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Is the Monetary Policy Effect Different for Bank Lending to Households and Firms?

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Is the Monetary Policy Effect Different for Bank Lending to Households and Firms?*

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Abstract

Monetary policy may affect bank lending differently depending on who the borrower is. We examine both the price and quantity of bank loans in Korea for the 10 years between 2010 and 2019 to study whether the bank lending channel differs for households and firms. Identifying the channel by comparing banks with different amounts of security holdings, we find that the monetary policy effect is significant in business loans, but not in household loans. Evidence suggests that the difference in loan maturities is the reason behind it. Business loans typically have shorter maturities than household loans. Thus, the share of new or refinancing loans, which are more directly influenced by monetary policy shocks, is higher in business loans than in household loans. Our findings provide important policy implications for the cases where household and business sector debts evolve in different directions.

JEL Classification: E3, E5, G2

Keywords: monetary policy, bank lending channel, business loans, household loans

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1 Introduction

> *"Monetary policy is too blunt a tool to be routinely used to address possible financial imbalances; instead, monetary policy should remain focused on macroeconomic objectives, while more-targeted microprudential and macroprudential tools should be used to address developing risks to financial stability." (Bernanke, 2011)*

Monetary policy is a powerful instrument that affects a vast range of economic activities, but the effect is not transmitted evenly to all targets. Even within the bank lending on which the policy has a direct influence, the effect magnitude may differ significantly depending on who the borrower is. This paper examines monetary policy effects both from household loans and business loans and compares the significance.

It is critical to know on which sectors of the economy the monetary policy has more influences. Financial stability has been an important consideration in monetary policy, especially after the global financial crisis. One form of financial imbalances, which provides an impetus for monetary policy reaction is a high level of debt. The problem is that the debt may accumulate more in one sector than the others. For instance, the rapid buildup of leverage in the business sector of the U.S. after the global financial crisis raised the alarm to the policymakers who were searching for possible faultlines of the next crisis.[1] Meanwhile, the size of household debt relative to GDP has been decreasing steadily since the sub-prime mortgage failure (left panel of Figure 1). In certain cases, the monetary authority may want to boost aggregate demand by lowering financing costs for the households, but the action may stimulate business sector debts even more. Knowing in which sector of the economy the monetary policy effect is transmitted strong would be crucial to make an informed decision.

[Figure 1 about here.]

The recent Korean experience gives a very opposite example. In Korea, investment remained

[1] The financial stability report of the Fed in May 2019 (Federal Reserve Board, 2019) evaluates that business debt is historically large, whereas household borrowing remains at a modest level. The report examines vulnerabilities associated with elevated business debt.

weak until around 2017 since the global financial crisis. As shown in the right panel of Figure 1, credit to firms was staggering until 2017. In contrast, household debt has been rising consistently, fueled by housing booms. One of Korea's major post-crisis policy reforms was to mandate the central bank to consider financial stability in its implementation of monetary policy. Concerned about the household leverage, the central bank raised the policy rate a couple of times during 2017-2018, although the business investment has been weaker than hoped. A possible difference in the potency of monetary policy between the two sectors must have been an important consideration in the decision on rate hikes.

More recently, central bankers around the world are trying to keep the liquidity flowing into firms hit by the coronavirus pandemic. They have cut policy rates significantly and came up with alphabet soups of liquidity facilities. Their action, however, also reduced the cost of mortgage borrowing. Mortgage lending is running at an all-time high after the global financial crisis in many countries. House prices in advanced countries rose by 5% in the second quarter of 2020 (Economist, 2020). It is important to know whether additional monetary easing would help stressed firms more or stimulate mortgage lending even more.

Our research question is whether the monetary policy affects bank credit supply to households and firms differently. Many different monetary policy transmission channels have been discovered theoretically, and the channel through which the monetary policy influences the course of the real economy by affecting bank loan supply is called the bank lending channel. When the monetary tightening drains bank deposits, the bank may replace the lost deposits with managed liabilities like CDs or bonds.[2] Since the bank faces elastic demand for its managed liability, however, the substitution cannot be perfect, and funding cost rises. The bank ends up reducing its assets. The empirical literature successfully identified the bank lending channel by comparing banks with different shares of securities in their assets (Kashyap and Stein, 2000, Cetorelli and Goldberg, 2012). Banks with high shares of security in their assets can avoid cutting loans by selling securities, but banks with low shares have little room to adjust

[2] See Choi and Choi (2020) for micro-level evidences. They show that monetary tightening increases banks' reliance on wholesale funding.

their portfolio to keep profitable loans. Thus the bank lending channel is stronger in banks with low security-to-asset ratios. Based on the same identification strategy, we ask: When the bank needs to reduce loans, does it tap the loans to households first or the loans to firms? We try to reveal the bank's pecking order of portfolio rebalancing among loans to different borrowers.

Monthly balance sheets of Korean banks are analyzed for the ten years from 2010 to 2019. We first confirm the bank lending channel with the total amount of loans each bank has. Breaking up the total loans into components, we find that the channel works more through loans to firms than through loans to households. Evidence shows that this result is related to the loan maturity. The maturities are usually around one year for firms, while they are often longer than a decade for household mortgage loans. Hence, at any given month, the portion of new loans (including loans being refinanced) in the total outstanding loans is higher in business loans than in household loans. Terms, conditions, and prices of new loans would be directly influenced by recent monetary policy changes. The policy, however, may not reset the conditions of already-settled existing loans. Further investigation through interest rates on new loans supports this conjecture; The bank lending channel effects estimated from new loans are significant also in mortgage loans as much as in business loans.

Our analysis of bank loans to different borrowers also shows that the bank lending channel effect is stronger for high-agency cost borrowers (i.e., SMEs without collaterals). We find that banks with low-security shares in their assets reduce lending to SMEs more than high-security ratio banks after monetary tightening. This contrasts with loans to large firms: We do not find monetary policy effects from bank lending to large firms. In addition, we find that low-security ratio banks raise the interest rates more than high-security ratio banks after monetary tightening when the borrower is an SME, and it does not provide collaterals. If the loan comes with collaterals, however, such a pattern disappears.

This paper adds important findings on the bank lending channel literature. Since Bernanke and Gertler (1995) criticized the empirical literature of monetary policy for treating the monetary transmission mechanism as a "black box", much progress was made toward several di-

mensions. Since the theory suggests that bank lending channel work by changing the external financing premium of banks, Kashyap and Stein (2000) compared banks with different balance sheet liquidity. They found that the monetary policy effect in lending is stronger for banks with lower ratios of securities to assets. Many followed their approach of comparing banks with different balance sheet characteristics to identify monetary policy effects from various setups: Gambacorta (2008) examines monetary policy effects on bank lending rates. Cetorelli and Goldberg (2012) find evidence for the international transmission of monetary policy through global banks. Sapriza and Temesvary (2020) examine monetary policy asymmetry between tightening and easing. Jiménez et al. (2019) control for the credit demand and estimate the real effect of bank lending channel from matched bank-firm data. Ivashina et al. (2020) analyze bank lending channel effects on different types of corporate loans and find that the policy effect is mostly driven by cashflow loans while asset-based credit is insensitive. However, all of these studies analyze the total amount of bank loans or bank loans to firms only.

Though it is well known that the monetary policy has significant impacts on residential investment or consumer durable spending, the literature is relatively silent on the monetary policy effect on loans to households. Some try to see whether the policy effect is different depending on different levels of household debts (Alpanda and Zubairy, 2019, Kim and Lim, 2020). However, they do not analyze the policy effects on household debts. Furthermore, no study has ever tried to compare the bank lending channel strength between household loans and business loans to the best of our knowledge. This paper contributes to the literature by adding significant new findings that the bank lending channel effect differs across bank lending to different borrowers: households, large firms, and SMEs.

The remainder of this paper is organized as follows. The next section provides the details of our dataset. Section 3 provides the main results from the analysis of the bank loan quantity. Section 4 presents additional results on the price of newly issued bank loans. Finally, section 5 summarizes and concludes.

2 Data

The main data for this study comes from the Financial Analysis Information Retrieval System (FAIRS) of the Bank of Korea. The FAIRS provides detailed balance sheets of banks in monthly frequency. The sample period is set to 10 years between 2010 and 2019. Figure 2 plots the policy rates together with median loan growth rates among banks over the sample period. During the 10 years, the policy rate draws two large swings. The central bank raised its policy rate seven times and lowered it ten times, all of them by 25 basis points. The median loan growth rates (YoY) appears to be negatively correlated with the policy rate fluctuation.

[Figure 2 about here.]

We investigate both the price and quantity of bank loans to households and firms. Detailed statistics on the data are provided in Table 1. The loan quantity data is from the bank balance sheets. The quantity is the outstanding loans at the end of each month. For the mortgage loans, the amounts of newly established loan are separately reported. The lending rate data covers only the new loans made in each month, and it has a shorter sample period: from June 2013 to December 2019. Every month, each bank weight-averages interest rates on new loans they made by the types of borrowers and reports to the system. The loan types are classified in more detail than in the quantity data.

[Table 1 about here.]

We have 23 banks over the sample period. In the case of merger and acquisition, we treat the banks before and after as different entities. Among those, we exclude four banks: a development bank, an exim bank, and two internet-based banks. These banks specialize in one type of loan. The development bank and exim bank are directly managed by the government, and most of their loan goes to the firms. The internet banks, on the other hand, lend only to households and individuals. These banks do not help answering our research question. Dropping those, we mainly analyze 19 banks in the quantity data and 17 banks in the price data.

In the balance sheets of sample banks, the average size of business loans is 41 trillion Korean won, and it is comparable to the size of loans to the household, 36 trillion. The majority of business loans banks make goes to small and medium-sized firms (35 trillion). Among the household loans, half is mortgage loans (18 trillion). The other half comprises various types of loans: housing-related loans other than the mortgage, student loans, auto loans, credit card debt, and other personal loans. Monthly new mortgage loan (including refinancing loans) amounts to one trillion won, and hence it takes only a small fraction from total mortgage loans (5.5%) or total household loans (2.7%).[3]

The interest rate data is not aggregated up to entire firms or households, but it provides more detailed classifications than the loan quantity data. It reports interest rates on new loans to large firms and SMEs separately, and the loans to SMEs are differentiated depending on whether the loan is made with collateral. We see that the collateralized loans have substantially lower interest rates. The interest rates are roughly one percentage point lower than loans without collateral, and the level is similar to the interest rates large firms pay. Household loans are categorized into mortgage loans and personal loans. The mortgage loans are separated by repayment schedule: install payment and single payment.

[3] Mortgage loans typically have a prepayment penalty, which is exempted after three years. The loans are actively refinanced when the interest rates are more favorable or when people migrate to new homes.

3 Quantity Analysis

We first examine loan amounts. Our baseline regression equation is:

$$\Delta \texttt{Loan}_{i,t} = \delta_i + \delta_t + \sum_{j=1}^{m} \beta_j \texttt{Sratio}_{i,\cdot} \times \Delta \texttt{MP}_{t-j} + X'\gamma + \varepsilon_{i,t} \tag{1}$$

,where Loan is log-transformed, so the dependent variable is the growth rate of loans. Top and bottom 0.5% are winsorized. δ_i, δ_t are bank dummy and time dummy, respectively. Sratio is the security-to-asset ratio, and MP is the monetary policy rate. Sratio is averaged over the sample period and has no time-series variation while MP has no cross-sectional variation. Hence, the direct effects of these two variables are absorbed by bank fixed effect and time fixed effect, respectively. m is the maximum lag we investigate. X is a vector of standard controls. It includes leverage ratio, core deposit ratio, and log asset size. These variables are lagged by one month to avoid simultaneity. All variables are measured in 2015 Korean won. Regressions are weighted by the size of corresponding loans, and the standard errors are clustered at the bank level to account for possible autocorrelations in the calculation of standard errors.

The specification is based on, and similar to, that used in Sapriza and Temesvary (2020). One major difference is that we use averaged security ratio over the whole sample period ($\texttt{Sratio}_{i,\cdot}$) rather than time-varying ratios to avoid possible bias coming from the time-series correlation between Sratio and Loan. As explained in Kashyap and Stein (2000), the security ratio Sratio is endogenous. If the cyclicality of Sratio is correlated with Loan, we may get spurious results. Fortunately, we find that the variation in the security-to-asset ratio is coming more from the cross-sectional dimension than from the time-series dimension.

In the baseline regressions, we set the maximum lag m at 6 months. It is known that monetary policy effects on real output last for two years or more (Christiano et al., 1996a,b), but the effects on bank lending are most pronounced during the first several months because delays are shorter in the financial sector than in the real sector. As some previous studies investigate one-year effects, we also include results from setting m at 12 as a robustness check.

Table 2 presents the baseline results. To begin with, we confirm the bank lending channel effect of monetary policy using the total loans as in the previous studies. Column (1) does not include time fixed effects and have the policy interest rate change term (ΔMP) on its own. Instead, we include the macro controls: the growth rate of industrial production index and seasonality fixed effects (12 dummies of months). The coefficient of the policy rate change (ΔMP) is negative and significant. More importantly, we find that the effect is more significant to the banks with lower security ratios. The result stays the same in column (2), where we include monthly fixed effects. The interquartile range of the security ratio is 2.8, and hence the interaction term coefficient 0.59 means that a 25th percentile security ratio bank reduces its loan growth rate by 1.65 percentage points more than a 75th percentile bank. It is significant compared to the mean (0.33%) or the standard deviation (1.73%) of the total loan growth rate. Overall, the results on total loans confirm the previous studies' findings and show that the identification approach is valid for our setup.

[Table 2 about here.]

Columns (3)-(6) do the same regressions as in columns (1)-(2) using different regressands. Columns (3)-(4) are on household loans, and (5)-(6) are on business loans. We do not find statistically significant impacts of monetary policy from the household loan growth rates. The effect on business loans, however, is significant. Hence we learn that the bank lending channel effect found from the total loans comes mainly from business loans rather than household loans.

To shed more light on the differentiated effects of monetary policy on different classes of loans, we investigate loans classified in more detail. Table 3 provides additional results on different types of loans. About half of the total household loans is the mortgage loan. Columns (1)-(2) show the results on mortgage loans, and (3)-(4) show the results from newly installed mortgage loans. The separate data for monthly new loans are provided only for the mortgage loans, and the data begins from June 2013. We find no evidence of bank lending channel effects from the total mortgage loans, but we find a strong effect from new mortgage loans. The coefficient to the interaction term is large in magnitude and also significant statistically. The

results suggest that existing loans that are settled before policy changes tend not to respond to the policy. In contrast, newly installed mortgage loans are very sensitive to monetary policy rate changes.

[Table 3 about here.]

Based on the results, we posit that the significance of monetary policy effects is closely related to the maturity characteristics of loans. In household loans, the share of new loans in total outstanding is much smaller than in business loans because the maturities often exceed a decade in household loans, while it is usually one year for business loans. Figure 3 shows the average outstanding loan share by remaining maturity over the 10 years between 2010 and 2019. The share of loans with remaining maturity less than one year is over 60% in business loans, but that in household loans is under 20%. In particular, the average remaining maturities are 1.5 years for business loans (1.4 years for SMEs) and 8.0 years for household loans (10.8 years for the mortgage) as of the end of 2019. This difference is likely to be the reason why we find the bank lending channel effect from business loans but not from household loans. This conjecture is also supported further by the results from the analysis of price data in the next section.

[Figure 3 about here.]

Next, in columns (5)-(8), we divide the business loans into two by the size of borrowing firms. Columns (5)-(6) show the results from loans to large firms, and (7)-(8) are on the loans to SMEs. We see that it is primarily the loan to SMEs rather than loans to large firms, which changes sensitively following monetary policy changes. Large firms have other sources of funding than bank loans. They can issue debt securities, and listed firms can also issue equities to fund their businesses. Having outside options, large firms are likely to have larger bargaining power against banks in the bank loan market. Facing the need to adjust loan supply after monetary policy changes, banks may not want to touch loans to large firms. Instead, the results show that they adjust loans to SMEs significantly. In columns (7)-(8), the statistical significance and

the economic magnitude of the coefficients are very strong. It shows that the results for the total loans or total business loans are driven mainly by loans to SMEs.

Lastly, we check the robustness of the results by changing the maximum lag (m from Equation 1) of the regression to one year. Table 4 shows the results. As we add more lags in the regression, we lose some of the observations. The results are, however, kept qualitatively the same as the previous baseline results. We find the bank lending channel effect from the growth rate of total bank loans, and we also find that the effect is mostly coming from business loans rather than household loans. Within the business loans, the bank lending channel effect is significant in loans to SMEs, but not in loans to large firms.

[Table 4 about here.]

4 Price Analysis

This section studies bank lending rates on different borrowers to provide supporting evidence for the findings in the previous section. The lending interest rate data is on new loans for each month, and it is aggregated up to the individual bank level. The data provide detailed classifications according to the types of borrowers. The sample period is narrowed to June 2013-December 2019 due to data availability.

As the banks ration loan quantity to different borrowers after monetary policy shock, they would adjust the price of the loans accordingly. We estimate the monetary policy effects from the bank lending rate data and examine whether there are any differences among loans to different borrowers. For identification, we extend the idea of security ratio onto the interest rate analysis. Banks with large security buffer would face less need to reduce loans after policy rate hikes because they can liquidate securities. Therefore banks with high-security ratios would

adjust their lending rates less than low-security ratio banks after monetary policy shocks. Gambacorta (2008) shows that the identification strategy works using interest rate data of Italian banks.[4]

In particular, we use the following estimating equation :

$$\Delta \texttt{Rate}_{i,t} = \delta_i + \delta_t + \beta\ \texttt{Sratio}_{i,.} \times \Delta \texttt{MP}_{t-1} + X'\gamma + \varepsilon_{i,t} \tag{2}$$

The dependent variable is the monthly change in bank lending rate. The main regressor monetary policy change is lagged by one month. A major difference from Equation (1) is that we do not include further lags of monetary policy shocks. The interest rate data is on newly issued loans for every month. Market interest rates are adjusted promptly after monetary policy shocks, and it is more so for the newly installed loans. It is not likely that policy rate changes take effect in the interest rates of newly issued loans with lags of several months. The specification is similar to that in Gambacorta (2008) because we use the same identification framework. However, we are focused on the short-run effect, and so the estimating equation differs from the error correction model of Gambacorta (2008). We take a more rigorous approach to identify the bank lending channel by including time fixed effects and by making the security ratio time-invariant.

First, in Table 5, we present results from the bank lending rates of different business loans. Columns (1)-(2) are on the interest rates of new loans to large firms, and (3)-(6) are for SME loans. For the SMEs, the interest rate data are separately provided for loans with and without collateral. Overall, the results are in line with the findings in the previous section. We find the bank lending channel effect from SMEs' interest rates (columns 5-6), but not from the rates of large firms (columns 1-2). Also, we find that the SME interest rate is not sensitive to monetary policy if the loan is made with collateral (columns 3-4). Hence it is consistent with the findings of Ivashina et al. (2020) that loans with collaterals are affected less by monetary policy

[4] Choi (2020), however, documents that the bank lending rate fails to reflect the credit market conditions in bank-based economies. If bank loan adjustment is made more through credit rationing than pricing changes, it would be difficult to find the effect of monetary policy from the interest rate data.

changes. The results in Table 5 imply that the bank lending channel effect is significant only in the high-agency cost loans (loans to SMEs without collateral). Column (5) does not have time fixed effects, and we can see the direct effect of ΔMP. The positive coefficient means that banks raise interest rates on SMEs without collateral after policy rate hikes. The bank lending channel is identified through the interaction term with security ratio, and we find it negative and significant. It means that banks with a larger stock of securities raise lending rates less compared to banks with lower security ratios. The result gets more statistical significance after we include time fixed effects in column (6). The coefficient (-0.108) means that a bank with a 25th percentile security ratio raises interest rates 0.3 percentage points more than a 75th percentile bank after a one percentage point policy rate hike.

[Table 5 about here.]

Next, in Table 6, we provide results from household loan interest rates. Interest rates for household loans are offered in three categories: two types of mortgage loans and personal loans. The mortgage loan interest rates are separately collected depending on the repayment schedule: installment loans, single payment loans. The majority of the new mortgage loans are installment loans. During the second half of 2019, 40.4% of the new mortgage loans are set in single payment schedules. We find no evidence for the bank lending channel effect from the single payment mortgage loans or personal loans. From the installment loan interest rates, however, we find significant monetary policy effects. Following a policy rate hike, low-security ratio banks raise interest rates more than high-security ratio banks (column 2). The results are in line with the findings from the previous section. The Bank lending channel effect of monetary policy is equally significant for newly setup mortgage loans as in the new SME loans.

[Table 6 about here.]

5 Conclusion

Different components of bank lending are affected differently by the monetary policy. The comparison of the monetary policy effects in bank loans to households and firms, however, is not included in the lengthy investigation of the literature yet. This paper studies the issue for the first time and provides important results. The bank lending channel effect is significant in business loans, but not in household loans. We conjecture that the difference in loan maturities is playing a key role. The maturities are much shorter in business loans than in household loans, and we find equally significant effects from newly issued mortgage loans as in the loans to firms. Another interesting result is that the bank lending channel effect is significant only to the high-agency cost borrowers. The different behaviors of banks with different security holdings are significant in loans to SMEs, but not in loans to large firms. The difference in loan interest rate adjustment among banks with different security ratios is significant only when the SME loan is not collateralized.

Our finding supports the remark of Bernanke (2011) quoted at the very beginning of this paper. Monetary policy is quickly transmitted to a large portion of outstanding business loans while it affects only a small fraction of the total household loans. When a prompt influence to the business cycle is desired, the monetary policy better has more consideration on credit to firms, while debt accumulation in the household sector is better to be handled by more targeted policy tools tailored to affect new loan installments.

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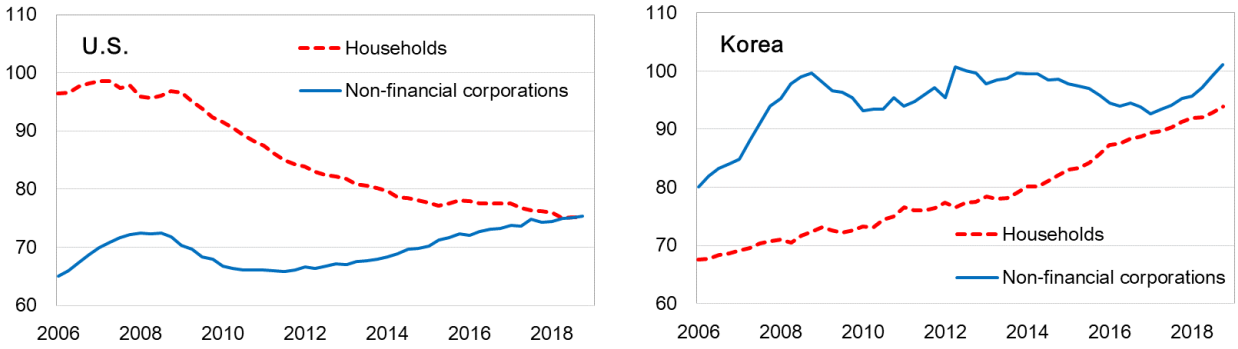
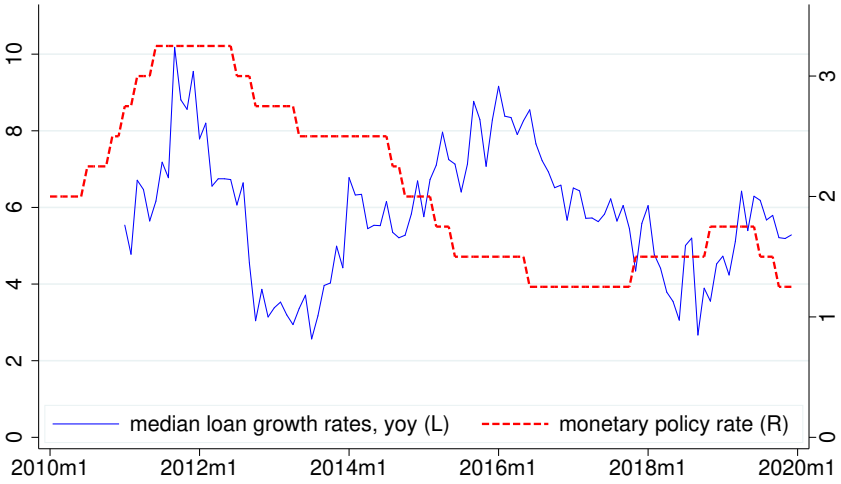
Figure 1: Credit to GDP Ratios



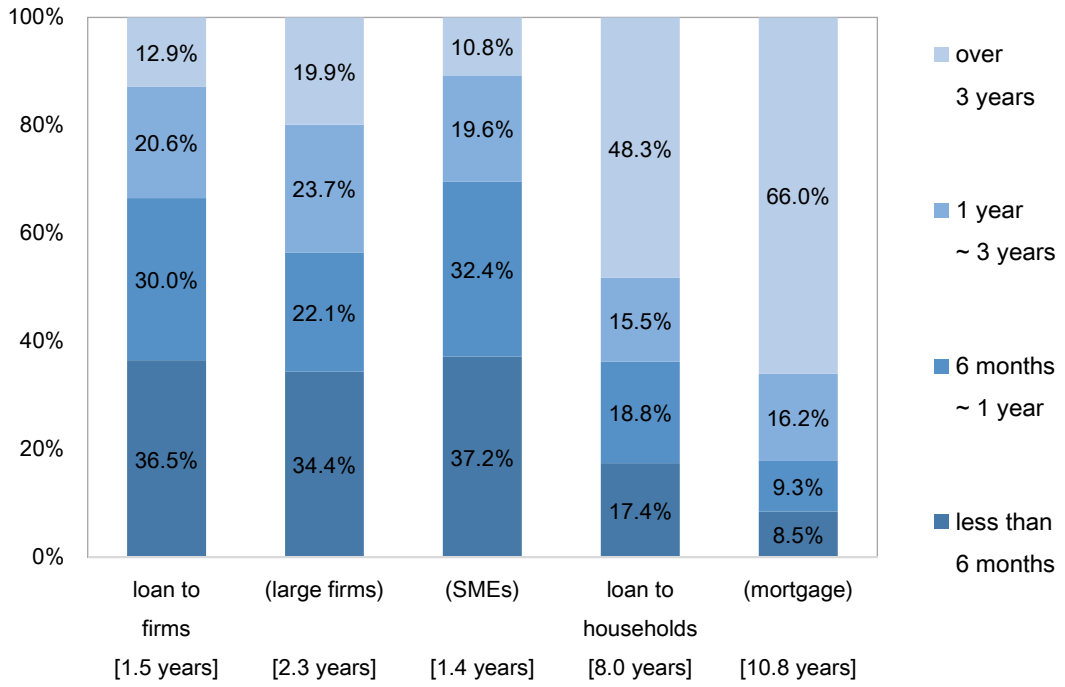
Notes: sourced from IMF WEO. The unit is percentage.

Figure 2: Median Loan Growth Rates and Policy Interest Rate



Notes: The red dotted line plots the BOK base rate. The solid blue line shows median loan growth rates (YoY) among banks for each month.

Figure 3: Outstanding Loan Share by Remaining Maturity



Notes: Data from FAIRS. Loan shares by remaining maturity are averaged over the 10 years from 2010 to 2019 at quarterly frequency. The contents in brackets mean the average remaining maturities as of the end of 2019. All domestic banks are included in the calculation.

Table 1: Summary Statistics

	N	mean	St.Dev.	p25	median	p75
	Loan Quantity: 2010m1-2019m12					
number of banks	19					
policy rate	120	2.06	0.67	1.50	2.00	2.50
total assets	1,783	121	110	31	60	228
securities	1,783	18	16	5	12	33
total liability	1,783	113	102	29	55	211
deposit	1,783	81	78	21	39	150
security ratio	19	15.6	2.5	13.6	15.4	16.4
total loans	1,783	89	83	22	38	169
(growth rate)	1,764	0.33	1.73	-0.63	0.39	1.32
loans to firms	1,783	41	40	8	22	78
(growth rate)	1,764	0.27	1.35	-0.37	0.39	1.03
loans to large firms	1,781	6	7	1	2	14
(growth rate)	1,760	0.32	6.67	-2.23	0.15	2.70
loans to SMEs	1,781	35	35	7	17	61
(growth rate)	1,760	0.24	1.21	-0.31	0.38	0.93
loans to households	1,783	36	39	6	17	63
(growth rate)	1,764	0.56	1.38	-0.22	0.47	1.27
mortgage loans	1,783	18	18	3	10	32
(growth rate)	1,762	0.49	5.04	-0.49	0.28	1.29
new mortgage loans	1,200	1.0	1.1	0.2	0.4	1.6
(growth rate)	1,154	0.24	50.93	-17.29	0.75	19.70
	Lending Rates on New Loans: 2013m6-2019m12					
number of banks	17					
large firms	1,008	4.1	0.7	3.6	4.0	4.6
SMEs with collateral	1,096	5.2	0.8	4.7	5.2	5.7
SMEs without collateral	1,096	4.1	0.6	3.7	4.0	4.6
mortgage loans-installment payment	1,096	3.3	0.4	3.1	3.3	3.6
mortgage loans-single payment	1,002	3.6	0.4	3.3	3.6	4.0
personal loans	1,097	5.0	1.1	4.2	5.0	5.7

Notes: Units are in trillion Korean won for balance sheet items, in percentages for interest rates and growth rates. Monthly newly established mortgage data covers 2013m6-2019m12.

Table 2: Loans to Households and Firms

	(1)	(2)	(3)	(4)	(5)	(6)
	All loans	All loans	loan to H	loan to H	loan to F	loan to F
ΔMP	-9.16**		-6.66		-7.92**	
	(0.014)		(0.427)		(0.014)	
Sratio $\times \Delta$MP	0.56**	0.59**	0.25	0.33	0.48**	0.47*
	(0.020)	(0.013)	(0.642)	(0.527)	(0.017)	(0.042)
observations	1,669	1,669	1,669	1,669	1,669	1,669
number of banks	19	19	19	19	19	19
R-squared	0.098	0.211	0.180	0.332	0.298	0.374
bank controls	yes	yes	yes	yes	yes	yes
macro controls	yes	–	yes	–	yes	–
bank fixed effect	yes	yes	yes	yes	yes	yes
time fixed effect	no	yes	no	yes	no	yes

Notes: The sample period is from 2010 to 2019. The dependent variable is the change in log loans. The top and bottom 0.5% are winsorized. Variables are in 2015 Korean won. The reported coefficients are summed over all 6 lags of each respective variable. Reported in brackets are the corresponding p-values. Bank controls include leverage ratio, core deposit ratio, and log asset size. Macro controls include the growth rate of the industrial production index, and seasonality fixed effects (12 dummies of months). Regressions are weighted by log size of corresponding loans. Standard errors are clustered at the bank level. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 3: Loan Classifications in More Detail

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Loans to Households				Loans to Firms			
	mtg	mtg	new mtg	new mtg	large	large	SMEs	SMEs
ΔMP	-10.09		-183.1*		10.43		-16.46***	
	(0.467)		(0.052)		(0.410)		(0.001)	
Sratio $\times \Delta$MP	0.423	0.511	12.48**	14.34**	-0.0963	-0.192	0.90***	0.91***
	(0.632)	(0.561)	(0.025)	(0.036)	(0.902)	(0.809)	(0.001)	(0.002)
observations	1,667	1,667	1,148	1,148	1,665	1,665	1,665	1,665
number of banks	19	19	17	17	19	19	19	19
R-squared	0.092	0.205	0.118	0.249	0.118	0.192	0.255	0.364
bank controls	yes	yes	yes	yes	yes	yes	yes	yes
macro controls	yes	–	yes	–	yes	–	yes	–
bank fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effect	no	yes	no	yes	no	yes	no	yes

Notes: The sample period is from 2010 to 2019 in columns (1), (2), (5)-(8). It is from June 2013 to December 2019 in columns (3)-(4). The dependent variable is the change in log loans. The top and bottom 0.5% are winsorized. Variables are in 2015 Korean won. The reported coefficients are summed over all 6 lags of each respective variable. Reported in brackets are the corresponding p-values. Bank controls include leverage ratio, core deposit ratio and log asset size. Macro controls include growth rate of industrial production index, and seasonality fixed effects (12 dummies of months). Regressions are weighted by log size of corresponding loans. Standard errors are clustered at the bank level. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 4: Cumulative Effects over One Year

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					loan to F			
	All loans	All loans	loan to H	loan to H	all	all	SMEs	SMEs
ΔMP	-11.62*		-8.221		-7.616+		-19.97***	
	(0.071)		(0.390)		(0.118)		(0.005)	
Sratio $\times \Delta$MP	0.73*	0.76**	0.312	0.452	0.467+	0.431	1.09***	1.06***
	(0.075)	(0.050)	(0.607)	(0.398)	(0.124)	(0.198)	(0.006)	(0.007)
observations	1,555	1,555	1,555	1,555	1,555	1,555	1,551	1,551
number of banks	17	17	17	17	17	17	17	17
R-squared	0.114	0.221	0.184	0.338	0.291	0.370	0.244	0.351
bank controls	yes	yes	yes	yes	yes	yes	yes	yes
macro controls	yes	–	yes	–	yes	–	yes	–
bank fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effect	no	yes	no	yes	no	yes	no	yes

Notes: The sample period is from 2010 to 2019. The dependent variable is the change in log loans. The top and bottom 0.5% are winsorized. Variables are in 2015 Korean won. The reported coefficients are summed over all 12 lags of each respective variable. Reported in brackets are the corresponding p-values. Bank controls include leverage ratio, core deposit ratio and log asset size. Macro controls include growth rate of industrial production index, and seasonality fixed effects (12 dummies of months). Regressions are weighted by log size of corresponding loans. Standard errors are clustered at the bank level. +, *, ** and *** indicate statistical significance at the 15%, 10%, 5% and 1% level, respectively.

Table 5: Interest Rate Regression - New Loans to Firms

	(1)	(2)	(3)	(4)	(5)	(6)
			SMEs			
	large firms	large firms	w/ col.	w/ col.	w/o col.	w/o col.
ΔMP	0.555		-0.0695		1.581+	
	(0.6996)		(0.9071)		(0.1017)	
Sratio × ΔMP	-0.0463	-0.0499	0.0191	0.0182	-0.0986+	-0.108*
	(0.6391)	(0.6353)	(0.6213)	(0.6651)	(0.1201)	(0.0946)
observations	924	938	1,027	1,043	1,027	1,043
number of banks	16	16	17	17	17	17
R-squared	0.029	0.084	0.044	0.123	0.032	0.092
bank controls	yes	yes	yes	yes	yes	yes
macro controls	yes	–	yes	–	yes	–
bank fixed effect	yes	yes	yes	yes	yes	yes
time fixed effect	no	yes	no	yes	no	yes

Notes: The sample period is from 2013m6 to 2019m12. The dependent variable is the change in interest rates. The top and bottom 0.5% are winsorized. Variables are in 2015 Korean won. Reported in brackets are the p-values. Bank controls include leverage ratio, core deposit ratio and log asset size. Macro controls include growth rate of industrial production index, and seasonality fixed effects (12 dummies of months). Regressions are weighted by log bank asset size. Standard errors are clustered at the bank level. +, *, **, and *** indicate statistical significance at the 15%, 10%, 5% and 1% level, respectively.

Table 6: Interest Rate Regression - New Loans to Households

	(1)	(2)	(3)	(4)	(5)	(6)
	mortgage					
	installment	installment	single	single	personal	personal
ΔMP	0.683***		0.719		-0.377	
	(0.0012)		(0.212)		(0.504)	
Sratio × ΔMP	-0.033***	-0.033***	-0.030	-0.031	0.043	0.0333
	(0.002)	(0.006)	(0.457)	(0.392)	(0.192)	(0.276)
observations	1,027	1,043	921	937	1,029	1,045
number of banks	17	17	17	17	17	17
R-squared	0.099	0.291	0.044	0.133	0.031	0.127
bank controls	yes	yes	yes	yes	yes	yes
macro controls	yes	–	yes	–	yes	–
bank fixed effect	yes	yes	yes	yes	yes	yes
time fixed effect	no	yes	no	yes	no	yes

Notes: The sample period is from 2013m6 to 2019m12. The dependent variable is the change in interest rates. The top and bottom 0.5% are winsorized. Variables are in 2015 Korean won. Reported in brackets are the p-values. Bank controls include leverage ratio, core deposit ratio and log asset size. Macro controls include growth rate of industrial production index, and seasonality fixed effects (12 dummies of months). Regressions are weighted by log bank asset size. Standard errors are clustered at the bank level. +, *, **, and *** indicate statistical significance at the 15%, 10%, 5% and 1% level, respectively.