The Japanese Regional Bank's Operation in the Ultra-Low Interest Rate, Intense Competition, and Aging Population Environments

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Abstract

This study highlights the economic challenges that Japanese regional banks have currently confronted during the low interest-rate environment, including fierce competition with both regional banks and Japan Post bank and a decline in spending due to a super-aged society. The objective of this study is to offer insights into the strategies that Japanese regional banks can employ to survive in the industry. The Bayesian multilevel analysis investigates the performance of 64 regional banks in Japan from 2010 to 2017. The empirical results are: (1) the aging population and the privatization of Japan Post Bank have a significant impact on weakening regional bank profits, (2) the interest earnings from bank loans remain the primary source of bank profits, but the returns from lending are less significant than lending to the housing market, (3) strengthening the bond and enhancing financial services to local businesses through the loan restructuring scheme will improve regional banks' profits, (4) reducing operating expenses is a critical strategy for improving regional bank profits and can be implemented internally and promptly. Based on these analyses, policymakers and central bankers can leverage these discoveries to formulate effective aimed at bolstering regional banks. In addition, bankers can use these insights to develop new business models and strategies that ensure sustainable bank profits.

JEL Classification: C11, G21, G28, G34
Keywords: Bayesian Panel Data, Japanese regional bank, ultra-low interest rate, aging population

1 Background

Japanese regional banks have faced several economic challenges in the past few decades. For instance, they have struggled with operating their businesses under the pressure of the ultra low-interest-rate environment introduced by the Bank of Japan (BOJ) since the asset price bubble in the early 1990s. Moreover, the advent of the accommodative monetary policy under the guidance of Governor Kuroda to revitalize the Japanese economy, targeting the 2 percent inflation rate, has evaporated commercial banks' interest-rate margins. The Global Financial Database of the World Bank shows that the bank net interest margin in Japan has been lower than one percent since 2013, approximately 0.8 to 0.9 percent.[1] The BOJ also has a similar estimate in its Financial System Report 2020, based on the average contract interest rates on new loans and discounts (Bank of Japan, 2020). Additionally, the banking sector had another backfire when the BOJ implemented the negative interest rate policy in 2016 by imposing an interest rate of 0.1 percent of commercial banks' excess reserves held at the BOJ. To avoid paying interest rates, regional banks have responded by acquiring more treasury discount bills (T-Bills), Japanese government bonds, and financial securities to prevent excess reserves. In addition, they have been compelled to increase their lending activities to circumvent this financial penalty for holding excess reserves. Based on the financial database of the Japanese Banker Association examining all 64 regional bank balance sheets, The deposits represent the most significant liabilities on their financial statements. The total outstanding deposits were approximately 278.32 billion yen or 81.4 percent of regional banks' total liabilities at the end of March 2019.[2] Meanwhile, the top three assets of these regional banks were loans and bills discounted (64.6%), securities (19.4%), and cash and due from banks (12.6%). From these balance sheets, these regional banks' core business depends heavily on lending. Nevertheless, the interest earned from lending was only around 3.13 billion yen, accounting for 69.3 percent of the ordinary income of regional banks. Given the unfavorable business environment, the extended expansionary monetary policy will continue to hinder the main source of income for regional banks' lending and raise the risk of more loan defaults (Baba et al., 2006).

Most regional banks primarily serve their clients within the prefecture where they are located. Consequently, Japanese regional banks can develop strong relationships with local- small- and medium-sized enterprises (SMEs) and governments (Uchida et al., 2008). For example, the primary bank for SMEs can gather information extending beyond the company's financial statements through personal visits to their clients. At least the bank staff will visit their client at least once a month (Yamori, 2022). On the one hand, having better information about local clients provides regional banks a great opportunity to offer tailored financial products that suit their customers' needs. On the other hand, it also hinders the ability to expand the customer base, which is limited only within the prefecture. This biggest constraint prevents the realization of economies of scale in the regional banking industry. The current economic outlook, especially in

[1] https://datacatalog.worldbank.org/search/dataset/0038648.
[2] The fiscal year in Japan begins from April 1 to March 31.

the low-income prefectures, has deteriorated after Japan became a super-aged society in 2007. Even though the total population grew slightly before 2010, the trend eventually reversed after 2010. In particular, the dynamic change in population composition instigates policymakers' and bankers' attention to observe the shrinking aggregate demand (Ota et al., 2018). Overall, the working-age population explicitly declined after 1990, but the elderly group has been rising rapidly over time, as shown in Table 1. In addition, the new generation of young Japanese people tends to postpone their marriage, leading to a smaller household size of about 2.33 members per household in 2015 (Statistical Handbook of Japan, 2020). As a consequence, the young population declined by about half from 1970 to 2019. The Statistics Bureau of Japan (SBJ) reveals that the aging population group in 2019 accounts for 28.4 percent of the total Japanese population and is projected to rise to 31.2 and 35.4 percent in 2030 and 2040, respectively. Nonetheless, upon closer scrutiny of the elderly population across the 47 prefectures, it becomes evident that several of them have already reached a super-aged status, exceeding the projections set by the SBJ for the entire nation. As an example, the top three prefectures with the highest elderly populations were Akita (35.6%), Kochi (34.2%), and Shimane (33.4%). Noticeably, the regional banks in these three prefectures often exhibit lower ordinary profits.[3]

Table 1: Decomposition of Japan Population

Year	Population (in Thousands)	0-14 Years Old (%)	15-64 Years Old (%)	65 Years Old and Over (%)
1970	104,665	24.0	68.9	7.1
1980	117,060	23.5	67.4	9.1
1990	123,611	18.2	69.7	12.1
2000	126,926	14.6	68.1	17.4
2010	128,057	13.2	63.8	23.0
2019	126,167	12.1	59.5	28.4
2030^p	119,125	11.1	57.7	31.2
2040^p	110,919	10.8	53.9	35.4

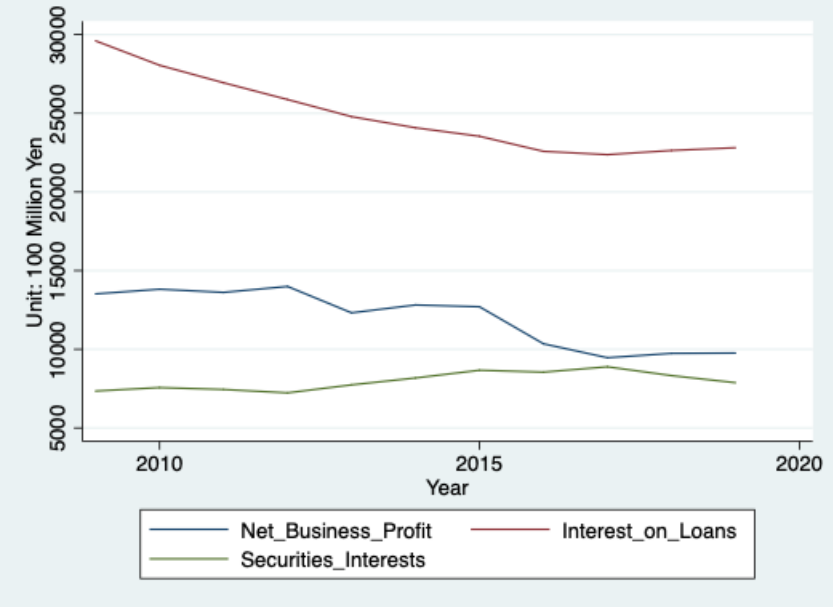
Source: Statistics Bureau of Japan

According to the Life-Cycle Hypothesis, it predicts that people's consumption spending will decline after their retirement since they no longer work and use their savings for consumption. For better or worse, the Ministry of Health, Labor, and Welfare reported in 2020 that the average life expectancies for Japanese males and females in 2019 were 81.41 and 87.45 years, respectively. Hence, it is logical to anticipate a significant drop in current and future consumption and demand for loans as individuals strive to smooth their consumption over time. Indeed, by December 2020, The Regional Banks Association of Japan had reported a decline in interest earnings from loans and net business profits across its 64 member regional banks I. However, from 2009 to 2019, there was an increase in the interest earned from financial securities, see Figure 1. In response to the threats of an aging population in Japan and a shrinking workforce, several regional banks have increased mortgage loans to compensate for a decline in their core business income while facing uncertainty in housing demand. In addition, regional banks have restructured their corporate models to ensure the sustainability of their operations. The commonly adopted strategy is to diversify and enhance the bank's portfolio investments by holding more risky assets such as trust funds, securities, collateralized loan obligations (CLOs), foreign assets, and leveraged loans. Furthermore, these regional banks take more risks by searching for better investment opportunities overseas. The Bank of Japan (2020) reported that at the end of March 2019, Japanese regional banks lent 2.3 trillion yen to overseas borrowers and had overseas investments of about 8.1 trillion yen. As for the Japanese government's response, the Japanese government attempted to counter the declining birth rate and a rise in the aging population by strengthening the regional economy through the project called "The Overcoming Population Decline and Vitalizing Local Economies" in 2015. This plan focused on improving the local economy's infrastructure, transportation system, and

[3]Using the data of regional banks from The Regional Banks Association of Japan, the correlation coefficient between all regional banks' ordinary profits and the prefecture's share of the aging population is about negative 0.23, showing an inverse relationship.

working environment to attract more people, including tourists, to stay and visit the area. However, the effectiveness of this policy still needs further investigation.

Figure 1: Net Business Profit, Interest on Loans, and Securities Interests of 64 Japanese Regional Banks (Tier I) from 2009 to 2019



During economic hardship, the emergence of a new player in the banking industry, Japan Post Bank, in 2007 threatened the existing regional banks further. The headquarters of Japan Post Bank is in Tokyo, yet it operates across the entire nation by exploiting the extensive network of Japan Post offices and ATMs throughout the country. As of 2020, Japan Post Bank has 23,881 branches and 32,005 ATMs nationwide. Therefore, unlike Japanese regional banks, Japan Post Bank does not face geographical restrictions when it accumulates deposits and can conduct business throughout Japan. Within a decade of its establishment, Japan Post Bank has grown exponentially and become a significant financial institution serving all regions in Japan. As of March 31, 2020, Japan Post Bank's total deposits stood at 183 billion yen. For a more comprehensive comparison, when comparing Japan Post Bank's deposit share to that of the five city banks collectively, it becomes evident that the five city banks held approximately 38 percent of the total deposits, whereas Japan Post Bank commanded a deposit share of around 21 percent.[4] Consequently, regional banks now confront a formidable competitor capable of leveraging its nationwide network to boost deposits and benefit from economies of scale. Given the ultra-low interest rate environment and the presence of Japan Post Bank, attracting a diminishing pool of deposits has become a challenging endeavor for regional banks.

The Japanese government responded to the regional banks' cut-throat competition from depopulation in 2020 by amending the Antimonopoly Act to encourage these banks to realign their businesses through mergers and acquisitions. Before the law amendment, the Japan Fair Trade Commission (JFTC) monitored the economy and prohibited unfair trade practices and mergers and acquisitions, including in the banking industry. However, since the net profits of all 64 regional banks have continuously declined, the government, through the Financial Services Agency (FSA), issued a special law encouraging mergers and acquisitions among regional banks. Therefore, the integration would strengthen regional banks' total assets and reduce operation costs, especially human resource expenses. In addition, the BOJ also created a monetary incentive in November 2020 by giving an additional 0.1 percent of interest to regional banks that integrated their business due to financial difficulty.

This paper aims to investigate Japanese regional banks' operation in the ultra-low-interest-rate environment by examining various sources of their income from bank loans, securities, and mortgage loans. These

[4]Five city banks are Mizuho Bank, MUFG Bank, Sumitomo Mitsui Banking Corporation, Resona Bank, and Saitama Resona Bank.

Japanese regional banks have strived to survive and developed new business models to improve profitability during business hardship. Consequently, most regional banks now hold a relatively high proportion of domestic and foreign securities to get better yields and lend more in the housing market, making them more prone to market volatility. Understanding the role of these financial assets on banks' profits will give us a comprehension of how regional banks perform during periods of aggressive monetary expansions. Furthermore, it will help policymakers, especially the BOJ, thoroughly consider the side effects of the monetary easing policy on the financial stability in the regional banking sector and maintain a healthy and sound economic environment for sustainable economic growth. In addition, this paper also attempts to evaluate the impact of an increase in the aging population on regional banks' profits because Japan has the highest proportion of the aged population, causing a massive decline in the demand for bank services. Studying the effects of an aging population on the banking sector in Japan will help other national governments carefully prepare a safety net for a future decline in aggregate demand due to an aging population. Finally, this study examines the impact of the advent of Japan Post Bank in the banking industry on the profits of existing regional banks.

2 Literature Review

There are numerous studies on competition and bank risks. Stiroh (2006) studies U.S. banks' non-interest income and illustrates that a higher proportion of non-interest income induces higher volatility. Similarly, Anginer et al. (2014) assert that competition leads banks to diversify their risks. The same study also demonstrates that banks operating in countries with weak institutions are prone to higher risk. Hirata and Ojima (2020) discover that competition reduces Japanese regional banks' financial stability, especially when regional banks take a more risky stance in lending money to non-core lending businesses. The privatization of Japan Post in 2007 is another factor increasing competition in the Japanese banking industry. Sawada (2013a) illustrates the impact of Japan Post Bank privatization on the banking industry and posits that the risk in the banking industry substantially increases for all banks. However, Liu and Wilson (2013) analyze the influence of competition on the Japanese banking sector. Their study uses all data categories of Japanese banks from 2000 to 2009. They further contend that low-risk regional banks will benefit from more competition.

Intense competition coerces regional banks to diversify their sources of income. The existing literature places emphasis on studying between traditional and non-traditional sources of income for commercial banks. For instance, Harimaya and Ozaki (2021) examine Shinkin banks' performance through loan and income portfolio diversifications. They find that Shinkin banks' loans are more prone to default when Japanese banks expand their loans in the housing market. Williams and Rajaguru (2022) investigate panel data of banks in the Asia-Pacific region from 1997 to 2016. They argue that declines in net interest income compel these banks to expand their operations in non-interest income. Ogawa and Imai (2014) estimate the demand for Japanese government bonds and bank loans from 128 Japanese commercial banks after the Asian Financial Crisis until 2010. The fixed effects in the panel analysis reveal that these banks have a higher proportion of Japanese government bonds in their portfolios compared to bank loans. DeYoung and Torna (2013) use the logit model to examine income from non-traditional stakeholder activities, service and traditional fees, and the probability of U.S. bank failure during the financial crisis. Their findings indicate that maintaining these non-interest income assets has raised the probability of bank failure, although the impacts are not uniform across assets. Unlike the research mentioned above, Lee et al. (2014) use a large panel dataset from 29 Asia-Pacific countries to investigate the effect of bank revenue diversification on bank performance through the dynamic panel generalized method of moments. They include different types of revenue, such as gross interest revenue, net commission revenue, net trading revenue, and other net revenue, along with the revenue diversification index as independent variables in the model. Their primary findings indicate that gross interest revenue, net trading revenue, and all other net revenue contribute to increased bank profits and a reduction in bank risk. In contrast, net commission revenue is not an effective strategy for revenue diversification. Sawada (2013b) employs different sources of bank revenue to study their impacts on the daily stock returns of Japanese banks. This study concludes that diversifying bank revenue leads to higher stock returns. In particular, Sawada proposes that expanding revenue from fee-based income could reduce bank risk because this source of income is more stable. As for the solution to this concern, several

researchers suggest banks should enhance their capital buffer for unexpected losses to mitigate the unforeseen consequences of exposure to various risks. (see Fukao, 2003; Konishi & Yasuda, 2004).

Fukuda and Okumura (2021) examine the aging population at the prefectural level in Japan and its impact on the banking sector. Along with the shrinking workforce, they conclude that a rising aging population will lead to a shortage of bank deposits. Consequently, it could also impede economic growth. Goh et al. (2020) employ the Autoregressive Distributed Lag model (ARDL) and establish the long-run relationship between the share of the aging population and gross domestic savings and fiscal balance. The results show that a rising aging population substantially reduces gross domestic savings and fiscal balance. Arslanalp et al. (2019) use the panel data analysis, encompassing both developed and developing economies from 1985 to 2013, to investigate the impact of demographic change on the economy. They discover that a rise in the share of the aging population will suppress the 10-year real interest rate. Furthermore, a rapid aging speed also has a similar effect. Another concern with the rising aging population is the lower demand for housing. Ohtake and Shintani (1996) construct the Mankiw and Weil housing demand index by aggregating the population age groups in Japan to study the Japanese housing market. They discover that demographic change impacts the demand for houses but not the house prices in the long run.

The low profitability of Japanese banks due to overbanking is widely recognized. Moreover, the rapid growth of the aging population exacerbates this issue, prompting further research on cost-reduction strategies for banks. Loukoianova (2008) identifies that Japanese regional banks could achieve higher efficiency through business consolidation, reducing the cost of operation and sharing the same management and computer systems. Kondo (2018) investigate regional banks' performance under the unstable economic conditions of the ultra-low interest rate policy and aging society. The regression model, accounting for competition among regional banks, implies that these banks increase the number of bank branches to facilitate the extension of loans to local businesses. Nevertheless, if bank branches are too many, it could increase bank costs. However, there are several contenders to the idea of increasing bank branches. For example, Uchida and Satake (2009) find that the number of bank branches increases bank inefficiency in Japan, while the bank size (total assets) can improve bank efficiency between 2000-2005. In addition, they also use the same independent variable to investigate bank profit efficiency. Their results indicate that increasing the bank's total net assets and reducing the number of bank branches can raise bank profit efficiency.

3 Data and Research Methodology

This study obtains financial data of the 64 first-tier regional banks from the Regional Banks Association of Japan. The annual data in the sample covers the periods from 2010 to 2017. There are two key advantages to selecting this particular period for the study. First, this study includes both periods of the Great East Japan Earthquake in 2011 and the quantitative easing policy of the BOJ since April 2013 to investigate the performance of these regional banks during the hostile business condition of the ultra-low interest rate. Second, a few regional banks consolidated before 2010 and after 2018. Thus, this study attempts to preserve the number of regional banks as much as possible in the sample. To assess the performance of regional banks, this study uses ordinary profit (*Ordinary Profit*) as a dependent variable, widely used to evaluate the firm's performance in Japan.[5]

Following the existing literature, exploring the factors in the balance sheet that impact bank profits is a reasonable strategy for selecting the independent variables. Regarding bank revenue, two types of bank loans are considered in this study. First, regional banks' core business to earn interest is lending, which has the biggest share of bank revenue. Therefore, the total outstanding loan (*Loan*) is used to measure the ability to make profits from lending, a traditional bank business. Second, regional banks emphasize expanding mortgage loans due to the shrinking demand for individual and business borrowing. In addition, Japanese regional banks take more risks and hold domestic- and foreign securities for better yields. As a result, this paper includes mortgage loans (*Mortgage*) and securities investments (*Securities*) to capture these changes in the regional bank's portfolios. Both of which are considered non-traditional bank businesses. Categorizing banks' revenue into traditional and non-traditional income can facilitate examining and comparing their impact on profits.On the expenditure side, the main expenses of banks are payroll, capital cost, and rent. Therefore, operating expenses (*Operating Expense*s) will capture the operational costs of regional banks.

[5]All variables in this study are italicized.

To gauge the strength of regional banks' financial health, total net assets (*TNA*) is a good indicator because this financial variable reflects the overall value of a bank, a.k.a. net worth. Also, researchers in the literature include bank assets as a measure to capture the bank size and characteristics of the banking market (see Berger et al., 2005; Imai, 2009; Sakawa et al., 2020;Uchida et al., 2008). Moreover, the Japanese government has advocated for regional banks to augment their net assets through mergers and acquisitions to fortify their financial stability and advance the rejuvenation of the local economy. Hence, evaluating the effects of increasing total net assets and reducing operating costs on profits allows us to substantiate the viability of this government proposal.

Several small and medium-sized enterprises (SMEs) were vulnerable during the financial distress and went out of business. To address this issue, regional banks have negotiated with local SMEs and offered them to restructure their loans to prevent loan defaults. In addition, the mission of regional banks is to strengthen the relationship with local businesses so that Japanese regional banks will actively seek opportunities to provide financial assistance. Thus, this paper employs restructured loans (*Restructure Loans*) as a proxy variable to signify the development of a relationship with local clients. All of these variables are measured in millions of yen.

Table 2: Data and Descriptions

Variable	Unit	Expected Impact	Source
Ordinary Profit	Millions Yen	N/A	The Regional Banks Association of Japan
Loan	Millions Yen	+	The Regional Banks Association of Japan
Mortgage	Millions Yen	+	The Regional Banks Association of Japan
Securities	Millions Yen	+	The Regional Banks Association of Japan
Operating Expenses	Millions Yen	-	The Regional Banks Association of Japan
Restructured Loan	Millions Yen	+	The Regional Banks Association of Japan
TNA	Millions Yen	+	The Regional Banks Association of Japan
Growth	Percent	+	e-Stat Portal Site of Official Statistics of Japan
Aging	Percent	-	e-Stat Portal Site of Official Statistics of Japan
JPB	Millions Yen	-	e-Stat Portal Site of Official Statistics of Japan

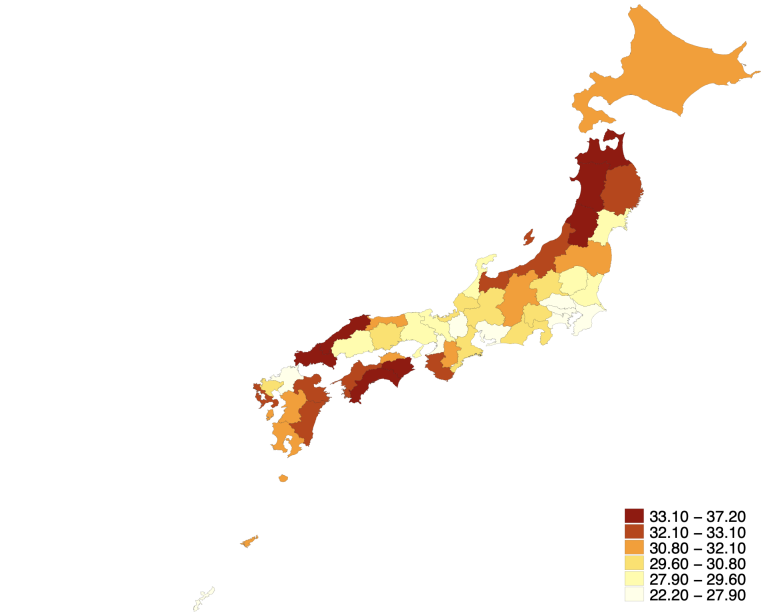
The advent of Japan Post Bank has remarkably intensified competitive pressures in the banking industry, directly reducing regional banks' capacity to attract deposits to support their lending activities. Both regional banks and Japan Post Bank are rivals and compete to obtain the same pool of deposits in each prefecture. As Japan Post Bank attracts more deposits, the available funds for regional banks diminish, reducing the potential of regional banks to make loans. Hence, this paper uses the outstanding post-office savings balance (*JPB*) at the end of the fiscal year as a proxy variable for bank competition to assess the impact of Japan Post Bank on regional banks' profits. Regarding the decline in demand for borrowing because of the aging population, this study includes the percentage of an aging population in the prefecture (*Aging*), which expects to deteriorate banks' profits. Lastly, the Japanese government created a policy campaign for economic revitalization. Hence, this paper includes the prefectural income growth (*Growth*) to observe economic development in the prefecture and its effect on business revitalization. All three variables are obtained from the e-Stat Portal Site of Official Statistics of Japan and measured in percentage points, except for *JPB*, measured in millions of yen. Table 2 displays variable names, units of measurement, expected impact signs of independent variables on *Ordinary Profit*, and descriptions of variables in this study.

In general, Japanese regional banks predominantly operate within their prefectures. The capability to make profits hinges mainly on how well they effectively manage assets and liabilities. Thus, ordinary profit varies from bank to bank. Furthermore, common factors that impact regional banks' profits are listed in Table 2. These variables are predetermined and regarded as fixed effects. However, each regional bank might experience different random effects, such as natural catastrophes, the odds of loan default, distinctive bank management characteristics, and IT systems. Furthermore, each prefecture's aging population can be considered as a population nested in the prefecture. Therefore, the Bayesian Mixed Effects Model or the two-level multilevel model is suitable for analyzing the panel data with the fixed- and random effects. Consider a simple two-level model with random intercepts in matrix notation.

$$y = X\beta + Zu + \epsilon \tag{1}$$

where y is the $n \times 1$ vector of the dependent variable, X is the $n \times p$ matrix of independent variables, including a constant term, β_i where $i \in \{1, 2, ..., p\}$ is the $p \times 1$ vector of coefficients (fixed effects), Z is the $n \times q$ matrix of random variables, u_j where $j \in \{1, 2, ..., q\}$ is the $q \times 1$ vector of coefficients (random effects), ϵ is the $n \times 1$ vector of stochastic terms.

Figure 2: The Ratio of Population 65 Years Old and Over (%) in 2019



Source: e-Stat, Japan

Figure 2 displays the ratios of the population 65 years old and over in 47 prefectures as of 2019. At first glance, the rates of the aging population are not uniform across Japan. In particular, the Tohoku and Shikoku regions exhibit a higher proportion of aging population than other regions. Among these prefectures, Akita has the highest proportion of the aging population, 37.2 percent. In contrast, Okinawa has the lowest ratio of the aging population, 22.2 percent. The range of the ratios of the aging population in 2019, approximately 15 percent, across prefectures is substantial. Thus, this study assumes that the effects of the aging population on bank performance are random in each prefecture. The variable *Aging* is the only independent variable in matrix Z.

It is occasionally infeasible to obtain an analytical solution for Equation 1 with the Bayesian estimation approach of the multilevel model. For technical specifications, this paper employs the Markov chain Monte Carlo (MCMC) simulation to estimate the posterior mean distributions of the coefficients in Equation 1. For simulating the MCMC algorithms, this paper identifies the priors for all posterior mean estimates for the parameters having a normal distribution, $\beta_i \sim N(0, 100)$, and the variance having an inverse gamma distribution, u_j and $\epsilon_{ij} \sim InvGamma(0.01, 0.01)$. To ensure the efficiency and reliability of the MCMC algorithms, the Gibbs sampling procedure iterates 20,000 times. However, the first 10,000 simulations have been discarded as part of the burn-in period. In addition, to mitigate autocorrelation issues, every 36 sample observations will be discarded during sampling, resulting in a total of 749,964 MCMC iterations.

4 Results and Discussions

4.1 Traditional- vs. Non-Traditional Business

Table 3 reports the estimated coefficients, standard deviations, and the 80-percent credible bands. In general, all coefficients have posterior probabilities within the 80-percent credible bands, except *Securities* and *Constant*. The acceptance rate is moderate, approximately 65 percent, and the average efficiency of the estimated parameters is 85 percent, which is reasonably high. During the ultra-low-interest-rate environment, low-interest rate margin, and aggressive competition for lending among financial institutions in Japan, bank loans remain an important source of profit for banks. The empirical model shows that for every additional 1 million yen of lending (*Loan*), there is an associated increase in bank profit (*Ordinary Profit*) by approximately 2,892 yen. This result implies that the average profit margin on interest earnings from loans is around 0.29 percent. Meanwhile, mortgage loans, a non-traditional banking business, have gradually become a regional bank's predominant source of profit since the magnitude of the coefficient of *Mortgage* is considerably larger than that of *Loan*, approximately three times higher. For an increase of 1 million yen in mortgage loans, bank profit increases by 8,583 yen, about 0.85 percent. For several reasons, mortgage loans are more attractive and profitable than lending and holding securities, given the current economic situation. First, regional banks can charge administrative fees, commonly known as origination fees. These fees, whether calculated as a percentage of the total loan amount or as a fixed sum, serve to counterbalance the potential loss of interest income from lending. This source of income is considered very stable and does not contain market exposure because homebuyers are obligated to pay originate fees upfront. Second, regional banks have the largest share of housing loans in Japan, more than city banks and Shinkin banks (Cooperative Financial Institutions). It is mainly due to a close relationship with local homebuyers, giving regional banks the advantage and becoming dominant lenders in the housing market. Third, the Japan Housing Finance Agency (JHFA), established in 2007, provides a fixed-interest rate loan for homebuyers called Flat 35 through private financial institutions. As of June 2021, Flat 35 has a maturity of up to 35 years with an average mortgage rate of 1.22 to 2.15 percent, in which the interest earned is moderately better than the core lending. Furthermore, the fixed interest rate guarantees a certain cash inflow for regional banks and improves bank cash management. Fourth, unlike holding foreign financial assets, domestic mortgage loans do not have exchange rate risk. Finally, the JHFA can purchase mortgage loans from private financial institutions, including regional banks I, and securitize these mortgage loans into mortgage-backed assets. Later, JHFA sells these securities to the market so that regional banks are more willing to extend credits to homebuyers. This is because the credit risk can be partially, if not entirely, transferred to potential investors. Japanese regional banks are risk-averse, so focusing on domestic housing lending is a reasonable strategy.

Even though *Securities* has a positive sign, and the magnitude is perceivable, this study cannot provide any statistical support for the association between *Securities* and *Ordinary Profit*. Most financial institutions in Japan, including regional banks, have increased the yen-denominated financial assets since the interest rates have been suppressed by the downward pressure of the zero-interest-rate policy and, later, the negative interest rate policy. Regional banks also search for better yields from overseas lending and credit product investment. In recent years, the most popular foreign asset that has gained the attention of regional banks is collateralized loan obligations (CLOs) in the U.S. Nearly 90 percent of CLOs held by Japanese banks have at least the BBB rating and are nearly mature, so they have a high priority of claim on the cash flow but low return, approximately 1 percent or slightly lower. Nevertheless, investing in securities has higher volatility and makes regional banks prone to market loss. If an external factor negatively impacts the global capital market, such as exchange rate and interest rate exposures. For example, when the Fed began raising the interest rate to tame inflation in early 2022, the value of CLOs might decline if they are structured as fixed-income securities. As a consequence, Japanese regional banks are likely to experience capital loss. The explained rationale might explain why the coefficient of *Securities* is the lowest among the three and lies outside the credible bands.

Table 3: MCMC Simulation Results

Ordinary Profit	Mean	S.D.	80% Credible Bands	
Loan	0.0029*	0.0007	0.0020	0.0038
Mortgage	0.0086*	0.0013	0.0069	0.0102
Securities	0.0007	0.0011	-0.0007	0.0021
Operating Expenses	-0.1539*	0.0526	-0.2211	-0.0871
Restructured Loans	0.1541*	0.0363	0.1076	0.2006
TNA	0.0328*	0.0053	0.0260	0.0396
Growth	52.3778*	7.5986	42.6053	62.0422
Aging	-98.4123*	36.4719	-144.9951	-52.1597
JPB	-0.0276*	0.0169	-0.0494	-0.0061
Constant	-4.1048	99.7785	-131.4988	124.4722
Prefecture: Sigma^2	1389.1170*	2951.2110	0.2004	5491.7580
Aging: Sigma^2	24904.3100*	6917.2690	17041.2100	33905.8200
Sigma^2	22300000.0000*	1494348.0000	20400000.0000	24200000.0000
Acceptance Rate	0.6452			
Average Efficiency	0.8467			
N =511				

* The posterior mean lies within the 80-percent credible bands.

After thoroughly examining traditional and non-traditional businesses of regional banks, empirical results validate that income from non-traditional core businesses, particularly mortgage loans, exhibits a higher potential for boosting bank profits than bank loans. This is due to regional banks' strategic response to the economic downturn. Undoubtedly, the ultra-low-interest-rate environment has compelled regional banks into this precarious direction. In practice, Japanese banks have indeed increased lending to high-risk clients and expanded their operations in non-interest-earning businesses. Given the prevailing circumstances, Japanese regional banks are currently more vulnerable and susceptible to numerous potential risks, including exchange rate exposure, market exposure, and credit default risk. Henceforth, further prolonged monetary easing policy will deteriorate the financial health of regional banks since it evaporates the interest margin. As a result, this paper recommends the BOJ carefully consider increasing the interest rate margin in the financial market by setting its policy rate slightly higher than zero percent so that financial institutions will have a larger spread between interest income and interest expenses and a larger buffer for interest rate fluctuations (see Borio et al., 2017).

4.2 Promoting Regional Revitalization and Aging Society

As for government policy recommendations, the finding in this study supports the Japanese government's initiative of local economic revitalization because the coefficient of *Growth* has a positive sign and relatively large magnitude. Specifically, a one percentage point increase in prefectural income growth leads to slightly more than 52 million yen of ordinary profit. Therefore, policymakers should prioritize the implementation of strategies aimed at fostering local economic growth. Such policies could potentially have a positive impact on the profits of regional banks by stimulating increased economic activities, subsequently leading to an increased demand for financial services from these banks. In addition, the government should find a solution for the super-aged society because the growing aging population can extensively reduce the demand for borrowing. Hence, regional banks located in the prefecture with a high proportion of elderly will face this challenge in the future. A one percentage point increase in the aging population leads to a deterioration in banks' profit by 98 million yen. For a forecasting outlook, based on the decennial population forecast of the Statistics Bureau of Japan in Table 1, it is projected that the aging population will grow by approximately 3.5 percent every decade from 2020 onward. As a result, this study predicts that, on average, bank profits will deteriorate by 320 million yen in the next 10 years.

One feasible long-run policy recommendation is to focus on boosting the total fertility rate since it will increase the number of newborns, who will later become a new generation of labor and contribute to maintaining sustainable economic growth. In the meantime, in the short run, the government can utilize more

labor from overseas by granting more temporary working visas. In comparison to other OECD countries, Japan has been relatively conservative in its use of foreign labor. While this might not entirely resolve the problem of the aging population, it can lower the dependency ratio and alleviate labor shortages in many industries. In addition, both short- and long-run policies aiming to increase labor can also increase national income.

4.3 Bank Organizational Management

Since the Japanese banking crisis of the 1990s, nearly 50 percent of city banks and regional banks II were either shut down or merged with other healthier banks by the end of 2019. However, the number of regional banks I has remained relatively stable, with low non-performing loans (NPLs). As a consequence, it is worth considering how regional banks I maintain financial soundness by investigating their asset management. This paper examines three variables: *Operating Expenses*, *Restructured Loan*, and *TNA*, to investigate regional banks' organizational management.

As of 2018, Japanese regional banks are known for having a high overhead cost ratio, estimated at around 70 percent (Bank of Japan, 2019).[6] To get a ballpark figure of the managerial capacity of regional banks, let's consider the net interest income to operating expense ratio for the entire group of regional banks. The Financial Services Agency (FSA) reported that the average net interest income to operating expense ratio was approximately 1.2 between 2018 and 2020. This statistic indicates that net interest income can barely cover the operating expenses.[7] Consequently, the interest income buffer within the banking industry is too low to absorb any unforeseen changes in bank operating businesses. For instance, a rise in *Operating Expenses* by 1 million yen can deteriorate the bank profit by roughly 15 percent, or 153,866 yen, which is a moderately large impact. In particular, the magnitude of the sum of all traditional- and non-traditional income coefficients in the absolute term is incomparable with a single coefficient of *Operating Expenses*. This statistical finding provides a valuable recommendation to bankers to promptly perform internal organizational restructuring and new business alignment. For example, regional banks operating in less populated areas or with a high aging population may choose to reduce the number of bank branches or transfer less profitable services to larger branches in the city as a cost-cutting measure. A common consolidation strategy employed by Japanese regional banks is Branch-in-Branch consolidation. This approach serves a dual purpose by not only enabling regional banks to reduce costs by approximately 200 million yen per closure (see Samikawa et al., 2022) but also preserving their presence in the banking industry. Alternatively, regional banks can utilize online banking to save processing time, papers, and human resource expenses. Taking action on cutting costs is an immediate call.

In 2002, the BOJ proposed a few principles for banks to deal with non-performing loans (NPLs). The necessary and sufficient actions are the preemptive measures to assess and promote quick disposal of NPLs to restore market confidence and improve overall bank management. In addition, banks must be willing to put in their efforts and work with their clients to restructure loans. These suggested practices aim to enhance corporate competitiveness and contribute to the rehabilitation of businesses (Bank of Japan, 2002). Most Japanese regional banks, committed to strengthening relationships within local communities, have proactively offered their clients medium- to long-term financial solutions. One example is the provision of restructuring loans specifically tailored to assist small and medium-sized enterprises (SMEs) experiencing financial distress. Thus, improving corporate competitiveness and rehabilitation (corporate debt restructuring) will promote bank profitability through bank restructuring. For every 1 million yen of loan restructuring, it can improve bank profit by 15 percent or an increase of 154,082 yen, whose magnitude is comparable to a cost reduction in operating expenses. Furthermore, strengthening the bank's financial position is a desirable and prudent practice, particularly beneficial during an economic downturn. Let us consider *TNA* represents bank net worth. The empirical result shows that bank profits will remarkably rise by around 3.3 percent for an additional 1 million yen in total net assets. The explanation for this result is that improving banks' net worth can boost market confidence and increase regional banks' financial capability to absorb adverse shocks.

The analysis of bank management suggests that cutting unnecessary operating expenses, providing financial assistance to local clients through the loan restructuring program, and increasing total net assets can

[6] The overhead cost ratio is calculated as the ratio of overhead costs to gross operating profits.

[7] https://www.fsa.go.jp/en/news/2020/20201204-2/02.pdf

significantly improve bank profitability. An in-depth comparison with bank income reveals that instead of regional banks focusing on extending loans to risky customers or in the housing market, they should prioritize curbing their operating costs because doing so can be done internally and immediately. This managerial approach can be implemented promptly and offers significant realized benefits that are worth the attention of bankers.

Besides the previously discussed approaches for regional banks to reduce operating costs, the Japan Fair Trade Commission and the BOJ created the environment for mergers and acquisitions. This scheme motivates banks with high operational costs and low profitability to consider business integration as a feasible strategy. Moreover, it is designed to enhance the overall total assets of regional banks. The statistical evidence presented in this section supports the implementation of this business initiative. There are a few successful cases of Japanese regional banks' integration. For instance, Hokuto Bank in Akita and Shonai Bank in Yamagata, both of which are in the Tohoku region, agreed to form a joint holding company, FIDEA Holdings Co. Ltd., headquartered in Sendai, Miyagi. FIDEA has utilized the same pool of human resources and shared marketing strategy to unify the operation of both banks. Furthermore, the integration of the IT system and back-office in 2014 granted both Hokuto Bank and Shonai to enjoy economies of scale and expand their financial services to cover the three prefectures in the Tohoku region, which are Akita, Yamagata, and Miyagi. The fiscal year 2020 financial report showed a rise in ordinary profit from 4 billion yen to 6.8 billion per year, mainly due to a continuous decline in expenses, especially personnel costs and a universal IT system.

Another famous banking integration case is in Honshu island. Fukuoka prefecture has four regional banks I, the highest number of regional banks in one prefecture. Among these banks, the Bank of Fukuoka is the largest regional bank in Fukuoka. In 2007, the Bank of Fukuoka began integrating with Kumamoto Bank and Shinwa Bank. These three regional banks, led by the Bank of Fukuoka, formed the Fukuoka Financial Group (FFG), serving their clients in the three prefectures of Fukuoka, Kumamoto, and Nagasaki in the Kyushu region. The FFG adopted the "Multiple Brands/Single Platform" management style and took a few years to complete the integration of employees, management, and the IT system in 2010. Under the Multiple Brands/Single Platform management, the FFG has aimed to provide financial services for the whole Kyushu region under the same management system while maintaining strong bonds with the locals through each subsidiary bank. Not surprisingly, the FFG has realized economies of scale. As of March 2015, the FGG had the highest total assets of 15.6 trillion yen, followed by the Bank of Yokohama (15.2 trillion yen) and Chiba Bank (12.8 trillion yen).

4.4 The Advent of Japan Post Bank

The last question that this research attempts to investigate is the impact of the privatization of Japan Post Bank in 2007 and whether the emergence of Japan Post Bank has ruined regional banks' financial position. As aforementioned, Japan Post Bank can utilize the network of the Japan Postal Service for accumulating deposits. The coefficient of *JPB* has a negative sign, indicating that Japan Post Bank and regional banks are rivalries. For every 1 million rise of *JPB*, regional bank profits decline by 27,591 yen. Consequently, the advent of the Japan Post Bank deteriorates regional banks' profit by depleting the pool of deposits in the prefecture and making it difficult for regional banks to make new loans due to having fewer funds. For this reason, it might have stimulated regional banks to build new business models beyond traditional lending. The worst is yet to come. Regional banks have expanded their businesses in the housing market, and Japan Post Bank also became a new participant in this market in 2021. The Financial Services Agency and the Ministry of Internal Affairs and Communications approved Japan Post Bank application for the new business operations, including the mortgage loan of Flat 35 on April 9, 2021.[8] Therefore, regional banks will face strong competition and might struggle to generate income in the near future.

5 Robustness Check

Finally, since the variances of "Prefecture: Sigma^2" and "Aging: Sigma^2," representing the prefectural fixed effects and the aging population random effects, are statistically significant, using the mixed-effects model

[8] https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/pressrelease/2021/4/09_01.html

is appropriate in this study.

Figure 3: Diagnostic Graphs

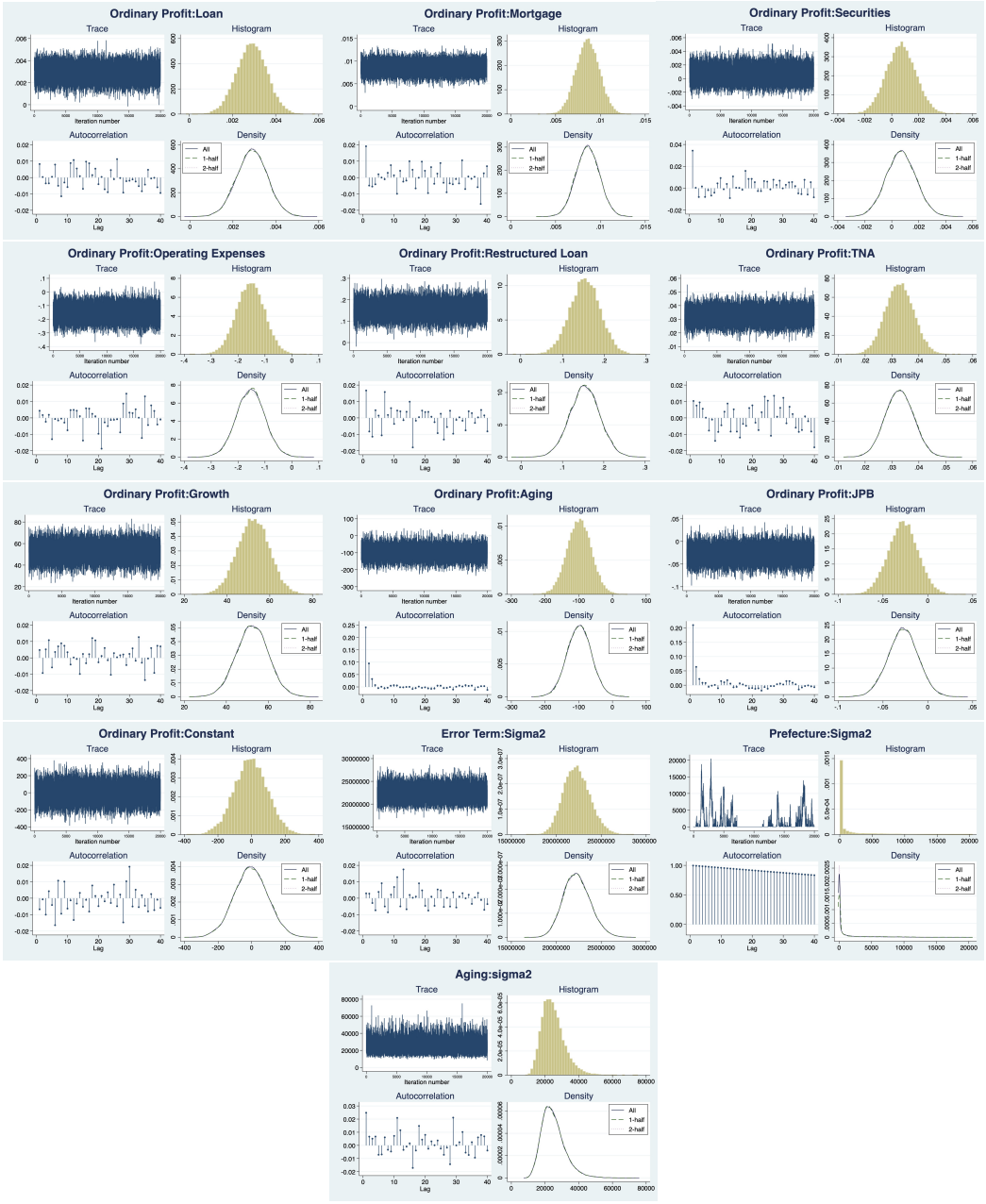


Table 4:

Ordinary Profit	ESS	Corr.Time	Efficiency
Loan	20000.00	1.00	1.00
Mortgage	19263.75	1.04	0.96
Securities	18715.40	1.07	0.94
Operating Expenses	20000.00	1.00	1.00
Restructured Loans	19354.06	1.03	0.97
TNA	19596.13	1.02	0.98
Growth	20000.00	1.00	1.00
Aging	11523.50	1.74	0.58
JPB	12572.05	1.59	0.63
Constant	20000.00	1.00	1.00
Prefecture: Sigma^2	58.08	344.34	0.00
Aging: Sigma^2	19054.04	1.05	0.95
Sigma^2	20000.00	1.00	1.00

6 Conclusion

The extended periods of the low interest-rate environment in Japan have forced Japanese regional banks to create new financial services beyond the core business of lending to offset the loss of interest earnings and search for financial assets with higher yields. The 64 regional banks are no exception and have strived to secure their profits. This paper investigates Japanese regional bank operations, facing the ultra-low interest-rate atmosphere and super-aging population. The Bayesian multilevel model analyzing panel data of 64 regional banks from 2010 to 2017 provides strong evidence that the rapid rise in the aging population and the privatization of Japan Post Bank have contributed to the deterioration of regional banks' profits. To counteract this decline, regional banks have been shifting their business models from making loans to lending mortgage loans and holding more securities. While expanding their business into new areas may improve their profits, it also exposes them to various business risks. The paper suggests that regional banks should first consider trimming unnecessary operating expenses, which can be done internally. Bank integration, such as forming a holding company, could be one way to achieve this. Finally, the Japanese government needs statistical evidence to support its proposal for mergers and acquisitions because the Japanese government will not enforce the integration of regional banks. Instead, the incentive program will encourage regional banks to form business partnerships. Therefore, regional banks can utilize the findings from this paper to make better decisions regarding mergers and acquisitions. This paper uses the Bayesian Multilevel Regression Approach to investigate the panel data and answer these issues.

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