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Influence of financial reform on business-lending performance of large and small commercial banks – evidence from the Taiwan market

Abstract

To analyze the performance of small business lending, this study uses the regression model of Carter and McNulty (2005) to test the relationships among loan spread, bank size, and financial reform. This article establishes a theoretical and practical mathematical model for unique banking environment in Taiwan. The conclusion and policy implications are as follows. First, bank spread reduces with increasing loan scale. Excluding government-owned banks gets similar results, and indicates similar behavior in government-owned and privatized banks. Second, the loan performance of new privatized banks improved in the long term. Third, if current banks increase their proportion of small business lending, the increase in loan spread remains unchanged, meaning the loan spread is previously higher than it currently is. Additionally, different from the literature of Carter and McNulty (2005), this study fails to find any small bank advantage, but identifies a significant positive relationship between size and loan spread. Moreover, the loan spread increased with bank size, indicating that over-banking still exists and the problem of excessively small size of financial institutions remains incompletely resolved, with large banks having gradually improves their business-lending performance over time, slowly increasing the spread of business lending.

Keywords: business lending, financial reform.
JEL Classification: G21, G28.

Introduction

Reviewing the financial environment during the past several decades, Taiwan has approved the creation of 15 newly established banks. To promote "the first and second financial reforms"[1], the Taiwanese government amended and enacted Six Financial Laws[2] and mechanism of the private placement. The impact of the 1997 Asian financial crisis, credit card debt storm (October 2005) and subprime mortgage crisis (August 2007) markedly changed the business situation of commercial banks. "Banking Act of The Republic of China" passed in 2000. After 2000, Taiwan primarily experienced the horizontal and vertical consolidation by "The Financial Institutions Merger Act" and the "Financial Holding Company Act", the deposit banks not only drew on lessons from past improper business operations causing significant losses owing to overdue loans, but also re-adjusted by increasing their capital scale to fit the

new financial regime, actively seeking creditable borrowers, finding for business from large-scale borrowers. In mid 2005, Banks not only faced challenges from the financial reform, but also suffered serious problems arising from the successive credit card debt storm, and a few banks accepted huge losses associated with bad debts, which not only impacted their profitability, but also induced high liquidity risk, thus affecting their credit.

Important questions include the impact of the above financial environment changes on loan spread in business-lending, and whether financial reform, bank size, and proportions of small business lending impact business-lending performance. All these issues are concerns for the banking industry, government and academia. Since this study is concerned about how financial environment affects the performance achievement of business lending, we adopt the model to assess how changes in the financial reform affect the loan spread of lending. The key findings are summarized as follows. First hypothesis results indicate that small business lending has higher loan spread than large one. The increase in small business lending ratio helps improve the loan spread. For both government-owned and privatized banks, the loan spread increases with small business lending ratio. Second hypothesis results show that the relationship between the small business lending ratio and the loan spread changes over time. Next, the third hypothesis results clarify that changes in market conditions increase the competitive pressure and reduce business lending spreads. The fourth hypothesis results demonstrate inconsistencies in the relationship

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[1] "The first financial reform" (July 2002) required banks reach the criteria of non-performing rate less than 5%, and bank of international settlement ratio higher than 8% within two years; on behalf of "the second financial reform" (October 20, 2004), three financial institutions achieved 10% of the market share, 12 government-owned banks incorporated into six banks by the end of 2005, 14 financial holding companies merged into seven, and at least one financial institution was run by foreign investors by the end of 2006.

[2] The amendment and enactment of Six Financial Laws means, "The Banking Act of The Republic of China" (announcement on November 1, 2000), "The Financial Institutions Merger Act" (announcement on December 13, 2000), "The Financial Holding Company Act" (announcement on July 9, 2001 implementation on November 1, 2001), "Financial Asset Securitization Act" (adopted on June 20, 2002), "Financial Supervisory Commission Organization Act" (establishment on July 1, 2004), and "Financial Reconstruction Fund Regulations" (adopted on June 22, 2005).

between bank size and loan spread. Following, the fifth hypothesis results exhibit business lending spread is decreasing each year. Finally, the sixth hypothesis results display a possible linear relationship between the bank size and the loan spread of business lending.

The remainder of this paper is organized as follows. Section 1 reviews the related literature and Section 2 describes the sample data, empirical models and hypotheses. Section 3 reports the empirical results while the last section concludes.

1. Literature review

The business-lending performance of large and small banks has attracted academic interest. Berger and Udell (1995) found evidence that large banks were reluctant to lend to small and medium enterprises (SME), creating a comparative advantage of small banks in SME lending, and thus proposed the "small bank advantage hypothesis". Berger, Klapper, and Udell (2001) suggested that small banks were relationship oriented and more competitive, while large banks were reluctant to invest heavily in dealing with "soft information" from SMEs. Subsequently, Berger and Udell (2002a) found that small banks stressed dealing with soft information, and thus enjoyed an advantage in relationship-lending. Berger and Udell (2002b) found that the organizational structure and incentive systems of large and small banks differed, improving the application of soft information in making business commitments in small banks versus large banks.

DeYoung, Hunter, and Udell (2004) analyzed the U.S. banking industry following a series and financial deregulations and concluded that it could be divided into large and small banks. Large banks use hard information, have distant customer relationships, low credit unit cost, and standardized credit policy (for example, credit card loans); meanwhile, small banks use soft information, close customer relationships, high credit unit costs, and a credit policy focused on non-standard objects (for example, small business lending). Furthermore, small banks with good internal governance mechanisms can comfortably adapt to changes in the competitive environment particularly strong competition from supervision and technical evolution; small banks enjoy an advantage in relationship lending and busi-

ness services for SME. Peek, Rosengren, and Kasirye (1999) and Berger, Saunders, and Udell (1998) claimed that M&A among large banks or involving large and small banks would reduce the future commitment of the involved banks to SME lending with only M&A among small banks contributing to increased SME lending.

2. Methodology

2.1. Data. This study investigates 52 banks as target objects over the 18 years from 1991 to 2008, a sample that includes both listed and government-owned banks; this study analyzes the annual financial statements of each bank. The data are from the Taiwan Economic Database (TEJ), which includes 342,518 items[1] comprising detailed loan facilities information based on data provided by the 52 banks. The study period runs from 1991 to the end of 2008, and covers loan customers (enterprises) including listed (both previously and currently) and government-owned banks. This study classifies borrowing involving loan contracts totaling less than NT 30 million dollars as small business lending. This study obtains total balance of business lending, total balance of small business lending, interest income of annual total business lending by calculating the average interest rate[2] and annual loan balance for every loan contract. Finally, following comparison and combination with the financial statements and the omission of missing values, loan spread (annual) comprising 774 items of business lending are calculated using data from 52 banks over and 18 year period. Data for each bank is studied over approximately 15 years.

2.2. Model development and hypothesis. Following Carter and McNulty (2005) assumed that: bank net interest income from business lending (I) is primarily influenced by the following four factors: (1) total small business lending (SBL); (2) surplus business lending (TBL-SBL) calculated as total business lending (TBL) minus small business lending (SBL); (3) bank size (measured by total assets (TA)); and (4) interaction between business lending scale and total balance of small business lending, also known as cross item of total assets (TA) of bank (book value) and total balance of small business lending (SBL); ε denotes the error item. The theoretical equation (1) is presented as follows:

$$I_{it} = \beta_1 SBL_{it} + \beta_2 (TBL_{it} - SBL_{it}) + \beta_3 (SBL_{it} \times TA_{it}) + \beta_4 \ln(TA_{it}) + \varepsilon_{it}. \tag{1}$$

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[1] According to statistics, the loan facilities in this study ranged from 1 (Kaohsiung Business Bank, 1993) to 2,792 items (Hua-Nan Bank, 2003). In comparison of the total number of loan facilities, the 31,927 items of Hua-Nan Bank were the most and the 100 items of the Seventh Bank were least. The average item of each bank in every year was about 395.

[2] There are two-denominated benchmark of fixed rate and variable rate in loan contracts. Due to the incomplete information, in this research, we measure the rate as the average rate in several loan contracts in a same lending company.

In equation (1), I_{it}[1] is measured by: "the total interest receipts of business lending (IRBL) for individual banks minus Net Charge off and allocated expenses[2] (AE), as shown in equation (2):

$$I_{it} = IRBL_{tt} - NetChargeoff - AE \qquad (2)$$

$$\frac{I_{it}}{TBL_{it}} = ADJI_{it} = (\beta_1 - \beta_2) \times \frac{SBL_{it}}{TBL_{it}} + \beta_2 + \beta_3 \times \frac{(SBL_{it} \times TA_{it})}{TBL_{it}} + \beta_4 \times \frac{\ln(TA_{it})}{TBL_{it}} + \frac{\varepsilon_{it}}{TBL_{it}}.... \qquad (3)$$

To explore how environmental changes impact loan scale and bank size, and hence the loan spread of business lending, the empirical model incorporates the interaction between the time indicator of environmental changes and business lending scale and obtains equation (4) – see below. Since the empirical

$$ADJI_{it} = (\beta_1 - \beta_2) \times \frac{SBL_{it}}{TBL_{it}} + \beta_2 + \beta_3 \times \frac{(SBL_{it} \times TA_{it})}{TBL_{it}} + \beta_4 \times \frac{\ln(TA_{it})}{TBL_{it}} +$$

$$+ TIME \left[(\theta_1 - \theta_2) \times \frac{SBL_{it}}{TBL_{it}} + \theta_2 + \theta_3 \times \frac{(SBL_{it} \times TA_{it})}{TBL_{it}} + \theta_4 \times \frac{\ln(TA_{it})}{TBL_{it}} \right] + \frac{\varepsilon_{it}}{TBL_{it}}. \qquad (4)$$

Hypothesis 1: For all banks, the loan spread generated from every dollar committed to small business lending equals that for other business lending.

That is, for banks, the loan spread generated from the commitment of small business lending is the same as that for other business lending. If the empi-

$$\frac{\partial ADJI}{\partial (SBL/TBL)} = (\beta_1 - \beta_2) + \beta_3 \times TA + (\theta_1 - \theta_2) \times TIME + \theta_3 \times TIME \times TA. \qquad (5)$$

Hypothesis 2: The relationship between proportion of small business lending and loan spread of business lending remains constant over time.

To reduce the influence of scale on credit comparison, in the assessment of performance on business-lending, every side of equation (1) is divided by TBL, allowing explanatory variables to include the risk-adjusted net interest income on business lending (denote ADJI: namely the loan spread of business lending). Transposing the equation yielded equation (3), as follows:

period runs from 1991 to 2008, the time indicator is set to $TIME = 0, 1, 2... 17$, and this $TIME$ value is substituted into equation (4) for performing regression analysis.

The estimation of equation (4) permits the testing of six important hypotheses:

rical results do not reject the hypothesis, the generated loan spread differs little regardless of loan size. However, if the empirical results reject the hypothesis, the loan spread generated from small business lending differs significantly from that for large business lending regardless of bank size. This study presents the following theoretical equation:

The loan spread difference between small business lending and other business lending remains constant with deregulation and technological progress. If the empirical results do not reject the hypothesis, the relationship between the proportion of small business lending and the loan spread of business lending remains constant in both the long-term and short-term lending markets. However, the relationship between the two changes if the test results reject the null hypothesis.

$$\frac{\partial^2 ADJI}{\partial (SBL/TBL)\partial TIME}. \qquad (6)$$

Hypothesis 3: The loan spread of business lending remains fixed over time.

If the empirical results cannot reject the hypothesis, the financial environment and regulation changes do not influence business lending loan spread. However, if the empirical results reject the hypothesis, bank business lending results in load spread that varies over time or variable loan spread.

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[1] According to the "Uniform Accounting System of Ministry of Finance Board" and financial statement format of public issued company, we can only obtain non-performing loans and recovery amount from individual bank "total loans", and total operating expenses as well, and cannot get non-performing loans and recovery amount of "business lending" and operating expenses of "business lending". To avoid difficulty in data collection, this research used the index of the proportion of the total interest income of "business lending" in the total interest income of the whole bank to estimate non-performing loans and recovery amount of "business lending", as well as operating expenses.

[2] Net Charge off mean bank debtor's assets like accounts receivable or notes receivable, etc. generated by dead loan loss due to the debtor's bankruptcy and death occurrence minus recoveries from identified bad debts. Allocated expenses mean indirect expenses ever produced or paid, but allocated to the product cost in gradual phases. Since this study is mainly based on lending business of banks, the "allocated expenses" is aimed to the necessary operating expenses of business lending. It is worth mentioning that in July 2000, Cosmos Bank first launched the George&Mary cash card in order to promote "small facilitated financing" in Taiwan. However, from 2005 to 2006, Taiwan experienced credit card debt storm, leading suspension of many banks in this period. In view of other relevant variables extrapolated from non-performing loans of the total loans, in order to reduce statistical bias possibly derived from a large number of bad debts transformed by personal loans in short term eroding normal profit figures and lowering the income rate of business lending of banks, in this study, non-performing loans derived from two-cards (credit card and debt card) event in 2005 and 2006 were averagely allocated to 2001 to 2006 to reduce bias as much as possible.

$$\frac{\partial ADJI}{\partial TIME} = (\theta_1 - \theta_2) \times \frac{SBL}{TBL} + \theta_2 + \theta_3 \times \frac{(SBL \times TA)}{TBL} + \theta_4 \times \frac{LNTA}{TBL}. \qquad (7)$$

Hypothesis 4: Business loan spread remains constant even with variations in bank size.

This test clarifies whether small business lending enjoys any advantages. If the test results cannot reject the null hypothesis, the loan spread of busi-

ness lending is the same in both large and small banks, and small bank business lending commitments are less efficient than those of large banks. If the test results reject the hypothesis, then the loan spread of business lending is related to bank size.

$$\frac{\partial ADJI}{\partial TA} = \beta_3 \times \frac{SBL}{TBL} + \beta_4 \times \frac{1}{(TBL \times TA)} + \theta_3 \times TIME \times \frac{SBL}{TBL} + \theta_4 \times TIME \times \frac{1}{(TBL \times TA)}, \qquad (8)$$

Hypothesis 5: The relationship between bank size and loan spread of business lending remains fixed over time.

This hypothesis is tested to reveal whether the financial changes derived from the deregulation and technological progress influence business-lending performance. If the empirical results cannot reject the hypothesis, the relationship between bank size and loan spread of business lending remains un-

changed whether during the near or distant past. If the hypothesis is rejected, then the relationship changes over time.

$$\frac{\partial^2 ADJI}{\partial TIME \partial TA} = \theta_3 \times \frac{SBL}{TBL} + \theta_4 \times \frac{1}{(TBL \times TA)}. \qquad (9)$$

Hypothesis 6: Bank size and loan spread of business lending are linearly related.

$$\frac{\partial^2 ADJI}{\partial^2 TA} = -\beta_4 \times \frac{1}{TBL \times TA^2} - \theta_4 \times TIME \times \frac{1}{TBL \times TA^2}. \qquad (10)$$

If the empirical results cannot reject the hypothesis, a linear relationship exists between the two. Meanwhile, the relationship is non-linear if the test results reject the null hypothesis.

2.3. Selection and measurement of control variables. *2.3.1. The average balance of business lending.* The average balance of business lending (AVELOAN) is the total balance of business lending divided by the total number of loan contracts. Deyoung, Hunter, and Udell (2004) believed that given an identical amount of lending, small banks undertook a higher unit cost, so AVELOAN may affect the determination of loan interest rate. Besides bank size, management costs decrease with increasing size of loan contract.

2.3.2. Logarithmic Hirschman-Herfindahl index (LNHHI). The HHI index is obtained by squaring the percentage of business lending of an individual bank relative to the total business lending of all banks, then summing the result as in the following equation:

$$HHI = \sum_{i=1}^{N} S_i^2,$$

where S_i denotes the market share in business lending of the ith bank, obtains from the total amount of business lending of the ith bank of that year divided by the total business lending of all banks. Therefore, the HHI index is summed after squaring the market occupation rate of business lending of every bank; then, the LNHHI measurement index is obtained by

logarithm on the Hirschman-Herfindahl index. Larger LNHHI indicates more intense competition in the business lending market and vice versa[1].

According to Carter and McNulty (2005), the deregulation of branch establishment and allowance of cross-state subsidiary bank establishment in areas of high market concentration helped enhance bank performance. Berger and Udell (2002a) considered low interest rates for business lending to depend on market structure intensity of competition, rather than lending commitment scale.

2.3.3. Liquidity asset ratio. Commercial banks have sufficient liquidity reserves to cope with demand liabilities or meet with loan applications. Loan commitments reduce with increasing liquidity asset ratio, also affecting loan spread. Carter and McNulty (2005) showed that loan spread on business lending reduces with increasing bank liquidity asset ratio. Liquidity asset ratio is total liquidity assets divided by total assets.

2.3.4. Dummy variables of listed sample bank or not (LISTDUM). For listed banks, LISTDUM equals 1, otherwise it equals 0. Listed companies have high transparent trading mechanisms than unlisted ones. Given the low information transparency of unlisted banks, the loan application businesses grasp is re-

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[1] Hirschman-Herfindahl index is the indicator to judge industry exclusive extent for the U.S. Department of Justice, if any industry's HHI < 0.1, competition in the industry is good; if HHI > 0.18, the industry's market concentration is high.

duced with relatively weak status when bargaining[1]. Therefore, this investigation expects a negative relationship between the LISTDUM and loan spread.

2.3.5. Dummy variables of a newly established bank or not (NEWDUM). Old banks have valuable credit experience accumulated over the long term, as well as close deposit and loans relationships; while the newly established banks simply participate in the deposit and loan market, making it difficult to correctly evaluate the profits and losses involved in business lending, creating information asymmetry problems. To show the discrepancy in business lending capabilities between old and newly established banks, the empirical model includes NEWDUM to compare the significant differences in loan spread between newly established and old banks.

The dummy variable equals 1 for a newly established bank and 0 otherwise

2.3.6. Dummy variables of financial holding company or not (BHCDUM). The variable equals 1 for banks that are financial holding companies, and otherwise equals 0. According to Keeton (1995), regardless of size, small banks gradually reduced their small business lending similar to a level of large banks as long as they got into the financial holding company system. Accordingly, the empirical model includes this dummy variable, in order to understand the influence of financial and non-financial holding systems on the loan spread.

To briefly summarize the explanatory variables, Table 1 summarizes the predictions and defines the independent variables examined here.

Table 1. Dependent variables, explanatory variables and control variables for sample banks

Variables	Symbol	Definitions	Predictions
Dependent variables			
Risk-adjusted net interest income on business lending (namely the loan spread of business lending)	ADJI	$ADJI = I/TBL$, $I = IRBL - Net\ Charge\ off - AE$, where I refers net interest income of business lending; $IRBL$ means total interest receipts of business lending means interest rate under the loan contracts, multiply by the bank's balance of business lending; *Net Charge off* means non-performing loans of business lending minus returned NPL; *AE* refers to allocated expenses of business lending.	
Explanatory variables			
Total balance of small business lending	SBL	Small loan is loan amount of loan contract less than 30 million NT dollars, while lending balance is the actual loan amount or the balance unpaid off.	Negative
Total balance of business lending	TBL		Positive
Total assets	TA		Positive
Logarithmic logarithm on total assets	LNTA		Positive
Average balance of business lending	AVELOAN	Total balance of business lending is divided by the total number of loan contract items.	Negative
Time indicator	TIME	If the study time is 1991, 1992, ..., 2008, variable value of *TIME* are 0,1,2,..., 17.	
Control variables			
Logarithmic Herfindahl-Hirsclhman index	LNHHI	Natural logarithm on Herfindahl-Hirschman index.	Positive
Ratio of liquidity assets	LNQUID/TA	Liquidity assets are divided by total assets.	Negative
Dummy variable of a listed bank or not	LISTDUM	If a sample bank listed, value equals 1, otherwise 0.	Negative
Dummy variable of a newly established bank or not	NEWDUM	If a sample bank is newly established, value equals 1, otherwise 0.	Positive/ Negative
Dummy variable of a financial holding subsidiary bank or not	BHCDUM	If a sample bank is a financial holding subsidiary bank, value equals 1, otherwise 0.	Negative

Note: This table summarizes definitions of all variables and reports the predictions of explanatory and control variables.

3. Empirical results and analysis

3.1. The statistical results of size, time indicator and bank characteristics. As bank size and time indicator are important variables confirming the impact of business-lending on the loan spread in this investigation, descriptive statistics not only divide banks into large and small categories based on scale, but also identify three empirical periods[2] from 1991

to 1996, from 1997 to 2002, and from 2003 to 2008, respectively, and then perform the t-test to verify whether significant differences exist between the mean of all the variables of large and small banks in each period, as it is listed in Table 2. Regarding the classification criteria of the large and small banks, the total assets of a large bank should exceed NT 300 billion dollars, while those of a small bank should be less than this figure.

According to the empirical findings in Table 2, the differences between the total assets of large and small banks were NT$481 billion and NT$666 billion, respectively from 1991 to 1996 and from 1997 to 2002. Over time namely from 2003 to 2008, the difference between the total assets of large and

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[1] In our sample 18 domestic banks are listed, including the Industrial Bank of Taiwan.
[2] Although Taiwan was less influenced by the Asian financial crisis, it was facing the threat of the "domestic financial crisis" hereafter. Therefore, this study still regarded the Asian financial crisis in 1997 and the beginning of the first and second financial reforms in 2002 as the division time of the financial environmental changes.

small banks increase to 1,034 billion, indicating that banks emerge to grow following the enactment of "Financial Institutions Merger Act" and "Financial Holding Company Act". Regarding the *TBL*/*TA*, large banks initially allocate more to business lending than small banks, a difference that began as insignificant, but gradually become significant; the *SBL*/*TA* exhibits opposite empirical results to the *TBL*/*TA*, indicating that small banks significantly increased small business lending over time.

Table 2. T-tests of differences in means for all sample banks (1991-2008)

Variables	Years 1991-1996 (N = 222)				Years 1997-2002 (N = 288)			
	Small banks	Large banks	Difference (t-statistic)		Small banks	Large banks	Difference (t-statistic)	
TA	8.33×10^{10}	5.64×10^{11}	-4.81×10^{11}	***	1.55×10^{11}	8.21×10^{11}	-6.66×10^{11}	***
	(5.49×10^{10})	(9.27×10^{11})			(6.93×10^{10})	(5.22×10^{11})		
TBL/TA	0.0773	0.0764	0.0009		0.1399	0.1579	-0.018	**
	(0.0939)	(0.0603)			(0.1522)	(0.1325)		
SBL/TA	0.0076	0.0078	-0.0002	*	0.0085	0.0077	0.0008	
	(0.0076)	(0.0041)			(0.0059)	(0.004)		
SBL/TBL	0.1843	0.1136	0.0707	***	0.0887	0.0588	0.0229	**
	(0.2246)	(0.0448)			(0.0949)	(0.0311)		
AVELOAN	6.23×10^{7}	6.63×10^{7}	-0.4×10^{7}		1×10^{8}	1.25×10^{8}	-2.5×10^{7}	**
	(4×10^{7})	(2.43×10^{7})			(6.57×10^{7})	(5.56×10^{7})		
LNHHI	0.0067	0.0479	-0.0412	***	0.0076	0.0434	-0.0358	***
	(0.0065)	(0.0415)			(0.0068)	(0.0319)		
LIQUID/TA	0.2794	0.2962	-0.0168		0.2203	0.2845	-0.0642	***
	(0.1284)	(0.073)			(0.0647)	(0.0613)		
LISTDUM	0.8626	0.8132	0.0494	**	0.7005	0.8218	-0.1213	**
	(0.3443)	(0.3898)			(0.458)	(0.3827)		
NEWDUM	0.5038	0.1648	0.339	***	0.4118	0.1782	0.2336	***
	(0.5)	(0.1648)			(0.4922)	(0.3827)		
BHCDUM	-	-	-		0.0341	0.1756	-0.1415	***
	-	-	-		(0.4459)	(0.3212)		
ADJI	0.0379	0.0596	-0.0217	**	0.0341	0.0389	0.0048	***
	(0.0955)	(0.0094)			(0.0276)	(0.018)		

Variables	Years 2003-2008 (N = 264)				Years 1991-2008 (N = 774)			
	Small banks	Large banks	Difference (t-statistic)		Small banks	Large banks	Difference (t-statistic)	
TA	2.06×10^{11}	12.4×10^{12}	-1.03×10^{12}	***	1.53×10^{11}	8.87×10^{11}	-7.34×10^{11}	***
	(1.11×10^{11})	(6.54×10^{11})			(9.53×10^{10})	(7.65×10^{11})		
TBL/TA	0.1251	0.1868	-0.0617	***	0.1178	0.1429	-0.0251	***
	(0.1758)	(0.2211)			(0.15)	(0.1622)		
SBL/TA	0.0075	0.0054	0.0021	**	0.0079	0.0069	0.001	**
	(0.006)	(0.0034)			(0.0065)	(0.004)		
SBL/TBL	0.0824	0.0418	0.0406	***	0.1127	0.0698	0.0429	***
	(0.0656)	(0.0329)			(0.1438)	(0.047259)		
AVELOAN	1×10^{8}	2.3×10^{8}	-1.3×10^{8}	***	0.899×10^{8}	1.44×10^{8}	-5.41×10^{7}	***
	(4.52×10^{7})	(1.66×10^{8})			(5.57×10^{7})	(1.24×10^{8})		
LNHHI	0.0052	0.0502	-0.045	***	0.0065	0.0472	-0.0407	***
	(0.0053)	(0.0489)			(0.0063)	(0.0415)		
LIQUID/TA	0.2365	0.2729	-0.0364		0.2419	0.2841	-0.0422	***
	(0.0702)	(0.0999)			(0.0915)	(0.0806)		
LISTDUM	0.6211	0.7767	-0.1556	*	0.7182	0.8034	-0.0861	*
	(0.4851)	(0.4165)			(0.4499)	(0.3974)		
NEWDUM	0.354	0.1748	0.1792	***	0.4175	0.1729	0.2446	***
	(0.4782)	(0.3798)			(0.4932)	(0.3781)		
BHCDUM	0.2745	0.6891	-0.4246		0.0883	0.4612	-0.3729	***
	(0.4712)	(0.5091)			(0.2886)	(0.5234)		
ADJI	0.0049	0.0121	-0.0072	**	0.0253	0.0359	-0.0106	**
	(0.033)	(0.009)			(0.0581)	(0.0232)		

Notes: This table reports the t-tests for differences in means of selected variables. Refer to Table 1 for the construction and definition of the variables. Descriptive statistics divides banks into large and small categories by 3,000 hundred million. The whole period separates 3 empirical periods from 1991 to 1996, from 1997 to 2002, and from 2003 to 2008. Standard errors are in parentheses. *, ** and *** denote significances at 10%, 5%, and 1% levels, respectively.

As for the *SBL/TBL*, regardless of period or bank size, the mean differences between every ratio are significantly positive, indicating that small banks paid more attention to small businesses as lending targets than large banks, consistent with the empirical results of Berger and Udell (1995), which showed that the phenomenon of small banks being more actively committed to small business lending than large banks also existed in Taiwan.

As for *AVELOAN*, large banks are less committed to small business lending than small banks and average business lending is higher for large banks than small banks. *LNHHI* in all periods are significantly negative, indicating that small banks have lower concentration of business lending than large banks. Regarding *LIQUID/TA*, shows that the mean differences between the large and small banks during the period of 1997-2002 and all other sample periods are significantly negative, indicating liquidity risk is higher for small banks because of they have lower liquid assets than large banks[1]. On the other hand, the mean differences of the *ADJI* of the large and small banks in every period are significantly negative, indicating that small banks underperform large banks in terms of average loan spread.

After 1991 the newly established banks were smaller and thus were classified as small banks. The *NEWDUM* is considerably positive regardless of period, fully reflecting that the bank size of newly established banks are still small than old ones after 18-year-management. Furthermore, *BHCDUM* demonstrates that the most large banks are subsidiaries of financial holding companies; the mean difference between the two types is significantly negative. However, compared with *LISTDUM*, this study cannot identify the differences between listed ratios of the large and small banks based on the test results during every period.

3.2. The regressive relationship between loan spread of business lending, bank characteristics and time indicator. To understand the establishment of government-owned banks in 1991, the enactment of the Financial Holding Company Act in 2001 and the impact of listed companies, besides normal control variables, the empirical model in Table 3 also includes the three dummy variables of *LISTDUM*, *NEWDUM* and *BHCDUM*. The empirical results reveal that *LIQUID/TA* is significantly

negative, and the *LNHHI* is significantly positive, consistent with the expected direction. Regarding *NEWDUM*, they are significantly positive below the 10% significance level, indicating that the business-lending performance of the newly established banks in 1991 significantly exceeded that of other banks. Additionally, the random effects obtain similar results to the OLS method.

Table 3. Estimates of the relationship between loan spread and sample banks (1991-2008)

Variables	Model 1		Model 2	
	Pooled OLS		Random effects	
Constant	0.0802		0.0643	
	(0.0087)	***	(0.0135)	***
SBL/TBL	0.0876		0.1250	
	(0.0244)	***	(0.0251)	***
INTERACTION	1.2726×10^{-13}		1.4900×10^{-13}	
	(7.3800×10^{-14})	*	(6.9700×10^{-14})	**
LNTA/TBL	-97614		-100869	
	(28651)	***	(27771.7)	***
TIME	-0.0028		-0.00195	
	(0.0006)	***	(0.000971)	**
TIME×SBL/TBL	-0.0006		-0.00435	
	(0.0044)	***	(0.00435)	
TIME×INTERACTION	-5.1279×10^{-15}		-1.08×10^{-14}	
	(1.07×10^{-4})		(1.09×10^{-14})	
TIME×LNTA/TBL	9388.43		1797.365	
	(9629.6)		(9655.8)	
AVELOAN	2.0033×10^{-11}		1.31×10^{-11}	
	(2.96×10^{-11})		(2.49×10^{-11})	
LNHHI	0.0042		0.004	
	(0.0016)	***	(0.00155)	***
LIQUID/TA	-0.0576		-0.0238	
	(0.0196)	***	(0.0202)	
LISTDUM	-0.0048		-0.00673	
	(0.0041)		(0.0043)	
NEWDUM	0.0074		0.0065	
	(0.0041)	*	(0.0039)	*
BHCDUM	-0.0053		-0.0006	
	(0.00514)		(0.00508)	
Observations	774		774	
White heteroscedasticity test	434.2	***	-	
Joint test	2783.39	***	-	
Durbin-Watson (DW)	1.978		-	
Hausman test	-		8.52	

Notes: This table presents pooled OLS and random effects estimates of the relationship between loan spread and bank characteristics. Refer to Table 1 for the construction and definition of the variables. The standard errors are reported in parentheses beneath the parameter estimates (robust standard errors are reported for the OLS model. *, ** and *** denote significances at 10%, 5%, and 1% levels respectively.

3.3. The test of the six hypotheses. The results of H_1: $\partial ADJI/\partial (SBL/TBL)$ in Table 4 are positive in each column, and reach the 1% significance level, indicating higher loan spread for small business

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[1] To prevent this classification from the effect of extreme value and then distorting empirical results, this article not only regards the total assets of 300 billion NT dollars as the criteria to distinguish the size of banks, but also classifies the banks with asset of the top one third as large banks, and the bottom one third as small banks to conduct t-test of the means. The empirical results show that except for the dummy variable of a newly established bank (*LISTDUM*) becomes insignificant (almost the back one third of the small banks are not newly established banks), others were roughly the same as in Table 1.

lending compared to large ones. If total business lending remains unchanged, each unit increase of small business lending, increase the loan spread. The increase in small business lending ratio helps improve the loan spread, consistent with the findings of Carter, McNulty, and Verbrugge (2004). Therefore, for both government-owned and privatized banks, the loan spread increases with small business lending ratio.

The results of H_2: ∂ ADJI/∂ (SBL/TBL) ∂ TIME listed in Table 4 are negative in each column, and reach the 1% significance level, indicating that the relationship between the small business lending ratio and the loan spread changed over time. This phenomenon means that compared to the early business lending market, banks are now increasing small business lending ratio, and the loan spread is not increased. That is, recently banks have not increased their earnings by being involved in small business lending, inconsistent with the findings of Carter, McNulty, and Verbrugge (2004). This phenomenon may occur because the Taiwanese banking sector is facing an increasingly challenging environment, characterized by reduced spreads, excessive market competition, credit card debt storm and changeable regulations and financial policies no longer providing bankers with a stable market structure, but impacting both large and small loans. Shen (2002) also considered that during the past decade, the profitability of privatized and government-owned banks has declined. Banks have continually reduced spreads for business competition, resulting in low profits from small business lending.

The results for $H_3: \partial ADJI / \partial TIME$ are below 0 and reach the 1% significance level, indicating the spread of business lending decreases during the empirical period, consistent with the results from Carter and McNulty (2005), fully reflecting that changes in market conditions increased the competitive pressure on commercial banks, reducing loan spreads. These results are consistent with the results of H_1 and H_2, since the statistical values listed in Table 2 indicate that the maximum ratio of small business lending to total lending does not exceed 20% regardless of bank size, and decrease over time. Thus, while small business lending could produce a higher loan spread, the proportion of such loans is comparably low and reduces over time, and decreases overall loan spreads.

The results for $H_4: \partial ADJI / \partial TA$ could be used to detect whether the domestic banking industry characterized by small bank advantages, empirical results demonstrate inconsistencies in the relationship between bank size and loan spread. The first two models, except for the OLS in the second model, which is significantly positive, are not significant;

the sample in the third model excluded the government-owned banks, and the hypothesis test results are significantly positive, inconsistent with the evidence from Carter, McNulty, and Verbrugge (2004), and Carter and McNulty (2005). This study fails to find a significant negative relationship between bank size and loan spread. This result suggests that loan spread increased with bank size, inconsistent with the literature suggesting that small banks enjoy an advantage in this area. However, the partial differential results are consistent with the descriptive statistical observations listed in Table 2. Domestic financial holding companies have existed for 7 years, and over-banking remains a problem, contributing to persisting large banks, reducing the survival space available to small banks, and causing damage through irrational credit competition.

The results for $H_5: \partial^2 ADJI / \partial TA \partial TIME$, except for the OLS in the Model 2 Table 4, the test results of H_5 are negative and reached 1% significance, consistent with other test results. The results of hypothesis H_5 indicate whether the large banks would improve their lending performance over time. A significant positive test value indicates that large banks are gradually improving the loan spread. However, this investigation presents a significantly negative test value, indicating business lending spread is decreasing each year, differing from the positive but insignificant results obtained by Carter and McNulty (2005). The reasons for this phenomenon may be the large loans undertaken by large banks, usually large companies, which use direct financing to meet their part of demand, create by the gradual opening up and progress of financial markets, increasing their bargaining power. On the other hand, with the constantly growing numbers of commercial banks, the competition for large loans derive loan spread reduced to be smaller than that for small business lending. Facing this change, large banks that continued to increase their non-small business lending ratio would suffer gradually decreasing business-lending performance.

The results of $H_6: \partial^2 ADJI / \partial TA^2$ are positive but insignificant, indicating a possible linear relationship between the bank size and the loan spread, differing from the original point curve in Carter and McNulty (2005). Thus, regardless of original bank size, given expansion of asset, the loan spread is slightly increased, but the increase rate is insignificant. Taking into account robustness, the ascending and insignificant results reminds banks not to insist on asset expansion or mergers, considering the indirect costs of credit, this ascending trend might no longer exist, and may even reverse, meaning banks should consider more carefully in future.

Table 4. Tests of six hypotheses

Hypotheses	Model 1				Model 2				Model 3			
	OLS		RANDOM		OLS		RANDOM		OLS		RANDOM	
H_1: $\dfrac{\partial ADJI}{\partial (SBL/TBL)}$	0.0013	***	0.0922	***	0.1147	***	0.1024	***	0.1186	***	0.1187	***
H_2: $\dfrac{\partial ADJI}{\partial (SBL/TBL)\partial TIME}$	-0.0025		-0.0089	***	-0.0028	***	-0.0090	***	-0.0240	***	-0.0221	***
H_3: $\dfrac{\partial ADJI}{\partial TIME}$	-2.99×10^{-3}	***	-2.60×10^{-3}	***	-0.0028	***	-0.0026	***	-0.0036	***	-0.0030	***
H_4: $\dfrac{\partial ADJI}{\partial TA}$	9.99×10^{-16}		-8.85×10^{-16}		4.87×10^{-15}	*	2.09×10^{-15}		5.71×10^{-14}	***	4.16×10^{-14}	***
H_5: $\dfrac{\partial^2 ADJI}{\partial TIME\, \partial TA}$	-5.52×10^{-16}	***	-1.35×10^{-15}	***	-7.89×10^{-20}		-9.46×10^{-16}	***	-7.89×10^{-15}	***	-6.36×10^{-15}	***
H_6: $\dfrac{\partial^2 ADJI}{\partial TA}$	7.46×10^{-25}		9.10×10^{-25}		7.42×10^{-25}		9.09×10^{-25}		5.53×10^{-15}		8.43×10^{-25}	

Notes: The sample in the Model 1 and Model 2 contains all of the domestic banks, the only differences are that the former does not include the explanatory variables such as *LISTDUM*, *BHCDUM* and *NEWDUM*; the sample in the Model 3 does not include government-owned banks, are classified with the criteria of over 50% of government ownership. *, ** and *** denote significances at 10%, 5%, and 1% levels, respectively.

Conclusion and policy implications

The study sample comprises 52 domestic banks, including listed and government-owned banks. The study period runs from 1991 to 2008, and covers 18 years. Numerous studies assume that small banks enjoy a comparative advantage in small business lending or SME business. This study adopts research methods from past studies to observe whether this phenomenon exists in the Taiwanese banking industry, and considers bank size, loan scale, interaction effect with time indicator, and includes control variables in the model that reflecting the status of Taiwan. The conclusion and policy implications are summarized as follows.

First, the average loan spread is lower for small bank business lending than large bank. Bank spread reduces with increasing loan scale. Excluding government-owned banks gets similar results, and indicates similar behavior in government-owned and privatized banks. Second, competition decreases with increasing concentration of the lending market that is in line with expectations; the dummy variable for newly established banks is significant but fails to meet expectations, but in the long term, the loan performance of new privatized banks improved.

Third, higher loan spread in small business lending regardless of bank size, but this phenomenon is not apparent in the earlier business lending, If current banks increase their proportion of small business lending, the increase in loan spread remains unchanged, meaning the loan spread is previously higher than it currently is. Additionally, different from the literature of Carter and McNulty (2005), this study fails to find any small bank advantage in the banking industry, but did identify a significant positive relationship between size and loan spread. Moreover, this study finds that loan spread increased with bank size, indicating that over-banking still exists and the problem of excessively small size of financial institutions remains incompletely resolved, with large banks having gradually improves their business-lending performance over time, slowly increasing the spread of business lending.

The further research of this paper is extended to include test on the impact of ownership structure differences in business-lending performance during financial reform. As for permitting data, it is hoped that more accurate measures of business-lending performance might yield greater insight into its impacts on performance and ownership structure.

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