

Lending Terms and Bank Capital

Kachkach Islam

N & K Co., Ltd

E-mail: islem8@gmail.com

ABSTRACT

Using a matched bank-firm dataset, I examine how bank capital position influences the lending terms that an SME receives. I find that banks experiencing falls in regulatory capital levels write tighter contracts in their loans to SMEs. When I separately analyze price and non-price terms, this effect of bank capital is found only in non-price terms of the loan contract.

Key words: Bank lending, Bank capital, Loan contact terms, SME financing.

JEL Classification: G20, G30

1. Introduction

Bank loans are a vital source of external financing for SMEs. The terms of loans set by banks have substantial implications on the financial wellbeing and decisions of small firms. For the most part, literature on loan contracting posits that borrower/project characteristics primarily determine the degree of strictness of loan contract terms (see Goss & Roberts, 2011; Graham et al., 2008; Strahan, 1999 among others).

However, loan contracting is an equilibrium outcome, and not only demand-side factors but also supply-side factors affect loan terms. So far, existing evidence on lenders' factors has documented the transmission of various shocks affecting banks to credit availability (for example, Peek & Rosengren, 1997; Pravisini, 2008), covenant tightening (Murfin, 2012) and loan growth (Gambacorta & Mitsruli, 2004). Essentially, irrespective of what triggers these shocks to banks, e.g., a default experience (Murfin, 2012), regulatory requirements (e.g. Bolton & Freixas, 2006; Van den Heuvel, 2002; Diamond & Rajan, 2000; Thakor, 1996) or a contractionary monetary policy (e.g. Krishan & Opiela, 2000), the existing studies document that these shocks are transmitted through the bank capital position then to lending behavior, the mechanism that we can call the *capital channel*¹.

Bank capital as a supply side factor in lending has increasingly garnered attention of researchers and regulators with its association with capital regulation, and the examination of bank capital effects on the likelihood and volume of lending has recently intensified. The existing evidence extensively demonstrate that, holding all else constant, with increasingly stringent regulations on banking activities, falls in bank capital levels are associated with a conservative lending attitude (reduced lending and risk-taking) that can potentially lead to a credit crunch (for a survey of these works see Jakovljevic et al., 2016). The curtailment of lending and/or the mitigation of risks associated with granting loans, particularly to a riskier class of borrowers like SMEs, helps banks in meeting binding capital adequacy levels by reducing the denominator (risk-weighted assets) of their regulatory capital ratios, as raising capital by issuing new equity is a costly alternative, due to market imperfections, especially for a financially constrained bank (Cornett & Tehranian, 1994; Stein, 1998).

However, in order to tighten loan supply and/or mitigate risk exposure from granting loans, banks have a variety of means other than straightforwardly rejecting loan applications². Other means to curb lending and reduce risk exposure that I focus on in this paper are banks' imposition of stricter terms, such as charging a higher interest rate (Fase, 1995), or at least augmenting loan security by requiring additional collateral to be pledged, for example³. To the best of my knowledge, existing work has not yet scrutinized the question of whether, *ceteris paribus*, the terms of lending set by banks are influenced by their regulatory capital position.

This work aims to answer this question by analyzing the effect of bank capital adequacy on the imposition of tighter terms in loan contracts by banks. For that purpose, I use a matched dataset on SMEs and banks in Japan obtained from a corporate survey and Banks' financial statements. The corporate survey dataset contains information on the terms of loans for the SMEs' most recent loan applications. The richness of the data enables me to control for bank and borrower characteristics as well as the strength and breadth of lending relationship, and to conduct separate analyses of the effect of bank capital on price (interest rate) and non-price terms (e.g. maturity and collateral) of loans. Specifically, I investigate whether, holding borrower characteristics constant, the level of regulatory capital of a bank, and changes in this level have an influence on the imposition of tighter terms in loan contracts.

The empirical findings indicate that, *ceteris paribus*, variations in banks' regulatory capital levels are inversely associated with the number and the presence of tight conditions imposed in loan contracts. This result is robust to numerous controls and specifications. Specifically, using different regression models or including lags to the capital position of the bank and proxies for bank-firm relationship yields similar results. Furthermore, if I separate price and non-price terms, I find that the presence of tighter non-price contact terms is significantly associated with bank regulatory capital level and changes in that level, while that of price terms is not. Thus, the findings support the hypothesis that making lending terms stricter is the mean through which banks with weakening capital position tighten loan supply and reduce credit risk. The findings also suggest that such banks particularly use non-price terms to tighten loan supply and/or mitigate risk exposure when their regulatory capital position deteriorates.

By proposing lending terms as a link that connects bank capital position with the reduction of volumes and riskiness of loans (capital channel), and providing empirical evidence to support this proposition, this work contributes to the literature on loan contracting, and the literature on regulatory bank capital. The capital channel literature strongly suggest that the bank capital position matters for bank lending volume (e.g., Gambacorta & Mitsruli, 2004; Peek & Rosengren, 1997), and level of risk taking (e.g. Flannery, 1989; Shimizu, 2015), yet, this line of inquiry has not identified the role that lending terms can play as a mechanism for banks with weak capital position to reduce loan supply and/or credit risk. This work fills this gap and provides further insights on the reliance of banks experiencing falls in regulatory capital on particularly imposing non-price terms in their loan contracts.

The only paper that I am aware of to investigate the effect of bank capital on contracting strictness is Murfin (2012). However, there are many differences between Murfin (2012) and this work. Firstly, Murfin (2012) uses the book capital ratio to capture the balance sheet effects of lender defaults, while this work uses capital adequacy ratio, a measure that accounts for capital

regulatory requirements. Secondly, the measure of contracting strictness in Murfin (2012) is the tightness of financial covenants; instead, it is the number of tight price and non-price terms in this work. Thirdly, the sample study of Murfin (2012) includes public firms only, whereas this work focuses on a class of firms (SMEs) that is very dependent on banks and has limited outside options. Ultimately, this work and Murfin (2012) answer different questions, Murfin (2012) investigates whether the book capital position of a bank affects the bank's desire to obtain control rights by means of tight financial covenants, whereas this work inspects whether the regulatory capital position of a bank affects the bank's loan supply and desire to mitigate risk exposure by means of tighter lending terms.

The remainder of this paper is organized as follows. Section 2 presents the data and the empirical approach. Section 3 reports the results and Section 4 concludes the paper.

2. Data and empirical approach

2.1. Data

I use data obtained from two sources. The first is firm level data obtained from a Survey of Corporate Finance conducted in 2014 to assess the corporate financial environment of SMEs in Japan by a team of scholars. These data contain, among other responses, information on the attributes, banking relationship and borrowing terms of 2,617 SMEs⁴.

The second is banks' financial data from Fiscal Year 2010 to Fiscal Year 2013 (Henceforth FY 2010, FY 2013 ... etc.) obtained from Nikkei Financial Quest database⁵. These data include the bank size and regulatory capital ratio (using BIS and domestic standards). I merged the two datasets based on the name of the main bank reported by the firm in the survey. I obtain 1162 bank-firm matched observations with 235 bank names.

For regulatory capital, I rely on the domestic standard because out of the 235 hand-matched banks, only 15 report their regulatory capital ratio using the BIS standards. Additionally, I account for bank mergers and capital injections and obtain the information on bank mergers in the last three fiscal years prior to the survey from the Financial Services Agency website, and the information on banks that received capital injections from the Deposit Insurance Corporation of Japan between FY 2010 to FY 2013 from the Deposit Insurance Corporation of Japan's website.

For loan contract terms, the surveyed firms were asked whether in the most recent loan application there were no changes to existing lending terms before approval or one or multiple tighter terms of the following were imposed by the lender: higher interest rate; lower loan amount; shorter term; additional collateral; or conditions other than these mentioned. From the supply side perspective, the information obtained from this question, is whether the lending bank shifted from the preexisting loan contracting equilibrium toward stricter lending terms. In other

words, the focus here is on the intensive margin of lending, and my analysis does not discuss the extensive margin of lending.

The provided answers regarding loan contract terms leave one term unspecified, that is, “conditions other than these mentioned”. Since these loans are for small and medium firms, the range of type of terms that a bank can tighten in loan contracts is somewhat limited. While the following cannot be said with absolute certainty, but the conditions that are already specified (higher interest rate; lower loan amount; shorter term; additional collateral) leave room for one particularly common condition used by financial institutions in Japan, that is, personal guarantees. The common use of personal guarantees by financial institutions in Japan is discussed by numerous works (e.g. Ono & Uesugi 2009, Ono et al., 2011; Ono et al.; 2021). Ultimately, it is not controversial to consider that the conditions, which were not specified in the survey I use, are for the most part personal guarantees. In my analysis, I will assume that the unspecified term in survey responses is mostly personal guarantees but allow for the fact that it might not be the case for all responses.

Finally, the information collected from the surveyed firms’ answers regarding the most recent loan terms helps with alleviating confounding demand from supply effects that generally contracting behavior studies are prone to, however, not knowing the exact timing of loan applications and negotiations results poses a concern. Considering that the surveyed SMEs responded to the questionnaire during September/October 2014, I expect that at least the capital position of the bank in the last two prior financial years (end of 2013 FY and/or 2012 FY) should have an impact on the imposed terms reported in the survey⁶. Regression results confirm this conjecture even after including capitalization of the bank at the end of FY 2011 and a battery of robustness checks.

2.2. Empirical approach and variables

Considering the count nature of the outcome variable, that is the number of tighter terms imposed in recent loan application, I use a Poisson regression to estimate the capital effect of the bank on the count of number of tighter terms imposed by the bank in a loan contract.

$$\text{Log}(\text{Nb of terms}_{ij}) = b_0 + b_1 * \text{Regcap}_j + b_2 * \text{Controls}_i + b_3 * \text{Controls}_j + \varepsilon_{ij} \quad (1)$$

$$\text{Log}(\text{Nb of terms}_{ij}) = b_0 + b_1 * \Delta \text{Regcap}_j + b_2 * \text{Controls}_i + b_3 * \text{Controls}_j + \varepsilon_{ij} \quad (2)$$

where ij is an indicator for each bank-firm observation, with i as the indicator of firms ($i = 1, \dots, N$), and j is the indicator of banks ($j = 1, \dots, M$).

The dependent variable in both equations (1) and (2), *Nb of terms_{ij}*, is the number of tighter terms imposed by the bank following a loan application from a borrowing SME. The tighter terms imposed are either one or multiple of the following: higher interest rate; lower loan amount; shorter term; additional collateral; or conditions other than those, which I assume to be personal guarantees.

The main explanatory variables are *Regcap* in equation (1) which stands for the level of regulatory capital ratios held by the bank (FY 2011–FY 2013); and *ΔRegcap* in equation (2), which represents the change in the regulatory capital ratios from each two consecutive fiscal years. The level of regulatory capital reflects the level of commitment of the bank to the regulatory requirement at the beginning of the fiscal year, and changes in the level of the regulatory capital proxy for deterioration or improvement in the level of that commitment from one fiscal year to the next.

If lending terms are tightened as a mean to reduce loan supply and/or mitigate risk by banks due to regulatory capital considerations, then I expect a negative sign for the coefficient of regulatory capital ratio *Regcap* and the coefficient of changes in that ratio *ΔRegcap*.

2.2.1. Variable definitions

The dependent variable in this study is the sum of number of tighter terms that an SME received in the most recent loan application prior to the survey. The respondent SMEs describe whether they had one or multiple of the following conditions imposed in their most recent loan contract: higher interest rate, reduced loan amount, shorter maturity, additional collateral and/or personal guarantees (assumed), or the loan was approved without any changes to existing lending conditions by the lending financial institution. The advantage of having detailed information on the shift in strictness of lending terms of each financial institution allows for analyzing the potential capital effects on changes in contracting strictness across banks as well as within each bank.

The main explanatory variables are the regulatory capital ratio of the bank and variations in this ratio from one fiscal year to the next. The use of regulatory capital accounts for binding regulatory requirements that the bank has to meet, and existing works document its influence on lending behavior of banks (for example Bolton & Freixas, 2006; and Gambacorta & Mistrulli, 2004; Thakor, 1996). Due to the concern regarding the timing of loan contracts (as explained in section 2.1), I include regulatory capital ratios of the last three fiscal years preceding the survey date (September 2014) and generate variables that capture the changes in the regulatory capital ratios as of the end of those three fiscal years (FY2011, FY2012 and FY 2013).

As for the control variables, I include dummies that account for age, size, profitability, type of industry and location of the borrowing SME. I use responses obtained from the survey on SMEs

age category, number of employees and recent net income of the last two settlement periods to proxy for firm age, size and profitability. The imposition of tighter loan terms by banks is likely to vary between SMEs that are older, larger and profitable vs younger, smaller and those that are unable to make profit, however, admittedly these are imperfect controls, and having the financial statements of the surveyed firms would have allowed me to construct additional controls that account for factors proposed by studies on the determinants of debt maturity choice (e.g. Diamond, 1991; Myers, 1977) and collateral pledge (Steijvers & Voordeckers, 2009), for example. Furthermore, I also account for potential effects of regional differences in the bank loan market by controlling for the location of the borrowing SME. That is because the degree of competition between banks operating in urban versus rural areas could have an impact on the lending terms of these banks. For instance, Kano and Tsutsui (2003) find that rural areas in Japan lack bank competition and are characterized by unfavorably high loan interest rates.

Whereas for the main bank characteristics, I account for the size and type of the bank, the use of BIS standards, and whether the bank engaged in merger activities and/or received capital injections in the last three fiscal years. With regard to controlling for capital injections, it is worth noting that from December 2012, the banking environment in Japan has witnessed an aggressive monetary easing policy that was pursued to improve economic outlook, stimulate bank lending and overcome deflation. Such policy could have an effect on lending terms that controlling for capital injections might not sufficiently absorb. While the monetary easing continued beyond FY2012, given the data limitation, it was not possible to assess how the initial response to that policy could have influenced loan terms in this study.

Furthermore, I use the length of banking relationship and number of lenders to account for the acquired soft information that the main bank possesses on the borrowing SME. For a detailed account of the variables used in this study, Table 1 presents the variables included in the empirical analysis and their definitions.

2.2.2. Summary statistics

Table 2 contains the summary statistics for the variables. The mean number of terms imposed is 0.16 and the variance is 0.22, suggesting that the outcome variable is modestly over-dispersed, as the mean and variance are close, thus satisfying an important requirement for using Poisson regression⁷.

More precisely, about 72% of the firms in the sample report no tighter term imposed in their most recent loan application, 22% report one tighter term imposed, and only about 4.5% report two tighter terms imposed; leaving approximately 1% reporting having three tighter terms imposed and only 0.5% reporting more than three tighter terms imposed.

Almost half of the SMEs in the sample employ 21 to 100 employees, and about 6% have more

Table 1. Variable definitions

Variable	Definition
Loan Contract Terms	
Nb of terms imposed	Number of terms imposed by the bank in the loan contract
Price-term	Price-term imposed by the bank in the loan contract
Non-Price terms	Non-Price term(s) imposed by the bank in the loan contract
Bank-Firm relationship	
Relationship length	The number of years since the start of lending relationship with the main bank
Exclusivity	Having one exclusive relationship with the main bank
Firm Characteristics	
Profit/Profit	Firm had a positive net income in the last two settlement periods
Loss/Profit	Firm had a negative followed by positive net income in the last two settlement periods
Profit/Loss	Firm had a positive followed by negative net income in the last two settlement periods
Loss/Loss	Firm had a negative net income in the last two settlement periods
Nb of employees 1–5	Firm has less than 6 employees
Nb of employees 6–20	Firm has between 6 to 20 employees
Nb of employees 21–50	Firm has between 21 to 50 employees
Nb of employees 51–100	Firm has between 51 to 100 employees
Nb of employees 101–300	Firm has between 101 to 300 employees
Nb of employees 301+	Firm has more than 300 employees
Aged 5 or less	Firm is 5 years old or less
Aged between 6–10	Firm is between 6–10 years old
Aged between 11–20	Firm is between 11–20 years old
Aged between 21–30	Firm is between 21–30 years old
Aged 30 or more	Firm is more than 30 years old
Construction	Firm is in the Construction Industry
Manufacturing	Firm is in the Manufacturing Industry
Wholesale	Firm is in the Wholesale Industry
Real estate	Firm is in the Real Estate Industry
Retail	Firm is in the Retail Industry
Transportation/Communications	Firm is in the Transportation/Communications Industry
Services	Firm is in the Services Industry
Restaurant	Firm is in the Restaurant Industry
Bank characteristics	
Regcap 2011	Bank regulatory capital ratio at 2011/03
Regcap 2012	Bank regulatory capital ratio at 2012/03
Regcap 2013	Bank regulatory capital ratio at 2013/03
Regcap 2014	Bank regulatory capital ratio at 2014/03
Δ Regcap11/12	Change in Bank regulatory capital ratio from 2011/03 to 2012/03
Δ Regcap12/13	Change in Bank regulatory capital ratio from 2012/03 to 2013/03
Δ Regcap13/14	Change in Bank regulatory capital ratio from 2013/03 to 2014/03
City Bank	The main bank is a City Bank
Regional Bank	The main bank is a Regional Bank
Second-tier Regional Bank	The main bank is a Second-tier Regional Bank
Shinkin Bank	The main bank is a Shinkin Bank
Bank Total assests 2012	Total assets of the bank in 2012/03
Bank Total assests 2013	Total assets of the bank in 2013/03
Bank Total assests 2014	Total assets of the bank in 2014/03
BIS Standard	Banks reporting regulatory capital ratio using BIS standards
Merged	Banks that took part in a merger during the last three fiscal years prior to survey
Capital injection	Banks that benefited from a capital injection from FY 2010 to FY 2013

This table explains the definitions of the variables I use in the regression analysis.

Table 2. Summary statistics

Variable	Unit	Obs	Mean	Std. Dev.	Min	Max
Loan Contract Terms						
Nb of terms imposed	Count	1,162	0.160	0.470	0	4
Price-term	Dummy	1,162	0.069	0.253	0	1
Non-Price terms	Dummy	1,162	0.109	0.312	0	1
Bank-Firm relationship						
Relationship length	Years	819	22.673	16.819	0	85
Exclusivity	Dummy	1,149	0.703	0.457	0	1
Firm Characteristics						
Profit/Profit	Dummy	1,162	0.611	0.488	0	1
Loss/Profit	Dummy	1,162	0.174	0.379	0	1
Profit/Loss	Dummy	1,162	0.095	0.293	0	1
Loss/Loss	Dummy	1,162	0.111	0.314	0	1
Nb of employees 1–5	Dummy	1,162	0.038	0.191	0	1
Nb of employees 6–20	Dummy	1,162	0.398	0.490	0	1
Nb of employees 21–50	Dummy	1,162	0.339	0.474	0	1
Nb of employees 51–100	Dummy	1,162	0.162	0.368	0	1
Nb of employees 101–300	Dummy	1,162	0.054	0.227	0	1
Nb of employees 301+	Dummy	1,162	0.005	0.072	0	1
Aged 5 or less	Dummy	1,162	0.011	0.105	0	1
Aged between 6–10	Dummy	1,162	0.050	0.218	0	1
Aged between 11–20	Dummy	1,162	0.108	0.311	0	1
Aged between 21–30	Dummy	1,162	0.145	0.353	0	1
Aged 30 or more	Dummy	1,162	0.683	0.465	0	1
Construction	Dummy	1,162	0.258	0.438	0	1
Manufacturing	Dummy	1,162	0.238	0.426	0	1
Wholesale	Dummy	1,162	0.100	0.300	0	1
Real estate	Dummy	1,162	0.018	0.133	0	1
Retail	Dummy	1,162	0.068	0.252	0	1
Transportation/Communications	Dummy	1,162	0.083	0.275	0	1
Services	Dummy	1,162	0.152	0.359	0	1
Restaurant	Dummy	1,162	0.014	0.117	0	1
Bank characteristics						
Regcap 2011	Ratio	1,162	12.033	3.783	5.69	67.76
Regcap 2012	Ratio	1,162	12.184	3.783	5.68	66.73
Regcap 2013	Ratio	1,162	12.290	3.862	5.81	68.58
Regcap 2014	Ratio	1,107	11.920	3.868	5.79	66.09
Δ Regcap11/12	Ratio	1,162	0.151	0.665	-3.47	5
Δ Regcap12/13	Ratio	1,162	0.106	0.512	-2.19	2.61
Δ Regcap13/14	Ratio	1,107	-0.213	0.824	-6.26	2.47
City Bank	Dummy	1,162	0.100	0.300	0	1
Regional Bank	Dummy	1,162	0.418	0.493	0	1
Second-tier Regional Bank	Dummy	1,162	0.155	0.362	0	1
Shinkin Bank	Dummy	1,162	0.327	0.469	0	1
Bank Total assests 2012	Million Yen	1,162	7,454,316	16,200,000	52,417	76,000,000
Bank Total assests 2013	Million Yen	1,162	7,612,860	16,500,000	53,272	77,600,000
Bank Total assests 2014	Million Yen	1,162	11,100,000	31,100,000	54,799	148,000,000
BIS Standard	Dummy	1,162	0.058	0.233	0	1
Merged	Dummy	1,162	0.061	0.240	0	1
Capital injection	Dummy	1,162	0.034	0.180	0	1

This table presents the mean, the standard deviation, the minimum, and the maximum of the main variables I use in the baseline regression.

than 100 employees, the remaining 44% have less than 21 employees. As for the age, the sample is skewed toward older SMEs, with approximately 68% of SMEs being 30 years older or more, and SMEs that are 10 years old or younger represent only about 6% of the sample. In terms of profit, roughly, 78% of SMEs in the sample had at least a positive net income in one of the last two settlement periods and 61% had a positive net income in the last two settlement periods, whereas 11% of SMEs in the sample were not generating profit for the last two settlement periods.

Turning to bank variables, most main banks reported in Table 2 are either regional banks or shinkin banks. Regulatory capital ratios on average increased from the end of FY2010 to the end of FY2012, but sharply decreased by the end of FY2013. The average regulatory capital in the sample is about three times the required regulatory percentage of 4% according to the domestic standard. The average of changes in regulatory capital ratio in the sample is positive at the end of FY2011 and FY2012, and negative at the end of FY2013, but overall, it was on a decreasing trend from the end of FY2011.

3. Results

3.1. Baseline results

The results of the Poisson regression using bank regulatory capital ratio levels are summarized in Table 3, and Table 4 presents the results of the Poisson regression using changes in bank regulatory capital ratio. In both tables, the dependent variable is the number of tighter terms imposed in a loan contract. The first column contains the variable names; and regression specifications are shown in the numbered columns of each table.

The results presented in Table 3 show that none of the coefficients for regulatory capital ratio is significant, and suggest that a bank's level of regulatory capital does not have an influence over the number of tighter terms it imposes in loan contracts. Unlike the levels of regulatory capital, however, changes in regulatory capital levels significantly influence the strictness of terms imposed in loan contracts (Table 4). Only the change in capital position at the end of FY2012 (March 2013) is significant across different specifications (Column (2) and (5)). The significant negative coefficient of $\Delta\text{Regcap12/13}$ implies that banks write tighter loan contracts as their regulatory capital levels are depleted. The findings of Table 4 also suggest that the period during which banks evaluated most loan applications in this sample, most likely occurred during the FY 2013⁸. Thus, the proposition that banks tighten lending terms as a mean to reduce lending and mitigate risk due to deterioration in regulatory capital position has empirical support.

A plausible explanation to why regulatory capital levels of banks appear not to have an influence on lending terms (Table 3), unlike the changes in those levels (Table 4), is that those

Table 3. Poisson Regression results using regulatory capital level

Variables	Nb of terms imposed					
	(1)	(2)	(3)	(4)	(5)	(6)
Regcap 2012	-0.035 (0.035)			-0.031 (0.019)		
Regcap 2013		-0.045 (0.036)			-0.036 (0.020)	
Regcap 2014			-0.035 (0.032)			-0.050 (0.034)
Relationship length				0.007 (0.007)	0.007 (0.007)	0.003 (0.007)
Exclusivity				-0.873*** (0.211)	-0.868*** (0.210)	-0.810*** (0.208)
Loss/Profit	0.982*** (0.219)	0.983*** (0.219)	0.799*** (0.227)	0.927*** (0.257)	0.928*** (0.257)	0.737*** (0.277)
Profit/Loss	1.034*** (0.251)	1.036*** (0.251)	1.020*** (0.252)	0.894*** (0.296)	0.893*** (0.296)	0.869*** (0.301)
Loss/Loss	1.377*** (0.232)	1.380*** (0.232)	1.394*** (0.237)	1.460*** (0.278)	1.461*** (0.278)	1.535*** (0.273)
Merger Dummy	0.256 (0.530)	0.285 (0.529)	0.170 (0.637)	-0.039 (0.520)	-0.005 (0.517)	-0.370 (0.728)
Capital Injection Dummy	0.033 (0.108)	0.032 (0.107)	0.026 (0.110)	-0.085 (0.123)	-0.075 (0.123)	-0.117 (0.125)
BIS Dummy	-1.324** (0.562)	-1.271* (0.562)	-1.359** (0.395)	-0.729 (0.621)	-0.648 (0.621)	-0.595 (0.569)
Observations	1162	1162	1107	810	810	774
Pseudo R-squared	0.086	0.087	0.088	0.113	0.114	0.120
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Bank Type and Size	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results for the Poisson regression explained in Section 2.2. The dependent variable is the number of tighter terms imposed by the bank in a loan contract, and the main explanatory variables are regulatory capital levels of the bank in the last three fiscal years prior to the firms' response in the survey. Column (1), (2) and (3) report the results using each of the regulatory capital levels at the end of FY2011, FY2012 and FY2013, respectively, without including relationship lending proxies. Column (4), (5) and (6) use an equivalent specification to Column (1), (2) and (3), respectively, with the inclusion of bank-firm relationship proxies (the separation is due to the loss of observations). The table gives the Poisson regression results with robust standard errors in parentheses. As for significance levels * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

levels for most banks are well above the threshold of regulatory requirement (4% according to the domestic standard). The capital adequacy levels of banks in the sample study average about three times the level required from FY 2010 to FY 2013 (about 12% as reported in Table 2). Whereas changes in those levels are quite substantial enough to trigger a bank response in terms of contracting strictness, as the highest and lowest quartile of these changes are almost equivalent to half the level of regulatory capital that banks are required to maintain.

For robustness, I replicate the regressions in Table 3 and Table 4 using a Probit model (whether imposing one tighter term at least is significantly associated with capital depletion) and an OLS model with logged dependent variable. I also replicate the baseline regressions using different measurements for the regulatory capital position, that is, the excess of capital above the minimum required (Capital buffer), and changes in that excess, and in another specification, I merge the domestic standard with BIS standard. Both models and ulterior dependent variable

Table 4. Poisson Regression results using regulatory capital changes

Variables	Nb of terms imposed					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\text{Regcap11/12}$	0.062 (0.151)			-0.072 (0.186)		
$\Delta\text{Regcap12/13}$		-0.377** (0.165)			-0.324* (0.190)	
$\Delta\text{Regcap13/14}$			0.132 (0.119)			0.089 (0.128)
Relationship length				0.007 (0.007)	0.007 (0.007)	0.002 (0.007)
Exclusivity				-0.874*** (0.212)	-0.855*** (0.207)	-0.816*** (0.207)
Loss/Profit	0.978*** (0.218)	0.979*** (0.220)	0.783*** (0.226)	0.926*** (0.259)	0.922*** (0.258)	0.739*** (0.281)
Profit/Loss	1.023*** (0.249)	1.015*** (0.247)	1.027*** (0.253)	0.880*** (0.302)	0.886*** (0.300)	0.890*** (0.301)
Loss/Loss	1.379*** (0.232)	1.390*** (0.232)	1.400*** (0.237)	1.448*** (0.278)	1.459*** (0.273)	1.519*** (0.269)
Merger Dummy	0.339 (0.528)	0.485 (0.535)	0.171 (0.635)	-0.045 (0.533)	0.249 (0.538)	-0.394 (0.718)
Capital Injection Dummy	0.034 (0.108)	0.030 (0.108)	0.029 (0.110)	-0.096 (0.125)	-0.103 (0.124)	-0.121 (0.126)
BIS Dummy	-1.375** (0.561)	-1.437** (0.576)	-1.369** (0.395)	-0.896 (0.622)	-0.869 (0.622)	-0.886 (0.634)
Observations	1162	1162	1128	810	810	774
Pseudo R-squared	0.085	0.089	0.086	0.110	0.112	0.116
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Bank Type and Size	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results for the Poisson regression explained in Section 2.2. The dependent variable is the number of tighter terms imposed by the bank in a loan contract, and the main explanatory variables are changes in regulatory capital ratios of the bank for each two consecutive fiscal years since FY 2011. Column (1), (2) and (3) report the results using each of the regulatory capital ratio changes at the end of FY2011, FY2012 and FY2013, respectively, without including relationship-lending proxies. Column (4), (5) and (6) use the equivalent main explanatory variable to Column (1), (2) and (3), with the inclusion of bank-firm relationship proxies (the separation is due to the loss of observations). The table gives the Poisson regression results with robust standard errors in parentheses. As for significance levels * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

specifications generate qualitatively similar results⁹.

Overall, the findings presented in Table 4 are in line with the assumption that banks reduce their lending and their risk exposure as their regulatory capital levels deteriorate, as suggested by existing works. In essence, these findings offer additional insights regarding the mechanism through which lending volumes and risk mitigation on one hand, and regulatory capital position of the bank on the other hand, are associated, by confirming that changes in the strictness of lending terms are related to depletions in banks' regulatory capital. For further understanding of this mechanism, the next section presents separate analysis of regulatory capital effects on price and non-price terms of loan contracts.

3.2. Bank regulatory capital effect on price and non-price terms

The existing evidence on bank capitalization effects on lending behavior mostly refers to credit rationing (see Thakor, 1996; Gambacorta & Mistrulli, 2004; Peek & Rosengren, 1997 for

illustration) and shifts toward safer assets (e.g. Shimizu, 2015). The results exhibited in the previous section are in line with this evidence; nevertheless, they additionally suggest that both decreasing loan supply and lowering risk exposure due to capital adequacy depletion can be achieved by tightening lending standards, namely, the inclusion of stricter price and non-price terms in loan contracts. Strahan (1999) finds that banks impose tighter price and non-price terms to control their risk exposure and enhance their ability to monitor borrowers, thus making both types of terms reflective of components of borrower risk. However, *ceteris paribus*, given a deterioration in bank capital, the question of whether borrowers incur tighter price or non-price terms remains unanswered. In this section, I inspect whether the inclusion of stricter price or non-price terms in loan contracts is perceived as effective by a bank with weak regulatory capital position aiming to reduce lending and/or mitigate risk exposure.

In the corporate survey data, I find that the percentage of respondent firms indicating that they had a tighter non-price term (lower amount, shorter maturity, collateral and personal guarantee requirements) imposed by their lender is 11% of the sample firm, while only 7% report a tighter price term (higher interest rate) charge by the bank. To discern whether the imposition of tighter price and/or non-price terms reflects bank capital effects on contracting tendencies, I run Probit regressions with a dummy that proxies for each type of tight terms (price and non-price) as the outcome variable and I use the proxies for regulatory capital position that I employed in the baseline analysis, namely, the levels of regulatory capital ratio and changes in those levels as the main explanatory variables.

Table 5 reports the Probit regression results for price and non-price terms using regulatory capital levels as the main explanatory variables. Note that no coefficient of regulatory capital levels is significant in the first three numbered columns (1, 2 and 3) showing price term results, while the coefficients of regulatory capital levels at the end of FY2012 and FY2013 are both significant and negative in the last two columns (5 and 6) reporting the non-price terms results. These results suggest that banks with higher (lower) ratios of regulatory capital are less (more) likely to impose a tighter non-price term in their loan contracts, holding the borrowing SME risk constant. However, the banks' regulatory capital level does not have a significant effect on the probability that banks will charge a higher rate in their loan contracts.

Table 6 reports the results of Probit regression for the price and non-price terms in which the changes in regulatory capital levels are used as the main explanatory variables. Similarly to the findings in Table 5 in which regulatory capital levels were used, the results in Table 6 show that changes in regulatory capital levels do not have a significant effect on the probability that the bank charges a higher interest rate (Column 1, 2 and 3), whereas the probability that a tighter non-price terms is imposed in a loan contract is significantly associated with deterioration in

Table 5. Probit Regression results for price and non-price terms using regulatory capital level

Variables	Price-term			Non-price terms		
	(1)	(2)	(3)	(4)	(5)	(6)
Regcap 2012	0.002 (0.017)			-0.035 (0.023)		
Regcap 2013		0.001 (0.016)			-0.040* (0.024)	
Regcap 2014			0.006 (0.016)			-0.039* (0.023)
Relationship length	-0.001 (0.006)	-0.001 (0.006)	-0.003 (0.006)	-0.001 (0.005)	-0.001 (0.005)	-0.005 (0.005)
Exclusivity	-0.259 (0.166)	-0.259 (0.166)	-0.291* (0.169)	-0.379** (0.134)	-0.376** (0.134)	-0.387** (0.137)
Loss/Profit	0.601** (0.187)	0.601** (0.187)	0.467** (0.200)	0.498** (0.165)	0.499** (0.165)	0.374* (0.176)
Profit/Loss	0.564* (0.250)	0.564* (0.250)	0.543** (0.250)	0.645** (0.208)	0.646** (0.208)	0.605** (0.211)
Loss/Loss	0.862*** (0.222)	0.862*** (0.222)	0.878*** (0.224)	1.012*** (0.188)	1.015*** (0.188)	1.044*** (0.195)
Merger Dummy	0.333 (0.540)	0.357 (0.541)	0.257 (0.584)	-0.051 (0.438)	-0.033 (0.437)	-0.236 (0.500)
Capital Injection Dummy				0.028 (0.102)	0.036 (0.102)	-0.005 (0.105)
BIS Dummy	-0.651 (0.622)	-0.602 (0.621)		-0.808* (0.482)	-0.752 (0.482)	
Observations	762	762	684	804	804	764
Pseudo R-squared	0.124	0.124	0.118	0.119	0.120	0.130
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Bank Type and Size	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results for the Probit regression using the price term and non-price terms dummies as dependent variables. Columns (1), (2) and (3) present the price-term results using regulatory capital levels at the end of FY2011, FY2012 and FY2013, as the main explanatory variables, respectively. The non-price terms results are presented in column (4), (5) and (6), using regulatory capital levels at the end of FY2011, FY2012 and FY2013 as the main explanatory variables, respectively. The drop of observations in columns (1), (2) and (3) is due to perfect prediction of failure of the dependent variable by the Real Estate industry and Capital injection dummies, and the drop of observations in column (6) is due to perfect prediction of failure of the dependent variable by the BIS dummy. The results are qualitatively similar when replicated without including these dummies. The table gives the Probit regression results with robust standard errors. As for significance levels * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

regulatory capital level (Column 5).

For robustness, in unreported results, I rerun the Probit regressions presented in Table 5 and 6 using alternative specifications for the main explanatory variables. First, I merge the domestic standard with BIS standard instead of using the domestic standard only when measuring the regulatory capital position. Second, I use the level of regulatory capital exceeding the required minimum and variations in that level to proxy for the capital position of banks. For both specifications, I obtain qualitatively similar results. However, when I exclude relationship variables from the regression, all regulatory capital proxies become insignificant.

Taken together, the empirical results in Table 5 and Table 6 suggest that the regulatory capital levels of banks and changes in those levels matter for the strictness of non-price terms included in loan contracts, however, neither regulatory capital levels nor variations in those levels have an

Table 6. Probit Regression results for price and non-price terms using regulatory capital changes

Variables	Price-term			Non-price terms		
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\text{Regcap11/12}$	-0.047 (0.102)			0.047 (0.116)		
$\Delta\text{Regcap12/13}$		-0.033 (0.111)			-0.249* (0.127)	
$\Delta\text{Regcap13/14}$			0.091 (0.112)			-0.016 (0.081)
Relationship length	-0.001 (0.006)	-0.001 (0.006)	-0.004 (0.006)	-0.001 (0.005)	-0.001 (0.004)	-0.005 (0.005)
Exclusivity	-0.255 (0.165)	-0.258 (0.165)	-0.295 (0.169)	-0.376*** (0.134)	-0.365*** (0.134)	-0.389*** (0.137)
Loss/Profit	0.600*** (0.186)	0.601*** (0.187)	0.463** (0.201)	0.486*** (0.164)	0.486*** (0.164)	0.364** (0.174)
Profit/Loss	0.574** (0.251)	0.564** (0.251)	0.567** (0.256)	0.645*** (0.207)	0.641*** (0.209)	0.604*** (0.210)
Loss/Loss	0.884*** (0.227)	0.862*** (0.223)	0.886*** (0.228)	1.004*** (0.188)	1.007*** (0.187)	1.029*** (0.193)
Merger Dummy	0.294 (0.555)	0.378 (0.547)	0.236 (0.582)	-0.015 (0.441)	0.188 (0.448)	-0.290 (0.497)
Capital Injection Dummy				0.016 (0.103)	0.008 (0.103)	-0.002 (0.105)
BIS Dummy	-0.732 (0.605)	-0.689 (0.620)		-0.910* (0.481)	-0.953* (0.489)	
Observations	762	762	684	804	804	764
Pseudo R-squared	0.125	0.124	0.118	0.112	0.120	0.124
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Bank Type and Size	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results for the Probit regression using the price term and non-price terms dummies as dependent variables. Columns (1), (2) and (3) present the price-term results using regulatory capital changes at the end of FY2011, FY2012 and FY2013, as the main explanatory variables, respectively. The non-price terms results are presented in column (4), (5) and (6), using regulatory capital changes at the end of FY2011, FY2012 and FY2013 as the main explanatory variables, respectively. Due to perfect prediction of failure of the dependent variable, the capital injection and Real Estate dummies are dropped in columns (1), (2) and (3), and for the same reason the BIS dummy is dropped in Column (3). As for the non-price terms regression only the BIS dummy is dropped in Column (6) due to perfect prediction of failure. The results are qualitatively similar when replicated without including these dummies. The table gives the Probit regression results with robust standard errors. As for significance levels * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

effect on the rate of lending. Price and non-price terms of loan contracts both reflect components of borrower risk, as evident in this study as well as prior work (Strahan, 1999); however, only non-price terms reflect the bank's concern over its commitment to regulatory capital requirements.

As approximately 70% of SMEs in the sample report having the main bank as their exclusive lender it is unlikely that banks with weakening regulatory capital did not impose higher rates because borrowing SMEs might not submit to such condition. Because these SMEs clearly have very limited outside options and therefore unable to seek out looser contracts with well-capitalized banks (Sharpe, 1990; Rajan, 1992; Murfin, 2012). Accordingly, what might drive banks preference for tightening non-price terms instead is that these terms are perceived as more effective means of reducing loan volumes (lower amount) and mitigating risk exposure (shorter

term, additional collateral and personal guarantees) and eventually preventing further deterioration of regulatory capital position.

4. Conclusion

Using a matched dataset on banks and SMEs in Japan, I investigate whether banks take into account their regulatory capitalization levels and changes when setting up loan contract terms. The findings reveal that, holding everything else equal, banks incurring a depletion in their regulatory capital levels impose stricter contract terms, and that banks that have less regulatory capital level or experiencing deterioration in that level particularly include tighter non-price terms in their loan contracts to SMEs. In other words, SMEs are more likely to receive loans with lower amounts, or shorter maturities or be required to pledge collateral and personal guarantees, if their main bank's regulatory capital is low or depleted.

Shortcomings of this work present fruitful avenues for future studies. As the empirical findings of this work are drawn from cross sectional data, time varying firm and bank characteristics as well as macroeconomic conditions were not taken into account, therefore, it is not certain whether regulatory capital effects on lending terms hold over time. In addition, while the hypothesis I investigate is not country specific, the focus in this study is on Japanese settings. Thus, future work can explore whether the tightening of loan terms due to regulatory capital concern persists under different institutional settings and survives time varying unobserved heterogeneities.

NOTES

1. In this regard, the capital channel literature points out that the bank capital soundness is an important determinant of its lending behavior as well as its ability to absorb various shocks in bad states of the world (see, e.g., Blum & Hellwig, 1995; Markovic, 2006; Meh & Moran, 2004; Van den Heuvel, 2002 for theory and Gambacorta & Mitsruli, 2004; Kishan & Opiela, 2006 for supportive evidence).
2. The likelihood of whether a bank might accept or refuse to lend i.e. the extensive margin of lending is not what I focus on in this paper. In this work, I focus on the committed volume of lending by banks i.e. the intensive margin of lending.
3. Beck et al (2006) find that collateral requirements are one of the most important obstacles to SMEs access to loan financing.
4. The survey management was outsourced to the Teikoku Databank inc. (TDB), one of the largest credit information providers in Japan, and the TDB sent the questionnaire to 13,500

SMEs from its database and the response rate was 19.38%.

5. The fiscal year in Japan begins on 1 April and ends on 31 March. For example, FY 2010 begins from 1 April 2010 and ends on 31 March 2011.
6. Gambacorta and Mitsruli (2004) provide empirical evidence that the regulatory capital position of a bank has a significant influence on the bank lending volumes for the following two years.
7. Poisson regression requires that the mean and variance of the outcome variable to be equal. Even though the detected over-dispersion of the outcome variable is negligible, I replicate the Poisson regressions used in the baseline analysis, using negative binominal regressions, and the results remain the same.
8. It should be noted, however, that the results presented in Table 4, indicating that only the change in regulatory capital ratio at the end of FY 2012 is negatively associated with tighter lending terms, may still suffer from the effects of the aggressive monetary policy that was implemented few months before FY2012, and that had potentially impacted the capital position of Japanese banks. To alleviate such concern, it is necessary to examine the association between the capital positions of banks and their lending terms over time; however, I have no such data.
9. Results of the OLS regression with logged count of terms and the Probit regression replicating the baseline regressions are available upon request.

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