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Bank-specific Determinants of Capital Structure: New Evidence from Japan

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Abstract

This paper is the first empirical research on the determinants of the capital structure of Japanese banks, using Japanese banks' financial data for two decades from 2000 to 2017 and adding new evidence to previous literature on the banks' capital structure. Previous researches show that the determinants of capital structure are different among countries or continents. We show that determinants vary and change in accordance with differences in business models among banks even within one country. By focusing on different business models between four sub-samples, "International banks before the Global Financial Crisis," "Domestic banks before the GFC," "International banks after the GFC," and "Domestic banks after the GFC", we analyze whether the determinants of capital structure differ among these sub-samples. The results are totally different and we find no determinants which can significantly and commonly explain all four sub-samples.

Keywords: Japanese banks, Capital Structure

JEL classification: **G21, G28**

1. Introduction

Banks' capital ratio is generally kept much lower than that of non-financial companies. This is puzzling for economists from a positive-theory viewpoint (DeAngelo and Stulz [2015]). Monetary and financial economists have examined the determinants of banks' capital structure for decades, and this became a hotter research field after the Global Financial Crisis that caused financial regulatory reforms.

There are two approaches that explain the determinants of banks' capital structure. The first approach is a corporate financial approach, which tries to explain banks' capital structure based on the theory of Modigliani and Miller (1958) and its development in corporate finance, such as tax savings on the financing of debt, a pecking order hypothesis, and so on.

The second approach is a banking approach, which places more focus on a bank's unique business model compared to non-financial companies and regards this uniqueness as a factor causing the bank's unique balance sheet structure: its low capital ratio (Diamond and Dybvig [1983], Diamond and Rajan [2000], Allen et al. [2011], DeAngelo and Stulz [2015]). DeAngelo and Stulz

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(2015), the latest theoretical research using this approach, shows that a bank's low capital ratio is optimal for banks whose central function is liquidity production. Banks provide deposits to the economy, and these are its most liquid assets. Deposits can bear a negative liquidity premium placed on it by the depositor, which enables the banks to earn external funds with lower costs than other external funds. This lower cost can explain the higher deposit-to-asset ratio, or the lower capital ratio.

Previous empirical works have tried to tackle this puzzle by using explanatory variables which are based on both banking and corporate-finance approaches. However, they can explain only some of the determinants of banks' capital structure. Gropp and Heider (2010), examining the capital structure of large U.S. and European banks from 1991 to 2004, found that an individual bank's specific factors are ultimately the most important determinant of a bank's capital structure. Kinai (2018), in subsequent research by Gropp and Heider (2010), examined the capital structure of U.S. and European banks by adding new explanatory variables that are based on both approaches. Although these new variables have significant effects, this research also concluded that a firm's capital structure is mostly driven by unobserved individual firm-specific factors.

What is the source of an individual bank's specific factors? Kinai (2018), examining the difference he found between the estimation results of U.S. and European banks, pointed out the possibility that the difference comes from differences in their business models. Although banks are categorized into one business type, "the banking industry", their business models differ from country to country as well as within a country. This difference is probably due to their cultural and historical backgrounds.

Taking Japan as an example, while we have more than 100 commercial banks in Japan, their business models differ. Some do business in international markets and can access several financial markets to receive and invest funds, while others only operate in one small, prefecture-level market, and deposits from this market are their single, most important source of external funds. Different back histories should also affect their different business models and capital structures. Some international banks have longer histories as commercial banks and have engaged in nationwide and international business for more than 100 years since Japanese modernization. On the other hand, some regional banks were originally saving banks or mutual banks and they have operated in a very small business area (Hoshi and Kashyap [2004]).

In this research, we categorize Japan's banks into two groups based on their business models as well as their back histories: "the international banks" which do business in international markets and have a relatively long history as commercial banks, and "the regional banks (the domestic banks)" which have operated only in one small, prefecture-level market since the middle of the 20th century[3]. Then, focusing on the possible difference between the two groups, we examine whether banks with different business models differ in what determines their capital structure.

As is clearly shown by Hoshi and Kashyap (2004), Japanese banks' business models have been strongly affected by regulatory changes during their long history since the 19th century. The current regulatory reforms since the Global Financial Crisis may have changed their business models as well. So, we will split the sample into before-2008 and after-2009 and examine whether the determinants of their capital structure changed before and after the GFC.

Using the unbalanced panel financial data of all Japan's banks from 2000 to 2017, we estimated a fixed effects model to examine the effects of possible factors on banks' capital ratios. By comparing the results between four sub-samples – "International banks before the Global Financial Crisis,"

[3] Most of the current regional banks were born under a "one prefecture, one bank" government program in the 1940s (Hoshi and Kashyap [2004] p.58).

"Domestic banks before the GFC," "International banks after the GFC," and "Domestic banks after the GFC" – we show that the determinants differ among banks and eras even within one country. We find no determinants that can significantly and commonly explain all four sub-samples.

Previous researches, such as Gropp and Heider (2010) and Kinai (2018), show that the determinants of capital structure differ among countries, and point out that these differences are probably caused by differences in business models due to the differences in their cultural and historical backgrounds. This paper contributes to this literature by showing differences among banks even within "one" country that are also due to their different business models.

To the best of our knowledge, this is the first study which examines the determinants of banks' capital structure by using Japanese financial data. There is a lot of literature that examines the effects of capital structure on banks' behavior in Japan (such as Montgomery [2005], Osada, Onji and Vera [2017]). Our research will also contribute to future work that examines the interaction between banks' capital structure and other economic variables.

The paper is organized as follows. Section 2 describes the models and econometric estimation as well as explaining the definition of variables in our model. In section 3, we present the estimation results and analyze them. Section 4 concludes.

2. Models and econometric estimation

In this paper, we employ following the seven independent variables affecting banks capital structure using annual data in an unbalanced panel: *P Loan Ratio, M Loan Ratio, Depo Ratio, Loan Rate, Depo Rate, Cost Ratio,* and *ln(Asset)*.

P Loan Ratio and *M Loan Ratio* are the ratio of Retail Loans to Total Assets and the ratio of Loans to SMEs to Total Assets, respectively. We use these two independent variables as the degree of asymmetric information between banks and borrowers as well as the degree of liquidity of their assets. According to Diamond and Rajan (2000), Retail and SME loans are less liquid assets with more asymmetric information between banks and borrowers than loans to big companies. So, banks with a higher ratio for these two assets have a stronger incentive to hold capital to cope with liquidity shocks and borrowers' moral hazard.

Depo Ratio is the ratio of Deposits to Total Assets. We use it to capture the liquidity premium, a concept used by DeAngelo and Stults (2015), one of the newer theoretical banking papers. Deposits are a source of funding with a negative liquidity premium. Depositors who favor this liquidity will accept a negative premium so banks can obtain funds at lower costs, which produces more profit resulting higher capital ratio.

Loan Rate is the ratio of interest income on loans to total loans. There are two conflicting hypotheses which explain the relationship between this rate and capital structure. According to DeAngelo and Stulz (2015), the higher *Loan Rate* produces more profit resulting in a higher capital ratio. On the other hand, we can hypothesize that worse banks with a lower capital ratio have more of an incentive to make loans to riskier borrowers, or borrowers with a higher interest rate, which leads to a negative relationship between this rate and the capital ratio.

Depo Rate is the ratio of interest expenditure on deposits to total deposits. A lower *Depo Rate* produces more profits resulting in a higher capital ratio, which leads to a negative relationship. This relationship can also be explained by hypothesizing that worse banks with a lower capital ratio have to pay a higher Depo Rate to depositors when they raise money.

Cost Ratio is the ratio of operating expenses to total assets. We use it as a measure of financial intermediary costs, in other words a bank's efficiency. A lower Cost Ratio produces more profits resulting in a higher capital ratio (DeAngelo and Stultz [2015]).

When we explain the relationship between a capital ratio and the first six independent variables, we often use the banking theory of DeAngelo and Stults (2015), where profitable variables can cause a higher capital ratio through the channel of capital accumulation. However, from the corporate financial view based on trade-off theory, there can be a negative relationship between profits and capital ratios. Companies with higher profits can enjoy higher tax saving benefits from debt financing. As a result, they have a stronger incentive to keep a lower capital ratio (Frank and Goyal [2009]).

The seventh variable is a logarithm of total assets, *ln(Asset)*, which is used to measure size effects. According to corporate finance theories, such as a pecking-order hypothesis, bigger companies have less incentive to finance through stocks because they dislike the mispricing in the stock market caused by asymmetric information with investors (Myers and Majluf [1984]). Also, bigger companies are less likely to go bankrupt so they have a stronger incentive to prefer debt-financing.

Expected estimation signs on coefficients are as follows: *P Loan Ratio* (+), *M Loan Ratio* (+), *Depo Ratio* (+), *Loan Rate* (+/-), *Depo Rate* (+/-), *Cost Ratio* (+/-), and *ln(Asset)* (-).

As for dependent variables that measure banks' capital structure, following previous studies (Gropp and Heider [2010], Kinai [2018]), we use three different capital ratios: the Ratio of capital to assets (Equity Ratio), the Regulatory capital adequacy ratio (Cap Ratio), and the Tier 1 Ratio.

Table 1 provides descriptive statistics for the variables we use. All the data are for the end of each fiscal year and unconsolidated-base data, at the end of each March from 2000 to 2017. Table 2 shows their correlations, VIF and Tolerance, where there is no multi-collinearity among our explanatory variables. Our data source is Nikkei Financial Data (NEEDS-CD ROM database)[4].

Using unbalanced panel data, we estimate a static model with fixed effects as follows[5]:

$$Cap_{it} = \beta_0 + BX_{it} + c_t + c_i + u_{it,}$$

where Cap_{it} is a dependent variable into which we put three different capital ratios. X_{it} signifies independent variables based on both banking and corporate-financial views. The regression includes time and individual-bank fixed effects (c_t,c_i) to account for unobserved heterogeneity at the individual-bank level and across time that may be correlated with the explanatory variables. Standard errors are clustered at the bank level to account for heteroscedasticity and the serial correlation of errors (Peterson [2009]).

Our estimations were conducted using both the full sample and two different sub-samples: one is "international banks" which do business in international markets and the other is "regional banks (domestic banks)" which operate only in one small, prefecture-level market. We also divide sample periods into two sub-sample periods: one is before the Global Financial Crisis, or 2008, and the other is after 2009. As explained in the introduction, we focus on the different business models that probably affect the determinants of capital structure. Comparing and analyzing the results for each sub-sample, we can focus on the significant implications from what we find.

3. Results

Estimation results in Tables 3, 4 and 5 show the coefficients of the explanatory variables and their corresponding standard errors adjusted for clustering at the individual bank level. From the estimation

[4] This database records regulatory capital ratios only since 2000.

[5] We do not use dynamic types of models which are often used in panel date analysis. Also, we do not use the market data which were used in a prominent previous study (Gropp and Heider [2010]). These improvements are left for future research.

Table 1.

The sample consists of 130 Japanese banks from FY 1999 to FY 2016. Subsample A consists of 25 international banks which conduct overseas operations. Sub-sample B consists of 105 domestic banks which do not operate overseas.

	Mean	Median	St. Dev.	Max	Min
All banks					
Equity Ratio	0.049	0.048	0.014	0.127	0.001
Cap Ratio	0.105	0.101	0.024	0.245	0.005
Tier 1 Ratio	0.083	0.079	0.026	0.196	0.002
P Loan Ratio	0.187	0.178	0.072	0.653	0.007
M Loan Ratio	0.507	0.518	0.128	0.797	0.071
Depo Ratio	0.858	0.893	0.119	0.963	0.132
Loan Rate	0.020	0.020	0.005	0.064	0.001
Depo Rate	0.002	0.001	0.002	0.029	0.000
Cost Ratio	0.012	0.012	0.003	0.028	0.000
ln(Asset)	14.753	14.697	1.200	19.135	12.320
Sub-sample A (International banks)					
Equity Ratio	0.056	0.057	0.014	0.088	0.017
Cap Ratio	0.130	0.124	0.027	0.219	0.067
Tier 1 Ratio	0.099	0.095	0.031	0.196	0.034
P Loan Ratio	0.153	0.151	0.064	0.339	0.011
M Loan Ratio	0.397	0.413	0.125	0.634	0.071
Depo Ratio	0.720	0.795	0.183	0.924	0.132
Loan Rate	0.017	0.017	0.004	0.027	0.001
Depo Rate	0.003	0.002	0.004	0.029	0.000
Cost Ratio	0.009	0.009	0.003	0.028	0.000
ln(Asset)	16.360	15.922	1.193	19.135	13.749
Sub-sample B (Domestic banks)					
Equity Ratio	0.048	0.047	0.014	0.127	0.001
Cap Ratio	0.099	0.098	0.020	0.245	0.005
Tier 1 Ratio	0.079	0.077	0.023	0.193	0.002
P Loan Ratio	0.195	0.185	0.072	0.653	0.007
M Loan Ratio	0.529	0.539	0.117	0.797	0.183
Depo Ratio	0.886	0.903	0.075	0.963	0.152
Loan Rate	0.021	0.021	0.005	0.064	0.009
Depo Rate	0.002	0.001	0.001	0.012	0.000
Cost Ratio	0.012	0.012	0.003	0.022	0.004
ln(Asset)	14.430	14.522	0.907	17.297	12.320

Table 2. Correlations, VIF and Tolerance

	Equity Ratio	Cap Ratio	Tier 1 Ratio	P Loan Ratio	M Loan Ratio	Depo Ratio	Loan Rate	Depo Rate	Cost Ratio	ln (Asset)	VIF	Tolerance
Equity Ratio	1.000											
Cap Ratio	0.625	1.000										
Tier 1 Ratio	0.748	0.869	1.000									
P Loan Ratio	-0.259	-0.322	-0.261	1.000							1.68	0.594
M Loan Ratio	-0.273	-0.683	-0.528	0.601	1.000						3.68	0.272
Depo Ratio	-0.305	-0.562	-0.331	0.385	0.633	1.000					2.74	0.365
Loan Rate	-0.297	-0.656	-0.524	0.352	0.717	0.426	1.000				4.11	0.243
Depo Rate	-0.006	0.052	-0.106	-0.158	-0.152	-0.522	0.187	1.000			2.12	0.472
Cost Ratio	-0.278	-0.642	-0.451	0.253	0.668	0.524	0.734	-0.120	1.000	4.66	0.215	
ln(Asset)	0.200	0.599	0.343	-0.294	-0.673	-0.645	-0.604	0.221	-0.819	1.000	3.33	0.300

results in Table 3, we can find the effects of each factor on capital structure on average in the full sample period. More importantly for our research, by comparing the results of the two sub-sample periods, or between Tables 4 and 5, we can find the effects of changes in banks' business models caused by regulatory reforms which happened before and after the Global Financial Crisis in Japan. Also, by comparing the results between the International and Domestic Banks in each sample period, we can find the effects of the difference in business models on their capital structure. The following are the results and analyses of the four sub-samples: "International banks before the Global Financial Crisis," "Domestic banks before the GFC," "International banks after the GFC," and "Domestic banks after the GFC".

Starting with the results for the international banks before the GFC in Table 4, they have negatively significant results in *ln(Asset)* and *Loan Rate*. In support of the corporate-financial hypothesis, the bigger international banks tended to hold less capital, and, worse, international banks with a lower capital ratio had more incentive to make loans to riskier borrowers, or borrowers with higher interest rates, before the GFC.

However, international banks' behavior changed after the GFC. The results in Table 5 show that *Depo Ratio*, *Depo Rate* and *Cost Ratio* have significant results. The *Cost Ratio* has especially significant positive results on all the three dependent variables at the 1% level. Because these three independent variables relate to banks' costs, we can say that after the GFC, international banks tried to heighten their capital ratio by reducing their costs: by increasing deposits with negative liquidity premiums (DeAngelo and Stultz [2015]), lowering their deposit interest-rate and reducing their operating expenses. As we predicted, international banks' behavior, or their business models, changed after the GFC in terms of their capital structure.

As for the domestic banks, their results are different both from those for the international banks and for the two sample periods. Domestic banks before the GFC have significant positive results in *P*

Table 3. Full sample period: from 1999 to 2017

	All Banks			International			Domestic Banks		
	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio
P Loan Ratio	0.012	0.019	0.022	-0.007	-0.032	-0.039	0.014	0.050**	0.055**
se	(0.012)	(0.023)	(0.025)	(0.026)	(0.056)	(0.068)	(0.013)	(0.022)	(0.026)
M Loan Ratio	0.009	-0.055***	-0.022	0.013	-0.049	-0.045	0.007	-0.073***	-0.039
se	(0.011)	(0.019)	(0.021)	(0.021)	(0.033)	(0.037)	(0.013)	(0.019)	(0.028)
Depo Ratio	-0.028*	-0.098***	-0.083**	-0.004	-0.064**	-0.054***	-0.040	-0.078*	-0.057
se	(0.015)	(0.029)	(0.032)	(0.014)	(0.025)	(0.019)	(0.024)	(0.046)	(0.063)
Loan Rate	-0.551*	0.309	0.270	-0.368	0.581	0.609	-0.441	-0.177	-0.147
se	(0.289)	(0.457)	(0.489)	(0.677)	(0.737)	(0.930)	(0.315)	(0.456)	(0.539)
Depo Rate	-0.697*	-3.935***	-4.000***	-0.811*	-2.491**	-3.815***	-0.151	-0.987	-1.370
se	(0.420)	(0.925)	(0.912)	(0.442)	(0.894)	(0.974)	(1.390)	(1.993)	(2.123)
Cost Ratio	0.619	1.054	0.916	0.076	1.001	1.085	0.597	-0.052	-0.204
se	(0.404)	(0.814)	(0.916)	(0.477)	(1.151)	(1.116)	(0.543)	(0.943)	(1.014)
ln(Asset)	-0.006*	-0.001	-0.002	-0.011*	0.000	-0.009	-0.006	-0.012*	-0.007
se	(0.003)	(0.005)	(0.007)	(0.006)	(0.010)	(0.013)	(0.004)	(0.006)	(0.008)
Constant	0.162***	0.220**	0.231**	0.256**	0.207	0.339	0.170**	0.363***	0.263*
se	(0.053)	(0.093)	(0.115)	(0.105)	(0.165)	(0.221)	(0.070)	(0.113)	(0.134)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1,829	1,823	1,507	309	305	301	1,520	1,518	1,206
Adjusted R^2	0.306	0.439	0.544	0.582	0.742	0.820	0.268	0.387	0.322
Unique Banks	130	130	130	25	25	25	105	105	105

Standard errors are adjusted for clustering at the bank level.
***, ** and * denote statistical significance at the 1%, 5 % and 10% levels, respectively.

Table 4. Before the Global Financial Crisis: from 1999 to 2008

	All Banks			International			Domestic Banks		
	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio
P Loan Ratio	0.039**	0.090***	0.074***	0.046	0.075	0.087	0.035*	0.097***	0.069**
se	(0.019)	(0.027)	(0.024)	(0.050)	(0.070)	(0.059)	(0.021)	(0.033)	(0.029)
M Loan Ratio	0.000	-0.034*	-0.010	0.001	-0.025	-0.017*	-0.001	-0.042	-0.011
se	(0.018)	(0.019)	(0.018)	(0.024)	(0.016)	(0.010)	(0.020)	(0.027)	(0.029)
Depo Ratio	-0.030	-0.053**	-0.023	-0.015	-0.055	-0.010	-0.030	-0.041	-0.027
se	(0.026)	(0.025)	(0.028)	(0.024)	(0.035)	(0.027)	(0.044)	(0.037)	(0.047)
Loan Rate	-0.790**	-0.889***	-0.996**	-0.873	-1.179*	-1.213***	-0.581	-0.679	-0.837*
se	(0.396)	(0.327)	(0.390)	(0.702)	(0.641)	(0.420)	(0.469)	(0.421)	(0.498)
Depo Rate	-0.478	-0.338	-0.199	-0.258	0.085	0.037	0.289	0.654	0.212
se	(0.736)	(0.666)	(0.831)	(0.425)	(0.718)	(0.608)	(1.272)	(1.547)	(1.829)
Cost Ratio	0.641	-0.358	0.139	-0.323	0.394	-0.400	0.420	-0.978	-0.394
se	(0.583)	(0.777)	(0.780)	(0.846)	(0.981)	(0.920)	(0.753)	(0.903)	(0.997)
ln(Asset)	-0.006	-0.008	-0.004	-0.019**	-0.010	-0.015*	-0.004	-0.007	-0.005
se	(0.005)	(0.006)	(0.006)	(0.008)	(0.007)	(0.009)	(0.006)	(0.007)	(0.007)
Constant	0.161**	0.285***	0.165*	0.387**	0.337***	0.362**	0.128	0.267**	0.185*
se	(0.074)	(0.083)	(0.084)	(0.149)	(0.114)	(0.139)	(0.090)	(0.108)	(0.106)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	917	916	914	153	153	151	764	763	763
Adjusted R^2	0.258	0.343	0.241	0.688	0.548	0.703	0.179	0.324	0.182
Unique Banks	129	129	129	25	25	25	104	104	104

Standard errors are adjusted for clustering at the bank level.
***, ** and * denote statistical significance at the 1%, 5 % and 10% levels, respectively.

Table 5. After the Global Financial Crisis: from 2009 to 2017

	All Banks			International			Domestic Banks		
	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio	Eqiuty Ratio	Cap Ratio	Tier 1 Ratio
P Loan Ratio	-0.003	0.016	0.009	-0.019	0.019	-0.034	0.011	0.048	0.035
se	(0.022)	(0.040)	(0.042)	(0.030)	(0.107)	(0.086)	(0.018)	(0.033)	(0.028)
M Loan Ratio	-0.001	-0.082**	-0.034	0.015	-0.090	-0.085	-0.010	-0.103***	-0.053*
se	(0.014)	(0.034)	(0.044)	(0.029)	(0.098)	(0.090)	(0.015)	(0.029)	(0.028)
Depo Ratio	-0.001	-0.040	-0.032	0.043***	0.031	0.055*	-0.017	0.015	0.005
se	(0.008)	(0.031)	(0.027)	(0.007)	(0.034)	(0.032)	(0.015)	(0.032)	(0.047)
Loan Rate	0.789**	1.146	-0.135	-0.138	1.639	-0.260	0.945***	0.453	-1.230
se	(0.365)	(0.749)	(1.360)	(0.627)	(2.526)	(2.731)	(0.351)	(0.681)	(1.050)
Depo Rate	-0.656	-2.719	-3.623*	-1.056*	-1.192	-3.608*	1.035	0.942	3.034
se	(1.478)	(2.841)	(1.939)	(0.531)	(1.926)	(2.077)	(2.796)	(5.094)	(3.540)
Cost Ratio	-0.171	0.366	-1.453	-4.087***	-9.784***	-10.351***	0.659	1.362	2.400
se	(0.604)	(1.181)	(1.773)	(0.703)	(3.006)	(2.237)	(0.526)	(1.106)	(1.497)
ln(Asset)	-0.015**	-0.005	-0.028**	-0.019***	-0.008	-0.017	-0.013*	-0.007	-0.005
se	(0.006)	(0.010)	(0.011)	(0.005)	(0.017)	(0.017)	(0.007)	(0.010)	(0.016)
Constant	0.279***	0.233	0.615***	0.381***	0.350	0.493*	0.244**	0.211	0.167
se	(0.093)	(0.146)	(0.171)	(0.074)	(0.261)	(0.265)	(0.115)	(0.153)	(0.261)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No
Number of Observations	802	797	483	138	134	132	664	663	351
Adjusted R^2	0.411	0.170	0.429	0.624	0.419	0.629	0.420	0.292	0.250
Unique Banks	117	117	115	19	19	19	98	98	96

Standard errors are adjusted for clustering at the bank level.
***, ** and * denote statistical significance at the 1%, 5 % and 10% levels, respectively.

Loan Ratio on all the three dependent variables in Table 4. Domestic banks which increased their retail loans during this period have a stronger incentive to hold capital to cope with liquidity shocks and borrowers' moral hazard.

Like international banks, the determinants of domestic banks also changed after the GFC, After the GFC, they have had significant "negative" results in *M Loan Ratio* and positive results in *Loan Rate* at the 1% level. Although the negative results of *M Loan Ratio* are hard to explain by the hypothesis introduced in the previous section, by combining the positive results of *Loan Rate*, it can be assumed that domestic banks reduced the amount of their SME loans and raised their lending rate to make more profits and heighten their regulatory capital ratio in order to cope with regulatory reforms after the GFC.

As you can see from the different results among these four sub-samples, we do not get any determinants which can significantly and commonly explain all the four groups' behavior in terms of their capital structure. Our results show that the determinants differ among banks and eras even in one country.

4. Conclusions

This paper is the first empirical research on the determinants of the capital structure of Japanese banks. Using the unbalanced panel financial data for all the Japanese banks from 2000 to 2017, we estimated a fixed effects model to examine the effects of possible factors on banks' capital ratios: the Ratio of capital to assets (Equity Ratio), the Regulatory capital adequacy ratio (Cap Ratio), and the Tier 1 Ratio.

Focusing on the different business models between the sub-samples, we analyzed whether the determinants of capital structure differ among sub-samples. By dividing the full sample into four sub-samples: "International banks before the Global Financial Crisis," "Domestic banks before the GFC," "International banks after the GFC," and "Domestic banks after the GFC"; we compared their estimation results.

The results and our analysis show that the determinants differ among banks and eras even within one country; we find no determinants which can significantly and commonly explain all the four sub-samples.

Previous researches, such as Gropp and Heider (2010) and Kinai (2018), show that the determinants of capital structure differ among countries or continents, or between EU countries and the US, and points out that these differences are probably caused by differences in business models due to their different cultural and historical backgrounds. This paper contributes to this literature by showing the differences among banks even within one country.

We provide new evidence which shows that the determinants of banks' capital structure vary and change in accordance with differences in the business models among banks. However, for a more detailed investigation, we need to improve our estimation models, data sets and so on. This we leave for future research.

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