are not shown in the table for brevity. The heteroskedasticity-consistent standard errors are in parentheses. †, *, **, *** indicate significance at 10%, 5%, 1% and 0.1% levels.

	TOTLOAN	CILOAN	NONRESLOAN	RESLOAN	OTHER
CONSTANT	0.5066***	-0.0175	0.0178	0.2131***	0.3167***
	(0.0670)	(0.0162)	(0.0151)	(0.0212)	(0.0586)
ASSET	-0.0042***	-0.0003*	-0.0007***	0.00013	-0.0026***
	(0.0007)	(0.0002)	(0.0002)	(0.0002)	(0.0006)
GDP	0.0003	0.00004	0.000003	0.00003	0.0002
	(0.0002)	(0.0001)	(0.00006)	(0.00008)	(0.0002)
CONSINDEX	-0.0040***	0.0003*	-0.00010	-0.0018***	-0.0027***
	(0.0006)	(0.0001)	(0.00014)	(0.0002)	(0.0005)
BUSINDEX	-0.0475***	-0.0017	0.0023	-0.0348***	-0.0196*
	(0.0097)	(0.0024)	(0.0022)	(0.0030)	(0.0079)
LENDATTITUDE	0.0018***	-0.00003	0.00007	0.0007***	0.0008***
	(0.0003)	(0.0001)	(0.00006)	(0.00008)	(0.0002)
LOANLOSS	-0.0121***	-0.0009**	-0.0011***	0.00008	-0.0081***
	(0.0013)	(0.0003)	(0.0003)	(0.0003)	(0.0011)
BISDIF	0.0007*	0.0002**	0.00007	-0.0002*	0.0007***
	(0.0003)	(0.0001)	(0.00006)	(0.00009)	(0.0002)
TOTLOAN(-1)	0.2517***	0.0144*	0.0116*	-0.0008	0.1858***
	(0.0260)	(0.0060)	(0.0056)	(0.0073)	(0.0247)
CILOAN(-1)	-0.0017	0.0452	0.0014	0.0026	-0.0331
	(0.0401)	(0.0285)	(0.0084)	(0.0076)	(0.0685)
NONRESLOAN(-1)	-0.0390*	-0.0380*	0.2439***	0.0461*	-0.1197†
	(0.0171)	(0.0160)	(0.0270)	(0.0207)	(0.0664)
RESLOAN(-1)	0.1321**	-0.0056	-0.0301*	0.4719***	-0.2000***
	(0.0451)	(0.0119)	(0.0125)	(0.0244)	(0.0428)
BLANKETPUBINJ	-0.0424*	0.0061	-0.0025	0.0046	-0.0264*
	(0.0202)	(0.0040)	(0.0060)	(0.0039)	(0.013)
RISKBASEDPUBINJ	0.0104***	0.0021***	0.0012†	0.0012	0.0059*
	(0.0029)	(0.0005)	(0.0007)	(0.0007)	(0.0025)
EQREVAL	-0.0018	-0.0001	-0.0005†	0.0002	-0.0015
	(0.0012)	(0.0003)	(0.0003)	(0.0004)	(0.0011)
LANDREVAL	-0.0041	0.0002	0.0017*	-0.0026**	-0.0051*
	(0.0030)	(0.0007)	(0.0007)	(0.0009)	(0.0025)
NO. OF OBS.	1583	1583	1583	1583	1583
ADJ. R-SQUARED	43.7%	27.5%	19.4%	44.3%	31.7%

TABLE 4: CORRELATION MATRIX

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) ASSET	1																
(2) BISDIF	0.042†	1															
(3) C&I LOAN	-0.224***	0.027*	1														
(4) DOMESTIC	-0.503***	0.427***	0.05*	1													
(5) EQREVAL	0.372***	-0.3***	0.044†	-0.747***	1												
(6) GDP	-0.032	0.017	0.021	-0.019	0.05*	1											
(7) LANDREVAL	-0.126***	0.317***	-0.011	0.253***	-0.282***	-0.103***	1										
(8) LOANLOSS	0.098***	-0.179***	-0.207***	0.119***	-0.183***	-0.12***	.079**	1									
(9) NONRESLOAN	-0.044†	0.02	-0.068**	0.0013	0.0085	0.013	-.006	-0.09***	1								
(10) BLANKET PUBINJ	0.138***	-0.01	.0039	-.01	-0.029	0.02	-0.007	0.091***	-0.023	1							
(11) RISKBASED PUBINJ	0.113***	0.062	-0.006	0.027	-0.057*	-0.017	0.014	0.1***	-0.003	-0.008	1						
(12) RESLOAN	-0.097***	0.015	0.088***	0.075**	-0.062*	-0.011	-.044†	-0.069**	0.166***	-0.011	-0.0003	1					
(13) SWITCHER	0.194***	0.538***	0.005	0.422***	-0.283***	-0.018	0.17***	-0.043†	-0.035	0.044†	0.063*	0.08***	1				
(14) TOTLOAN	-0.105***	-0.017	0.246***	-0.047†	0.073**	0.045†	-0.12***	-0.29***	0.263***	-0.09***	-0.011	0.6***	-0.05*	1			
(15) UNUSEDTIER2	0.131***	-0.12***	-0.05	-0.032	-0.02	-0.021	-0.043†	0.403***	-0.109	0.01	0.08**	-0.03	0.09***	-0.22	1		
(16) UNUSEDTIER2 *EQREVAL	0.132***	-0.077**	0.004	-0.082***	0.115***	-0.032	-0.049†	0.051*	-0.027	-0.003	-0.008	-0.03	-0.02†	-0.09	0.4***	1	
(17) UNUSEDTIER2 *LANDREVAL	0.079**	0.001	-0.205†	0.059*	-0.087***	-0.02	.256***	0.094***	-0.034	0.05*	0.068**	-0.001	0.12***	-0.09	0.13***	-0.01	1

†, *, **, *** indicate significance at 10%, 5%, 1% and 0.1% levels.

TABLE 5: 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 heteroskedasticity-consistent standard errors are in parentheses.

†, *, **, *** indicate significance at 10%, 5%, 1% and 0.1% levels.

	$\Pr(Switcher_{i,t} = 1 \mid \overline{X})$
CONSTANT	-50.7578***
	(4.8294)
ASSET	1.9453***
	(0.2348)
GDP	0.0641
	(0.0393)
CONSINDEX	0.1945***
	(0.0273)
BUSINDEX	-1.9618***
	(0.4448)
LENDATTITUDE	0.0104
	(0.0214)
LOANLOSS	-0.3455**
	(0.1303)
BISDIF	0.1241***
	(0.0313)
TOTLOAN(-1)	-1.1748
	(1.4286)
CILOAN(-1)	-1.3161
	(2.3012)
NONRESLOAN(-1)	-0.8644
	(1.1236)
RESLOAN(-1)	10.9843**
	(4.1928)
BLANKETPUBINJ	-1.8384*
	(0.9129)
RISKBASEDPUBINJ	-0.0760
	(0.1718)
EQREVAL	0.4536
	(0.3153)
LANDREVAL	2.2922**
	(0.8406)
UNSEDTIER2	0.7018***
	(0.2126)
UNUSEDTIER2*EQREVAL	-0.7974**
	(0.2854)
UNUSEDTIER2*LANDREVAL	2.9843*
	(1.2398)
NO. OF OBS.	1583
MCFADDEN R-SQUARED	73.82%
LR STATISTIC	1530.91
PROB (LR STATISTIC)	0.000

TABLE 6: IMPACT OF REGULATORY CAPITAL REMEDIES 2SLS Estimation WITH FIXED EFFECTS of: $((L_{i,j,t} - L_{i,j,t-1})/A_{i,t-1}) = a_0 + a_1 BANK_{i,t-1} + a_2 DEMAND_{t-1} + a_3 YEAR_t + a_4 LOANLAG_{i,t-1} + a_5 CAPREQ_{i,t-1} + a_6 SWITCHER_{i,t-1} + u_{i,t}$

SWITCHER is the predicted value (Table 5). Our estimation controls for bank-type dummies and the bank operations dummy that controls for the area of bank operations-international or domestic (in the vector BANK). In addition, we also control for annual dummies (in the vector YEAR), though the coefficients of these binary variables are not shown in the table for brevity. The heteroskedasticity-consistent standard errors are in parentheses. †, *, **, *** indicate significance at 10%, 5%, 1% and 0.1% levels.

	TOTLOAN	CILOAN	NONRESLOAN	RESLOAN	OTHER
CONSTANT	0.5123***	-0.0177	0.0153	0.2154***	0.3189***
	(0.0673)	(0.0163)	(0.0153)	(0.0212)	(0.0551)
ASSET	-0.0052***	-0.0003	-0.0006*	-0.0001	-0.003***
	(0.0010)	(0.0002)	(0.0002)	(0.0003)	(0.0007)
GDP	0.00022	0.00004	0.00001	0.00002	0.0002
	(0.00024)	(0.00006)	(0.00006)	(0.0001)	(0.0002)
CONSINDEX	-0.0039***	0.0003†	-0.00010	-0.0017***	-0.0027***
	(0.0006)	(0.0001)	(0.00014)	(0.0002)	(0.0005)
BUSINDEX	-0.0470***	-0.0017	0.0024	-0.0347***	-0.0194*
	(0.0097)	(0.0024)	(0.0022)	(0.0031)	(0.0079)
LENDATTITUDE	0.0018***	-0.00003	0.00007	0.0007***	0.0008***
	(0.0003)	(0.00006)	(0.00006)	(0.0001)	(0.0002)
LOANLOSS	-0.0118***	-0.0009**	-0.0011***	0.0001	-0.008***
	(0.0013)	(0.0003)	(0.0003)	(0.0003)	(0.0011)
BISDIF	0.0006*	0.0002**	0.00009	-0.0002*	0.0007**
	(0.0003)	(0.0001)	(0.00006)	(0.0001)	(0.0002)
TOTLOAN(-1)	0.2510***	0.0145*	0.0127*	-0.0011	0.1859***
	(0.0260)	(0.0060)	(0.0056)	(0.0074)	(0.0247)
CILOAN(-1)	-0.0014	0.0452	0.0014	0.0027	-0.0359
	(0.0401)	(0.0285)	(0.0084)	(0.0076)	(0.0685)
NONRESLOAN(-1)	-0.0390*	-0.0382*	0.2399***	0.0478*	-0.1158†
	(0.0170)	(0.0161)	(0.0271)	(0.0208)	(0.0666)
RESLOAN(-1)	0.1303**	-0.0057	-0.0302*	0.4726***	-.02011***
	(0.0451)	(0.0119)	(0.0125)	(0.0245)	(0.0429)
BLANKETPUBINJ	-0.0413*	0.0060	-0.0026	0.0046	-0.026*
	(0.0203)	(0.0040)	(0.0060)	(0.0039)	(0.0129)
RISKBASEDPUBINJ	0.0106***	0.0021***	0.0012†	0.0012†	0.006*
	(0.0029)	(0.0005)	(0.0007)	(0.0007)	(0.0025)
EQREVAL	-0.0016	-0.0001	-0.0005†	0.0002	-0.0014
	(0.0012)	(0.0003)	(0.0003)	(0.0004)	(0.0011)
LANDREVAL	-0.0045	0.0002	0.0021**	-0.0027**	-0.0052*
	(0.0031)	(0.0007)	(0.0008)	(0.0009)	(0.0026)
SWITCHER	0.0028	-0.0002	-0.0007	0.0010	0.0012
	(0.0020)	(0.0006)	(0.0005)	(0.0007)	(0.0016)
NO. OF OBS.	1583	1583	1583	1583	1583
ADJ. R-SQUARED	43.5%	27.5%	19.4%	44.1%	31.5%