Banks restructuring sonata:

How capital injection triggered labor force rejuvenation in Japanese banks

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May 17, 2013

Preliminary and incomplete

Abstract

Given divergent interests of managers and regulators, the agency problem is inherent in bank rescue operations that require banks to follow guidelines. This paper analyses the extent and nature of the agency problem in the Japanese capital injection program. We examine a hypothesis that, in response to requirements to downsize, banks reassigned older workers near their retirement age to bank subsidiaries, so as to meet the targeted amount of downsizing, and to sidestep the tight legal environment on layoffs. Our data is a panel dataset of Japanese banks from 1990 through 2010. We examine the changes to the demographics of bank workers by analyzing the average age of bank employees reported in financial statements, supplementing the analysis with the number of workers at parent's stand-alone basis as well as at consolidated basis. The result shows that injected banks exhibited workforce rejuvenation relative to non-injected banks. Roughly, average age fell by one year in injected banks, which is equivalent to about seventy less 65-years old workers for an average injected bank. While injected banks employees at unconsolidated basis falls in response to injection, we do not detect any effects at consolidated basis. Our finding suggests that (1) the life-time employment practice has evolved and survived (2) productivity at parent-bank level would have risen due to rejuvenation.

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† Osada would like to acknowledge the financial support under the Grant-in-Aid for Scientific Research (KAKENHI) No23830068 provided by the Japan Society for the Promotion of Science. Onji would like to acknowledge the support provided by the Australia-Japan Research Centre under the directorship of Jenny Corbett. Akira Kinefuchi provided excellent research assistance. All remaining errors are ours.

Introduction

The Global Financial Crisis forced governments all over the world to rescue severely affected financial institutions for the purpose of containing systemic crisis. Some business firms, such as the General Motors, also received government assistance. These rescue operations typically arranged government purchases of senior stocks or senior debts of troubled firms. Just as in any widely-held corporations, where ownerships and controls differ, managers of government-assisted firms and the regulatory agent need not share the same interests in executive compensation and employee downsizing. As a result, the effectiveness of a rescue operation, when ill designed, could be undermined by the agency problem. AIG, which announced extravagant bonus payments to executives after receiving capital injection, is a case in point.

This paper considers the extent and nature of the agency problem to highlight issues in designing a rescue operation. We focus on the case of the Japanese capital injection program in which previous studies identify the existence of the agency problem. Japan implemented capital injection to banks in March 1998, and the program required banks to comply with targets on workforce downsizing. To banks that receive public capital, the government becomes an active shareholder with power to punish. Hoshi and Kashyap (2005) first noted that one bank met a downsizing target by shuffling workers to its subsidiaries. Onji, Vera, and Corbett (2012) verified the pervasiveness of the personnel shuffling behavior among injected banks with a sample of regional banks. The latter study offers a nuanced interpretation on the behavior, observing that the intent of the bank management may not be malicious in that, in addition to the downsizing target, banks operated in an environment where banks face restrictions on layoffs due to the existing labor law and the life-time employment practice. Onji, Vera, and Corbett (2012) hypothesize that banks shuffled older workers, who were near their retirement age, to subsidiaries, but offer only circumstantial evidence to support their hypothesis.

In this backdrop, this paper empirically examines the demographic composition of bank employees to see whether the Japanese capital injection programs induced injected banks to shed older employees. The first motivation for examining the demographic composition is to provide a direct test of the hypothesis suggested by Onji, Vera, and Corbett (2012). The second motivation is to consider the role of active shareholders in the death, or survival, of the Japanese-style employment practices. The Japanese banks extensively adopt the life-time employment (LTE) practice (Koike, 1996).[1] A corollary of the prominence of LTE is that older workers tend to be protected from negative productivity shocks at the expense of younger workers who find less job openings (Genda, 2003). Therefore, if LTE remains intact and banks freezes hiring of fresh graduates, the workforce would age. Genda and Rebick (2000) observe that the change in employment practices in Japan since the mid-1980s till late 1990s had been slow. They are pessimistic that shareholders will exercise much influences, noting that the lack of mechanisms in which large institutional shareholders, except lending banks, can directly place pressure on firms to change employment practice. Our examination of employee demographic of injected banks provides insights into how LTE has changed in response to a shareholder who demands restructuring. The third motivation is to see if the capital injection programs have had 'real' impacts on productivity through facilitating shifts in employee composition towards more IT-literate workforce. The skill-biased technological change has been documented as the importance of information technology has risen, and in particular, Bresnahan, Brynjolfsson, and Hitt (2002) show that IT is embedded in a cluster of innovations including organizational changes. In the case of Japan, injected banks were

[1] Koike (1996) documents notably long service lengths in the Japanese banking sector in the 1970s, compared with white-collar workers in manufacturing, wholesale and retail, and also with bankers in the West Germany.

required to achieve mechanization, so to the extent that young workers are on average more computer literate, banks' demand for younger workers, relative to older workers, would have risen.

The outcome variable we examine is the average age of bank employees retrieved from financial statements. We examine the number of workers in conjunction with the average age to infer how demographic composition changed. The panel dataset covers financial year (FY) 1990-2010. After accounting for mergers, the number of panel units in the base analysis is 172. The idea of the empirical analysis is to see how banks with larger capital injection react relative to banks with no injection and lower capital injection, accounting for bank-specific observables and common macroeconomic shocks. As is well recognized in the literature (Onji, Vera, Corbett, 2012; Duchin and Sosya, 2012), banks do not receive capital injection randomly. The sample selection bias is thus a concern. We address this concern in two ways. First we explicitly account for bank performance in the regression. Second, we consider constructing a control sample on the basis of observed characteristics employing the Mahalanobis Distance Matching.

Our result suggests that injected banks exhibited workforce rejuvenation relative to non-injected banks. The estimated coefficients roughly translates to one year reduction in average age, equivalent to about seventy less 65-years old workers, for an average injected bank. Upon repayment of injected capital, the average age at injected banks falls further by 1.7 years, which is equivalent to about extra two hundred 22-years old workers. We also examine the number of employees using both consolidated and unconsolidated data. Consistent with the previous studies, on parent bank's stand-alone basis, we find capital injection is associated with a reduction in employment while repayment increases employment. In contrast with fidings, on consolidated basis, we do not detect the impacts of injection, while repayment is weakly associated with an increase in employment. The contrast between unconsolidated and consolidated basis supports the hypothesis that employees were shifted to subsidiaries. This set of analysis suggests that older workers lost their position at parent banks but were still not made completely redundant as they were transferred to subsidiaries.

This paper primarily extends the studies on personnel shuffling induced by the Japanese capital injection program (Hoshi and Kashyap, 2005; Onji, Vera, and Corbett, 2012). First, no study to our knowledge has examined how capital injection programs induce changes in the demographic compositions of bank workers. Second, our analysis with extended time series is able to account for the impacts of repayments, which have not been considered in the previous studies. Third, we employ a higher frequency data than data employed by Onji, Vera, and Corbett (2012), who draws from subsidiary-level data on employment, but on biennial frequency.

Our study relates more broadly to other types of behavioral responses to capital injection programs. One type of responses that have received attention is the risk taking by banks. The main objective of capital injection programs is to contain financial system meltdowns, but policy makers explicitly or implicitly expect business lending to continue. Such expectations lead banks to meet targets by extending loans to risky lenders or to induce moral hazard by creating the perception that recipient banks are "too-important-to-fail." Studies have examined loan-level data on risk rating, and have found that the riskiness of loans increased for TARP banks (Duchin and Sosya, 2012; Black and Hazelwood, 2012).

Our study is also relevant in understanding the transformation of the LTE practice. Despite popular discussion about the collapse of the Japanese-style employment practices, a number of recent studies have documented the resilience of LTE using employee-level data across industries (e.g. Kambayashi and Kato, 2011). Our research presents a case study from the banking industry, and shows that even among firms under strict supervision, the practice of LTE survived in a transformed form, rather than being completely abandoned.

The rest of the paper is organized as follows. Section 1 describes the capital injection programs in Japan. Section 2 describes the data. Section 3 describes the regression analysis. Section 4 presents the results of the regression analysis. Section 5 describes the matching analysis. Section 6 concludes.

1. Institutional background

The Japanese government administered capital injection since 1998 in response to the collapses of several prominent financial institutions in 1997 (Hoshi Kashyap, 2010). The Financial Function Stabilization Act (FFSA) administered total of 1.8 trillion yen on March 1998 to 21 large banks. The Prompt Recapitalization Act administered 8.6 trillion yen to 32 banks (1999-2002).

Injected banks develop a business improvement plan with the Financial Services Agency and lay out targets on financial outcomes (e.g. tire 1 ratio) as well as restructuring targets (Onji, Vera, and Corbett, 2012). Restructuring targets include items such as the number of workers and board members, compensations, overhead costs, and mechanization expenses. The target on workforce downsizing can be quite aggressive. In 2001, the Ashikaga Bank for example targeted a reduction of 26.3% in its workforce by 2005. The reported figure on the number of regular workers is however ambiguous in that it leaves leeway to reshuffle personnel to subsidiaries so that the parent bank appears to achieve the target. In contrast, under the public support for businesses targeting non-financial firms administered under the Law on Special Measures for Industrial Revitalization enacted in 1999, firms that receive support report target on the number of employees, breaking down by temporary transfer (*shukkou*), permanent transfer (*tenseki*) and the number of new hires.[2] Onji, Vera, and Corbett (2012) argue that the ambiguity in the reporting requirement under the Japanese capital injection program, in conjunction with the tight restriction on layoffs in Japan, lead banks to reshuffle workers, particularly the older ones. The reasons for reshuffling older workers are many. First, under the seniority wage practice, workers on average are paid below its productivity when young and compensated more than s/he produces become older. Given the target on profitability, banks have incentives to shed workers compensated below its productivity. This is particularly so given the target on overall payroll. Second, the business restructuring included mechanization of operations, which increases demand for IT literate workers.

As a preliminary examination, we plot the time series of average age for three largest regional banks since the late 1970s (Figure 1). Regional banks did not go through as extensive merger process as the larger banks in Japan, so they provide a convenient sample. We also show Sumitomo Trust Bank in the figure since it did not merge with other banks during the sample period. This sample is not meant to be a representative sample or a group of most influential banks in Japan, but is a sample of important banks in the economy.

For banks that did not receive capital injection, the Chiba Bank and Shizuoka Bank, the average age increased generally steadily from around 30 years old in the late 1970s to around

[2] The past reports for individual cases are reported in http://www.meti.go.jp/sankatsuhou/nintei/past_result.html (accessed 25 January 2013).

40 years old by 2010, suggesting the lifetime employment practice remained generally intact over time. Contrastingly, the average age at the Yokohama Bank fell sharply in 2001, 2 years after receiving capital injection, probably reflecting early retirement of older workers. The average age also falls sharply again few years after the repayment. This time, the fall is attributable to increased hiring of fresh graduates. The average age at the Sumitomo Trust Bank fell since 1999, when the bank received capital, and generally declined thereafter. While yet tentative, the difference in the time series pattern of average age is indicative of the impact of capital injection program upon the job retention rate of older employees. We turn to a regression analysis employing all the Japanese banks to see if this pattern holds for a broader set of banks.

2. Description of the data

The main data source used in this paper is Nikkei Economic Electronic Databank Systems' (NEEDS) financial statements data CD-ROM (version 2011), which includes not only accounting data but also employee characteristics data. From this database, we retrieved the fiscal-year-end data of all the Japanese commercial banks that existed between FY 1990 and FY2010. The number of banks varies over time, mostly due to mergers. The count for FY1990 is 140 banks, but that for FY2010 is 114. Banks that have experienced mergers during a particular fiscal year are treated as new banks from the following fiscal year. Therefore, our dataset constitutes an unbalanced panel covering the period between Mar. 1991 and Mar. 2011.

The main dependent variable of our estimation is the average age of a bank's employees. The average age data that we used in our estimations is an adjusted version of the original data from NEEDS.[3] Our regression analysis employs control variables to capture the bank specific factors. All these variables are from NEEDS and on unconsolidated basis (i.e. standalone figures for parent banks not including subsidiary outcomes).

Aside from NEEDS database, in order to control for the differences among regional labor market environment, we used two regional variables from e-Stat (Regional Government Statistics for Japan site). One is the number of effective job seekers in a region, and the other is the average cash wage in the finance and insurance industry.[4] The average of these variables are available for each prefecture per fiscal year . Table 1 provides the summary statistics for the data used in the estimations.

2. Empirical models and results

2.1. Method: Demographic composition

Our aim is to analyze the response of banks' worker demographic to the Japanese capital injection programs after both the injections and the pay-backs. Under these programs, banks which received capital injections were forced to carry out personnel restructurings to downsize banks' personnel costs. The targets of these restructurings were middle-aged and older generations of employees, who received higher salaries. So, it is expected that the average age of those banks' employees might fall. On the other hand, after paying back injected capitals, banks' personnel decisions are no longer constrained by the government monitoring. So, it is possible that banks started to hire younger generations, which also may lower the average age of pay-back banks.

[3] If the average age was 40 years and 11 months, NEEDS records the data as "40.11". Our modified data records it as "40.92"(=40+11/12).
[4] The data source for wage is the Basic Survey on Wage published by the Ministry of Health, Labor and Welfare (MoHLW). The number of job seekers is from ''Employment Referrals Statistics'' reported in Labor Market Annals also published by the MoHLW.

Based on the above discussion, in theory, both capital injections and pay-backs should affect banks' demographic composition. To examine this hypothesis, we take the average age of a bank's employees as a dependent variable, and estimate the following equation;

$$Age_{it} = \sum_{j=0}^{3} \alpha_j INJcross_{i\,t-j} + \sum_{j=0}^{3} \beta_j PAIDcross_{i\,t-j} + \gamma Age_{i,t-1} + X_{i,t}{}'\theta + \kappa + \mu_i + \phi_t + \varepsilon_{i,t}, \qquad (1)$$

$$INJcross_{i\,t-j} = INJ_{i\,t-j} \frac{InjCap_i}{Asset_{it}}, \qquad (a)$$

$$PAIDcross_{i\,t-j} = PAID_{i\,t-j} \frac{InjCap_i}{Asset_{it}}, \qquad (b)$$

where Age_{it} is the employees' average age of bank *i* at the end of financial year *t*. The lagged dependent variable on the right-hand side captures the sluggishness in making annual adjustments to an existing pool of employees who are typically under indefinite term contracts. There are two main explanatory variables; $INJcross_{i\,t-j}$ and $PAIDcross_{i\,t-j}$, defined in equations (a) and (b) respectively. $\frac{InjCap_i}{Asset_{it}}$ is the ratio of total amount of capital injection divided by total asset. This formulation allows for differences in the intensity of treatment, which should matter if banks with larger government supports are under more stringent targets. This formulation follows Onji, Vera, and Corbett (2012) whose analyses show the importance of accounting for the intensity. $INJ_{i\,t-j}$ is a dummy for banks that received capital in *t-j*. For banks that received multiple injections, we employed the first injection to define this variable. $PAID_{i\,t-j}$ is also a dummy for banks that paid back all of their injected capital in *t-j*. In practice, banks gradually paid back injected funds over the years, but only after all of the injected funds are payed off, banks' personnel decisions became independent from government monitoring. $PAIDcross_{i\,t-j}$ therefore captures the removal of constrains imposed under capital injection programs. The effects of capital injection and pay-back on banks' demographic composition can last over time. To capture these effects, we include the indicator for their lags up to three years.

Vector $X_{i,t}$ denotes a vector of control variables that control for bank specific factors and regional labor market factors. As is well recognized in the literature (Onji, Vera, Corbett, 2012; Duchin and Sosya, 2012), banks do not receive capital injection randomly so the sample selection process can bias estimated coefficients. Importantly, coefficients on the injection dummies and repayment dummies may capture the average effects of employment reduction at poorly performing banks, rather than the direct effects of capital injection programs. To remove the source of bias, we include the return on assets (ROA) in the regression as a control for performance. In addition, we included the total amount of salaries and allowances, the total number of employees, and the total assets, as other bank specific controls. The number of effective job seekers and the average cash wage of finance and insurance industry are included as regional factors[5]. μ_i and ϕ_t are fixed effects and $\varepsilon_{i,t}$ is a heteroskedastic error with no serial correlation. κ represents the constant term in a regression.

We estimated the model (1) through fixed effects regression method. Since the right-hand-side variables include a lagged dependent variable, the dynamic panel bias may appear to be a concern with the fixed effect estimator. We think however the dynamic panel bias is not an issue in this context. First, the fixed effects estimators generate bias when the time series dimension is small (Judson & Owen, 1999). The time series dimension in our data is of a reasonable size (T=20), and the cross section dimension is large (N=173). Second, the coefficient on lagged dependent variable suffers more severely than those on other covariates. Our chief interest is on the coefficient on the injection and repayment variables, and not that

[5] Except for ROA, the other control variables are logarithmic values.

on the lagged dependent variable, so we would expect that our inference should not be affected by the choice of estimator.

2.2. Personnel shuffling hypothesis

In addition to examining the effects on average ages, we examine the banks' personnel 'shifting behavior' with longer time series data than that employed in Onji, Vera, and Corbett (2012). The inclusion of latter time period allows us to account for effects of repayments. We estimate the following equation (2) and (3);

$$Employee^{UN}{}_{it} = \sum_{j=0}^{3} \alpha_j INJcross_{i\,t-j} + \sum_{j=0}^{3} \beta_j PAIDcross_{i\,t-j} + \gamma Employee^{UN}{}_{i,t-1} + Z_{i,t}{}'\theta + \kappa + \mu_i + \phi_t + \varepsilon_{i,t}, \quad (2)$$

$$Employee^{CON}{}_{it} = \sum_{j=2}^{3} \alpha_j INJcross_{i\,t-j} + \sum_{j=0}^{3} \beta_j PAIDcross_{i\,t-j} + \gamma Employee^{CON}{}_{i,t-1} + Z_{i,t}{}'\theta + \kappa + \mu_i + \phi_t + \varepsilon_{i,t}, \quad (3)$$

where $Employee^{UN}$ and $Employee^{CON}$ are the number of employees on an unconsolidated basis and on consolidated basis respectively, which are both logarithmic values. Not all subsidiaries are consolidated for accounting purposes; as a general rule, a parent company includes majority-owned subsidiaries in a consolidated accounting statement. The number of employees at consolidated basis thus includes employees at consolidated subsidiaries, most of which with 50 or more percent direct and indirect ownership. If parent banks merely shuffled employees to consolidated subsidiaries, we would expect that the number of employees to fall at the parent bank but not at consolidated level.

With the parent-bank-level consolidated data, the present approach would not be able to capture shuffling to unconsolidated subsidiaries. However, in the previous analysis by Onji, Vera, and Corbett (2012) whose data includes unconsolidated subsidiaries, most of the responses take place within wholly-owned subsidiaries, so the present approach should not lead to 'false negative.'

One caveat is the availability of consolidated data. Consolidated financial reporting was not mandatory until 1999 in Japan, and we do not have data at consolidated level prior to 1999. In equation (3), we are only able to estimate the lagged impact of injection for the 2nd and 3rd year. $Z_{i,t}$ is vector of control variables similar to vector $X_{i,t}$ from equation (1). However, $Z_{i,t}$ includes employees' average age instead of total number of employees.

3. Results

We first examine the estimation results of equation (1), which are presented in Table 2. The model in the first column includes all of the control variables while those for the remainders include each control variable in turn.

Looking at the first four rows in Table 2, every coefficient of *INJcross* is significantly negative, excepting for the second row. These results indicate that the average age of employees of capital-injected banks gradually fell, that is banks were hiring younger workers over several years after receiving injections. How much younger did the average employee become? Using the estimation result from the first column, we can roughly estimate it as follows; the sum total of coefficients is -52.091 (=$\hat{\alpha}_0$+$\hat{\alpha}_2$+$\hat{\alpha}_3$), and the mean value of $\frac{InjCap_i}{Asset_{it}}$ is 0.023 from Table 1. So, we can say that capital injections reduced the average employee's age at injected banks by 1.198 years (=-52.091*0.023). What does one year reduction in average age imply about the demographic composition? Consider a bank with 2,000 employees whose average age is 37 years old. The average age falls by about 1 year if sixty nine 65-years-old workers leave the parent bank.

As for the effect of pay-backs, while the effects are not as strong, we find significant effects after one and two years of pay-backs, which the 6th and 7th rows of Table 2. Almost all of these coefficients are negative and significant, which indicate that the average age of employees of capital-injected banks gradually falls two years after paying back the injected capitals. Using the estimation results of the second column, we can roughly estimate that injected-banks become around 1.7 years younger on average after paying back the capital. Since the paybacks are typically accompanied by increases in employment, as will be demonstrated below, this reduction would have been due to extra hires. If all the extra hires consisted of 22-years-old college graduates, this would imply about extra 204 young workers.

These empirical results confirm that both Capital Injection and Payback have a negative impact on banks' average age. This suggests the possibility that older generations of employees were dismissed or transferred to subsidiaries several years after injections, and that banks started to hire younger workers two years after paying back the capital.

Next we turn to the results of Table 3. We can say that injected banks gradually decreased the number of employees several years after the event of the first capital injections. On the other hand, it is also significant that the number of employees was gradually increased several years after completing the capital pay-backs. These results are very consistent with the findings from equation (1). The reduction after injections indicates the possibility of older workers' transfer, and the increment after pay-backs suggest that of hiring younger workers.

The result on consolidated basis in Table 4 is quite different. For instance, there is almost no significant effect of capital injections on employment levels, and the results are not robust to the inclusion of additional controls. Even though the reduction of employees occurred on unconsolidated basis, or in parent companies, there is no significant reduction on consolidated basis after injections. These asymmetric results between on unconsolidated and consolidated indicate the possibility that banks' shifting behaviors was caused by capital injections.[6]

The coefficients on paybacks are significantly positive for the first and third lags at the 10 percent level, indicating that employment increased on the consolidated basis as well as on the unconsolidated basis. [7] The employment on the consolidated basis however seems to take more time to increase than that on the unconsolidated basis, and the effects are not as precisely estimated. The weaker response may be due to several reasons. One possibility is that some of the transferred old workers were rehired by parent banks. However, this is not likely to have occurred on a large scale given the fall in the average age at parent banks documented above. Another more likely scenario is that the transferees retired, offsetting the increase in young workers are parent banks.

Our empirical results are consistent with the previous studies, and what is more, show the new finding that injected-banks coped with restructuring programs monitored by government by changing their demographic composition.

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[6] The analysis in Table 4 employs a shorter time series than that in Table 3, so the imprecise estimate in Table 4 may be due to weak power of the test: due to non-reporting of consolidated financial statement until 1999, T=10, rather than 20, in the analysis on the consolidated employment. As a robustness check, we re-estimated the model (2) using the FY1999-2010 data, dropping the first two injection variables. We still found significantly negative coefficients so that the result is robust to this the time series length.

[7] Though the dependent variable in equation (3) is on a consolidated basis, control variables for bank specific effects are on an unconsolidated basis. As a robustness check, we re-estimated the model (3) using consolidated data instead. Again, there is almost no significant effect of injections, but the coefficients on lagged paybacks are significantly positive.

5. Matching based on Mahalanobis distance

This section considers a robustness check to our regression analysis with an alternative approach. In an ideal setting, we would like to randomly assign banks to capital injection programs to identify the impacts of an intervention. In our setting the receipt of capital injection was not random, but rather, selected banks received injection. In the previous section we controlled for confounding influences, including the impacts of poor performance, explicitly in the model. As an alternative, we consider the Mahalanobis Distance Matching (MDM). MDM is similar to the Propensity Score Matching (PSM) in constructing a control sample with similar observable characteristics to a treatment group. MDM is known to perform better than PSM when the number of covariates to match is small, as in the current setting (Rubin and Thomas, 2000). The advantage of the matching approaches in general is improving the comparability of treatment and control samples in settings where treatment assignments are not random. Duchin and Sosya (2012) employ PSM to check robustness in their study of the recent capital injection in the US. Notice that the matching analysis identifies the average treatment effect on the treated, the effect of the capital injection for banks that received capital injection, so our estimate does not indicate how other poorly performing financial institutions, in Japan or elsewhere, would have downsized had they received a Japanese-style capital injection. The scope of the analysis here is to provide documentation on the case of Japan, which provides a reference for other setting.

We implement the MDM analysis as follows. First, we match injected with non-injected banks using pre-injection data on a set of covariates. Second, we proceed to test the difference between workers average age for injected banks versus non-injected banks in the post injection period.

Our data allows us to match banks in the pre-injection period, not only using the variable of interest, workers average age, but also using additional bank's characteristics. To determine our sample of control units (non-injected banks), we use the following set of covariates: workers average age, return over assets, bank's size, number of workers and number of job applicants. It is important that we include pre-injection workers average age in order to meet the selection-on-observables assumption (Dehejia and Wahba. 1999) That is, if we did not include pre-injection workers average age we may be unable to capture the effect of some other unobservable confounders. Return over assets is included to make sure that the banks injected are being compared to banks of similar financial health in the pre-injection period. Bank size, measured as the natural logarithm of total assets as well as number of workers, allow us to match injected to non-injected banks in two different alternative measures of size. Number of job applicants, data aggregated over region, is also a relevant matching variable, since it guarantees that we are comparing the capital injected banks with non-injected banks with similar labor supply.

The pre-intervention period is taken to be 1997 or 1998, depending on the timing of the initial injection for a particular bank. Ideally, we want to match injected and non-injected banks, in a period closed to the capital injection. We selected 1997 and 1998, since they are the two periods immediate before the capital injections occurred. We tried post intervention periods to be each of years from 2003 through 2009. We fix the post-intervention period for all injected banks, but the timings of injection vary from 1998 to 2002. Thus, in this formulation, banks in the treatment group are exposed to intervention for varying length.

We have examined the balance of the covariates using data from the pre-intervention period. Ideally, the means of the covariates (workers average age, return over assets, bank's size, number of workers and number of job applicants) should be similar. We found that the matching resulted in a considerable bias reduction, especially in terms of return over asset, bank's size, number of employees, and job applicants. There is no bias reduction for average workers' age, however it is important to attempt to match banks on this variable to meet the selection-on-observables assumption. The overall improvement in balance reduction though adequate for our analysis does suffer from small pool of potential control units (113 non-injected banks) versus the number of injected units (13 injected banks). Given the moderate ratio of control over injected banks, it is not possible to find perfect matches in terms of observed covariates.

Figure 2 shows the results for 2003 through 2009, comparing the treated sample with the control sample. The average difference is consistently negative, indicating that injected banks on average had lower average age during the entire post intervention period. The range of the difference is -0.21 to -1.21 years, with a simple average of -0.6 years. These estimates are roughly comparable to that from the regression analysis.

The estimates are not significantly different from zero, except for when the post-intervention sample is taken to be 2004. While this result may appear to conflict with the earlier findings, there are a number of reasons for exercising caution in interpreting this figure at face value. First, the test of difference in means is based on a small sample, so the lack of power in statistical test is a concern. Second, while the regression analysis took into account the differences in the intensity of treatment, the present analysis does not. Third, the time since intervention is not constant among treated sample since capital injections occurred from 1998 through 2002 but we take the post intervention period to be fixed across banks with different timing of receipt of intervention. In contrast, the regression analysis account for individual differences in the timing of the intervention. For these reasons, we suspect 'false negative' in the analysis due to the design of the analysis. This said, we take comfort in the fact that the average age is consistently lower for the treatment sample.

As a robustness check to our MDM estimates we performed propensity score matching (PSM), using the same covariates and pre-injection period. The results from PSM indicate that at least for the year 2004 the average age difference between injected and non-injected banks is negative and significant.

6. Conclusion

This paper empirically examined the demographic composition of bank employees to see whether the Japanese capital injection program induced injected banks to shed older employees. The main contribution of our paper was in providing the first exploration of the relation between the Japanese capital injection program and worker demographics. The results support the following conclusions. First, injected banks tended to shed older workers, but many of them would have found employment at subsidiaries until they retired. Second, the lifetime-employment practice evolved in injected banks but not completely disappeared: Workers may not stay at a parent bank itself, but still continue to work in a corporate group, at a subsidiary. Third, to the extent that the banking sector became high tech, a rejuvenation of workforce would have resulted in productivity growth.

Our empirical analysis is based on bank-level aggregate of employee characteristics. Ideally, we would like to have employee-level panel data that allows researchers to track movements of employees. Such future work would be of interests.

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Figure 1
Average age for four banks

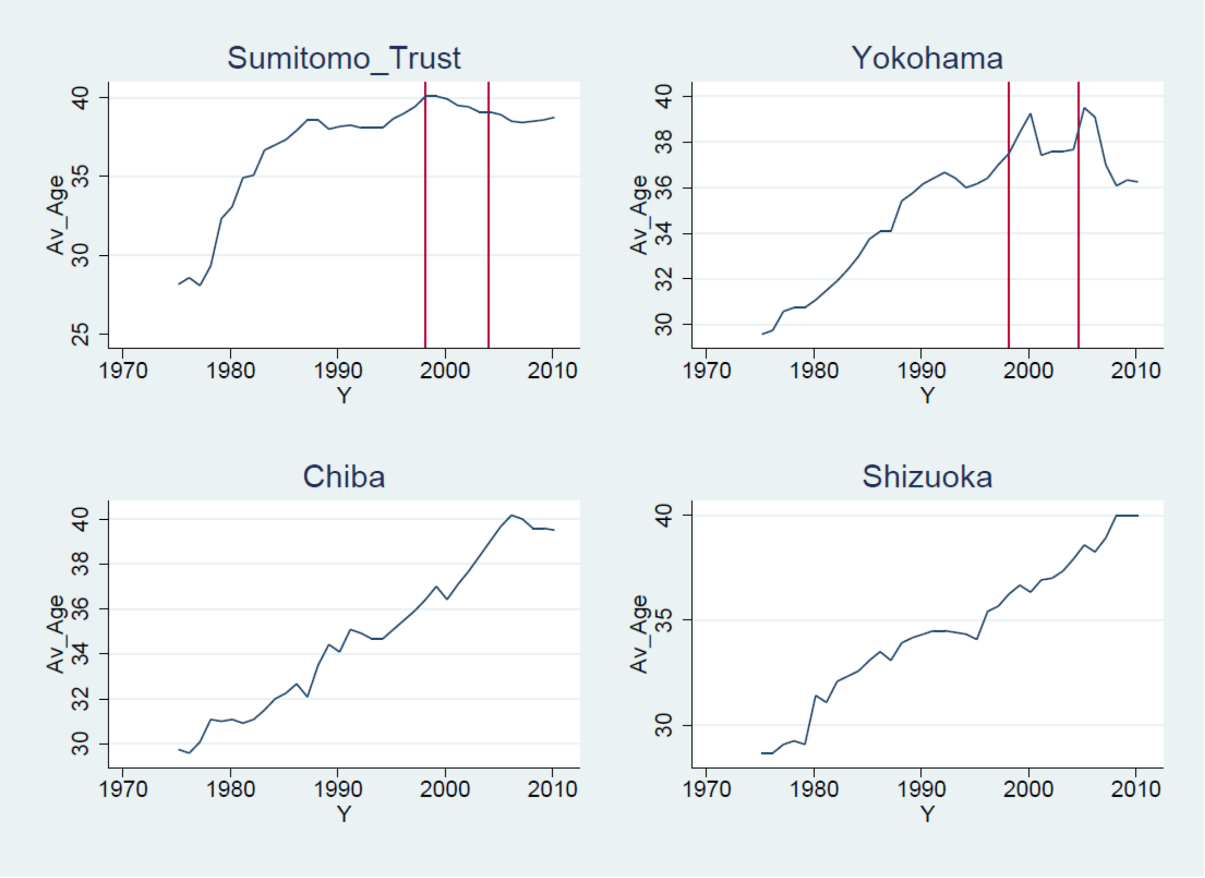

Figure 2
Difference in average ages with the 95% confidence intervals

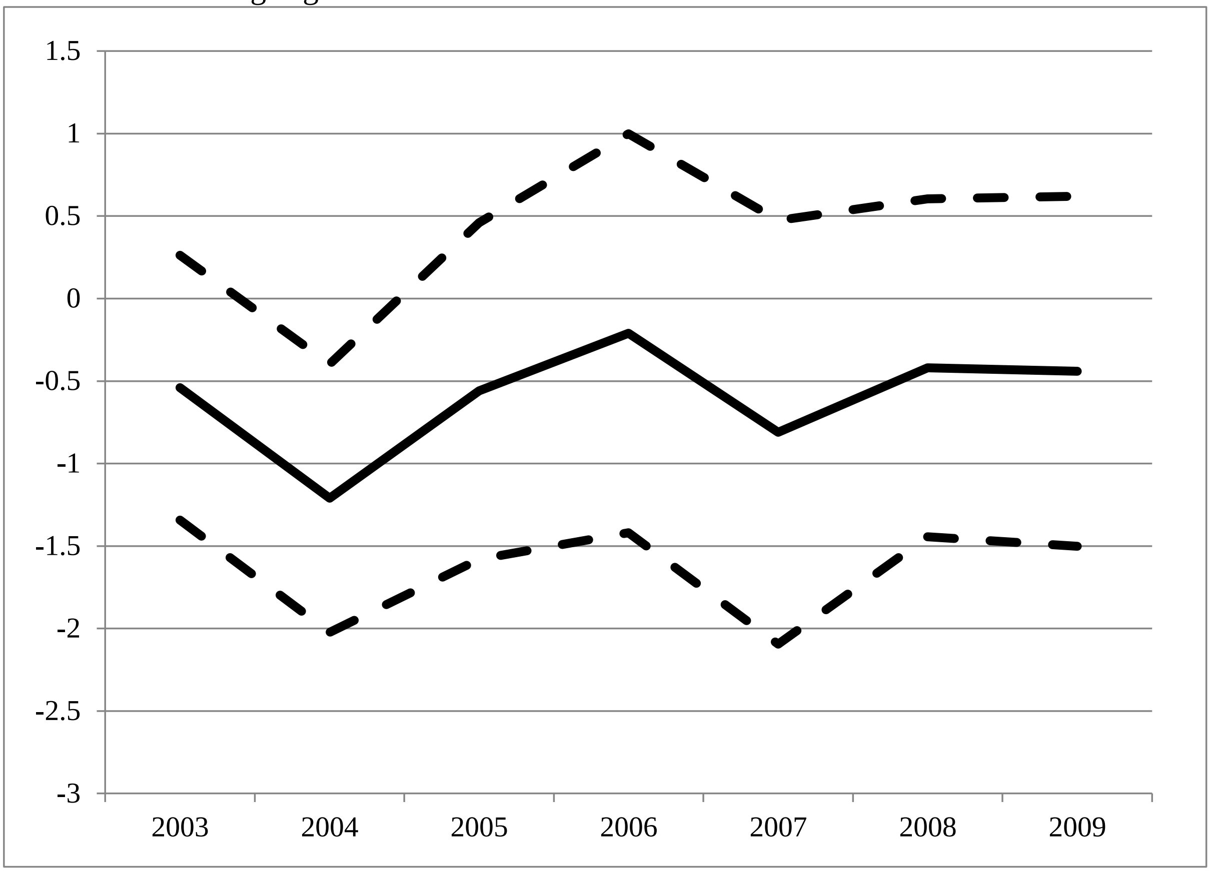

Table 1
Summary statistics

Variable		Mean	Std. Dev.	Min	Max	Obs
Av. Age	*level*	37.079	2.199	30.917	43.667	*2352*
$\frac{InjCap_i}{Asset_{it}}$	*ratio*	0.023	0.012	0.006	0.067	*263*
Control Variables (Bank specific factors)						
No. Employees ^{UN}	*logarithm*	7.482	0.807	5.652	10.460	*2352*
No. Employees ^{CON}	*logarithm*	7.520	0.853	5.872	11.004	*1228*
Salary	*logarithm*	9.454	0.908	7.425	12.663	*2352*
Total Asset	*logarithm*	14.641	1.208	12.303	18.852	*2352*
ROA	*raio*	0.045	1.049	-25.333	1.603	*2352*
Control Variables (Regional labor market factors)						
Job Applicants	*logarithm*	10.759	0.897	8.586	12.517	*2352*
Wage	*logarithm*	6.108	0.104	5.776	6.406	*2352*

Table 2
Effects of capital injection and payback on the average age of workers

Equation	(1)	(1)	(1)	(1)	(1)	(1)	(1)
$INJcross_{t-0}$	-8.712*	-8.876*	-10.123**	-9.461*	-7.886*	-8.694*	-8.410*
	(3.978)	(3.631)	(3.732)	(3.749)	(3.592)	(3.510)	(3.574)
$INJcross_{t-1}$	-12.333	-3.932	-5.174	-12.024	-3.409	-3.484	-3.229
	(9.349)	(7.033)	(6.860)	(9.452)	(6.974)	(6.974)	(6.947)
$INJcross_{t-2}$	-21.771*	-20.775*	-21.957*	-22.615*	-20.220+	-19.751+	-20.044+
	(10.453)	(10.115)	(9.645)	(10.523)	(10.305)	(10.358)	(10.403)
$INJcross_{t-3}$	-21.608**	-18.469**	-21.025**	-21.830**	-17.487**	-16.896**	-17.561**
	(6.476)	(5.787)	(6.000)	(6.225)	(5.814)	(5.726)	(5.824)
$PAIDcross_{t-0}$	10.944	12.123	10.710	9.361	12.926	14.097	12.986
	(13.282)	(14.587)	(14.452)	(13.320)	(14.801)	(15.009)	(14.792)
$PAIDcross_{t-1}$	-21.584+	-23.776*	-24.522*	-25.090*	-22.944*	-20.990*	-22.815*
	(11.430)	(9.920)	(10.429)	(11.426)	(9.577)	(9.620)	(9.571)
$PAIDcross_{t-2}$	-42.322	-48.286+	-47.219+	-47.457+	-47.819+	-45.490+	-47.839+
	(28.454)	(26.955)	(27.792)	(28.531)	(26.571)	(26.302)	(26.493)
$PAIDcross_{t-3}$	-21.660	-25.427	-25.470	-24.674	-25.218	-23.698	-25.132
	(22.360)	(21.242)	(21.792)	(22.632)	(20.953)	(20.454)	(20.913)
Lag of dep. var.	0.751**	0.778**	0.769**	0.759**	0.782**	0.779**	0.782**
	(0.032)	(0.031)	(0.031)	(0.032)	(0.031)	(0.031)	(0.031)
Salary	0.567**	-0.163					
	(0.192)	(0.136)					
Asset	-0.261		-0.462**				
	(0.207)		(0.155)				
$Employees^{UN}$	-1.040**			-0.709**			
	(0.293)			(0.191)			
ROA	0.011				0.006		
	(0.014)				(0.011)		
Job Applicants	0.494*					0.404+	
	(0.212)					(0.214)	
Nominal Wage	-0.112						0.021
	(0.294)						(0.296)
Constant	10.698*	9.346**	14.856**	13.878**	7.662**	3.610	7.549**
	(4.550)	(1.832)	(2.775)	(2.095)	(1.091)	(2.370)	(2.214)
Observations	2,352	2,357	2,359	2,354	2,359	2,359	2,359
R-squared	0.897	0.894	0.895	0.896	0.894	0.895	0.894
Number of banks	172	173	173	172	173	173	173

Notes: Robust standard errors in parentheses. Sample Period: FY1990-FY2010 (Mar.1991-Mar.2011). ** p<0.01, * p<0.05, + p<0.1

Table 3

Effect of Capital Injection and Payback on the number of employees (Unconsolidated Basis)

Equation	(2)	(2)	(2)	(2)	(2)	(2)	(2)
INJcross $_{t-0}$	0.032	-0.374	-0.786	-0.753+	-0.487	-0.982*	-1.021*
	(0.336)	(0.327)	(0.641)	(0.382)	(0.403)	(0.470)	(0.473)
INJcross $_{t-1}$	-1.173	-1.178	-2.429+	-1.720+	-2.796*	-2.624*	-2.670*
	(0.949)	(0.939)	(1.344)	(0.990)	(1.255)	(1.271)	(1.269)
INJcross $_{t-2}$	-1.098**	-0.709*	-0.424	-1.326**	-0.602	-0.542	-0.510
	(0.383)	(0.342)	(0.494)	(0.263)	(0.451)	(0.470)	(0.471)
INJcross $_{t-3}$	-1.950**	-2.085**	-1.187	-2.747**	-1.712*	-1.802*	-1.726*
	(0.687)	(0.730)	(0.758)	(0.738)	(0.796)	(0.828)	(0.829)
PAIDcross $_{t-0}$	2.386**	2.464**	2.396**	2.630**	2.426**	2.371**	2.507**
	(0.679)	(0.633)	(0.709)	(0.733)	(0.669)	(0.657)	(0.665)
PAIDcross $_{t-1}$	2.957	2.932+	2.893+	3.055	2.830+	2.706+	2.932+
	(1.807)	(1.507)	(1.493)	(1.856)	(1.493)	(1.520)	(1.511)
PAIDcross $_{t-2}$	3.373*	4.039*	3.607+	3.704*	4.066*	3.757+	4.053*
	(1.683)	(1.857)	(1.943)	(1.792)	(1.875)	(1.913)	(1.937)
PAIDcross $_{t-3}$	2.774**	3.358**	3.126**	2.872**	3.165**	3.086**	3.289**
	-0.438	(0.537)	(0.511)	(0.374)	(0.482)	(0.472)	(0.504)
Lag of dep. var.	0.733**	0.784**	0.852**	0.918**	0.930**	0.929**	0.927**
	(0.038)	(0.036)	(0.022)	(0.015)	(0.011)	(0.012)	(0.012)
Salary	0.154**	0.174**					
	(0.031)	(0.035)					
Asset	0.076**		0.102**				
	(0.022)		(0.033)				
Av. Age	-0.007**			-0.007**			
	(0.001)			(0.001)			
ROA	0.003**				0.005**		
	(0.001)				(0.001)		
Job Applicants	-0.003					-0.048**	
	(0.011)					(0.012)	
Nominal Wage	0.001						-0.005
	(0.022)						(0.022)
Constant	-0.247	-0.051	-0.425	0.895**	0.509**	1.036**	0.557**
	(0.376)	(0.146)	(0.394)	(0.137)	(0.081)	(0.162)	(0.141)
Observations	2,352	2,464	2,472	2,354	2,472	2,472	2,472
R-squared	0.958	0.953	0.948	0.948	0.946	0.945	0.945
Number of banks	172	175	175	172	175	175	175

Notes: Robust standard errors in parentheses. Sample Period: FY1990-FY2010 (Mar.1991-Mar.2011). ** p<0.01, * p<0.05, + p<0.1

Table 4

Effect of Capital Injection and Payback on the number of employees (Consolidated Basis)

Equation	(3)	(3)	(3)	(3)	(3)	(3)	(3)
INJcross $_{t-2}$	0.458	1.758	-0.816	0.857	1.016	0.938	0.908
	(1.173)	(1.363)	(1.519)	(1.370)	(1.410)	(1.367)	(1.400)
INJcross $_{t-3}$	-1.307	-0.726	-1.931+	-1.753+	-1.609	-1.561	-1.540
	(1.028)	(1.424)	(1.058)	(0.987)	(1.171)	(1.125)	(1.133)
PAIDcross $_{t-0}$	0.539	-1.146	-1.292	-0.535	-2.034	-2.176	-2.082
	(1.236)	(1.639)	(1.467)	(1.850)	(1.927)	(1.957)	(1.943)
PAIDcross $_{t-1}$	2.409+	0.519	0.377	1.582	0.097	-0.138	0.061
	(1.287)	(1.475)	(1.348)	(2.353)	(1.865)	(1.918)	(1.879)
PAIDcross $_{t-2}$	1.515	2.116	0.171	3.172*	2.312*	2.110*	2.347*
	(1.190)	(1.350)	(1.151)	(1.472)	(0.939)	(0.902)	(0.919)
PAIDcross $_{t-3}$	6.869+	6.957*	6.153+	8.340+	7.700*	7.517*	7.647*
	(4.083)	(3.398)	(3.318)	(4.341)	(3.462)	(3.500)	(3.455)
Lag of dep. var.	0.204	0.285	0.280	0.298	0.352+	0.353+	0.353+
	(0.152)	(0.183)	(0.183)	(0.194)	(0.205)	(0.204)	(0.204)
Salary	0.318**	0.401**					
	(0.063)	(0.091)					
Asset	0.346**		0.490**				
	(0.103)		(0.122)				
Av. Age	-0.016**			-0.022**			
	(0.005)			(0.007)			
ROA	-0.002				-0.003		
	(0.005)				(0.007)		
Job Applicants	0.002					-0.049	
	(0.030)					(0.037)	
Nominal Wage	0.025						0.006
	(0.046)						(0.048)
Constant	-1.637	1.615*	-1.836+	6.135**	4.856**	5.395**	4.815**
	(1.626)	(0.709)	(0.999)	(1.699)	(1.529)	(1.630)	(1.527)
Observations	1,107	1,212	1,215	1,109	1,215	1,215	1,215
R-squared	0.671	0.621	0.597	0.543	0.522	0.523	0.522
Number of banks	147	150	150	147	150	150	150

Notes: Robust standard errors in parentheses. Sample Period: FY1999-FY2010 (Mar.2000-Mar.2011). ** p<0.01, * p<0.05, + p<0.1