

A Key Driver for the Mixed Relation between Collateral and Loan Risk Premium: Evidence from China

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ABSTRACT

This paper revisits the conflicting empirical results demonstrating both positive and negative relationships between loan risk premia and collateral. In spite of both ex-ante adverse selection and ex post moral hazard theories supporting this mixed observable relationship between loan risk premia and collateral, any plausible explanation for this mixed result still remains conspicuously absent in the literature. We show that collateral is generally negatively correlated with loan risk premia, which is consistent with the ex-ante theory. However, after controlling for the purpose of the loan, mixed relationships between collateral and loan risk premia for different types of collaterals are obtained: a positive relation for mortgage collateral and a negative relation for non-mortgage collateral. Furthermore, we find that different types of collateral can either in- or decrease risk premia on working capital loans, while the same does not hold true for advance loans. Our results suggest that different combinations of collateral types and loan purposes generate and explain variable loan risk premia. Thus, we demonstrate that the mixed empirical results found in the existing literature to date may result from different economic characteristics of both collateral type and loan purpose.

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1. Introduction

Banks charge variable risk premia on loans made to private sector firms. Both the value and type of collateral pledged are of first order importance in determining excess premia paid over and above going market rates. Previous studies suggest that loan credit risk results predominantly from information asymmetry. The information asymmetry in the loan market derives from two main sources, one is the adverse selection mechanism occurring before the transaction and the other is explained by a moral hazard effect taking place ex-post after the transaction. In order to mitigate such adverse selection and moral hazard effects, collateral is widely used in loan contracts offered by commercial banks.

Theory suggests that collateral plays a very important role in the debt contracts. Collateral will reduce agency costs or contracting frictions of asymmetric information in the loan market. Economic theory indicates that collateral may be associated with either higher or lower risk premium. Therefore, both positive and negative correlations between loan risk and collateral are supported by different economic theories.

On the one hand, collateral will help mitigate the ex-ante asymmetric information channel. The adverse selection model suggests that collateral can be used to identify high-quality borrowers, which in this particular case leads to a negative correlation between collateral and default risk (see Bester 1985,1987; Besanko and Thakor,1987a, 1987b; Chan and Thakor,1987; Boot et al,1991).

On the other hand, collateral can also serve to reduce ex-post frictions in the loan contract. The moral hazard model suggests that collateral may prevent high-risk borrowers from defaulting, therefore low-quality borrowers are more likely to be required by lenders to pledge collateral. Consequently, a positive correlation has also been found to exist between collateral and default risk (see Boot and Thakor,1994; Aghion and Bolton,1997; Holmstrom and Tirole,1997).

Given these two opposite channels, it is perhaps not surprising that mixed empirical

results on the relationship between loan risk premia and collateral have been found in the existing literature. For example, previous studies indicate both the presence of positive (Berger and Udell, 1990; Machauer and Weber, 1998; Brick and Palia, 2007; Godlewski and Weill, 2011) as well as negative (Agarwal and Hauswald, 2010; Berger et al., 2011;) relationships between loan risk premia and collateral. In other related studies, Berger and Udell (1995) find no significant relationship between loan risk premium and collateral, while Jimenez and Saurina (2004) and Berger et al. (2011) study the relation between ex-post nonperformance and collateral, empirically documenting a positive correlation.

Few studies have been conducted in order to explain this apparent loan premium puzzle in the literature. Berger and Udell (1995) find no significant relation between different types of collateral and loan risk premia based on a sample of small U.S. business firms. John et al. (2003) suggest that corporate debt with non-mortgage collateral pledges are charged with higher loan premia from lenders than debt pledged with mortgage collateral. Berger et al. (2015) investigate this puzzle by examining the empirical relationship between loan risk and various economic characteristics associated with different types of collateral. They investigate the extent with which loan risk premia and ex-post non-performance relate to different collateral types. Their results suggest that different types of collateral with different economic characteristics may result in the conflicting empirical results found in the existing literature to date.

Literature on Chinese market

The loan market in China has experienced rapid growth in recent years. However, how and to what extent loan risk premia are related to collateral still remains an open question, which both investors and scholars want to shed light on in view of China's rapidly developing financial system. Given the fact that the Chinese government controls most of the economic and financial resources, large state-controlled banks correspondingly dominate the Chinese financial system. Previous studies indicated that Chinese banks are partially subject to government intervention (García-Herrero et al.,

2009). Bank financing is associated with economic growth (Beck et al., 2005), and typically small and medium-sized firms face greater obstacles in accessing financing (Beck et al., 2008). As for the loan market in China, however, and within the specific context of credit crunches, all and in particular small and medium-sized firms face more pronounced financial constraints (Ayyagari et al., 2010; Cheng and Degryse, 2010a). In such circumstances collateral becomes particularly important and is widely used to reduce these constraints.

Although financial institutions in China rely heavily on collateral in their decisions to extend loans to the business sector, few studies can be found on the relation between collateral and loan risk premia. Based on a credit data set of domestic banks, Liu (2006) finds that the moral hazard model can successfully explain the credit market in China. Also, Ping and Yang (2009) suggest that the predictions emanating from moral hazard model are generally consistent with the observed market reality. Xu and Wang (2001) study the risk inherent in China's housing mortgage loan market. They find that loans of higher value and longer time-to-maturity horizons tend to be more prone to default and should thus be charged with higher premium. Yin and Gan (2011) show that apart from collateral, variable internal credit ratings of firms can help explain differential loan risk premia charged by banks.

Various types of collateral and different loan purposes exist in China's loan market, which however have thus far been neglected in the literature. The relationship between loan risk premia and collateral remains complex and unclear.

China's loan market can be broadly categorized along three different collateral types, given by mortgage collateral pledges, non-mortgage collateral pledges and credit guarantees. As Chinese real estate prices have been rising for more than one decade, mortgage loans have become increasingly popular. As a result, mortgage collateral pledges are attractive to banks. One potential problem with this specific arrangement is that the value of mortgage-related collateral may experience a sudden and unexpected erosion, should housing prices start to experience a broad market decline (Boz and

Mendoza, 2014; Gorton and Ordóñez, 2014). In such a scenario, the secured loan may suddenly increase in perceived riskiness, as the value of the borrower's property can no longer cover the loan loss in the event the borrower defaults. Similarly, Chinese loan data can also be divided into several loan purpose categories. In our analysis we consider the trade financing loan (loans related to commerce and international trade), the discount loan (bank acceptance and commercial invoice discount), the working capital loan (loan to finance the firm's operational activities), and the advances loan category (loan is used to pay the bill holder the face value of the bill on maturity).

Our Hypotheses

Previous studies have not considered the existing heterogeneity in both collateral types and loan purpose outlined above. Based on a unique data set from the Chinese loan market, we attempt to develop a more differentiated explanation of loan risk premia by taking both the different types of collateral and purposes of loans into account. We hypothesize that the positive or negative correlation between collateral and loan risk should depend on the varying combinations of the various collateral types and loan purposes. Consistent with Berger et al. (2015), liquid collateral (non-mortgage collateral pledges) may be more preferred by lenders than illiquid collateral (mortgage collateral pledges). In addition, the specific loan purpose may also play an important role in determining loan risk premia. A loan extended with either a low-risk or high-risk purpose in mind may again rank differently in terms of the lenders overall desirability..

Using a comprehensive commercial loan data set provided by a major bank in China, this paper extends previous research by studying the various links which may exist between loan risk (i.e. loan risk premia charged by the banks), one the one hand, and different types of collateral and loan purposes, one the other. To the best of our knowledge, the extent to which the combination of loan purposes and collateral types affect loan risk premia has not been studied before. We therefore fill this gap in the

literature by first investigating the relationship between different loan purposes and loan risk premia. We then proceed by comparing the various collateral types (mortgage collateral or non-mortgage collateral pledges) with more basic credit guarantees in terms of their overall effect on loan risk premia. A positive relationship may be indicative of supporting the ex-post asymmetric information theory (moral hazard model), while a negative relationship may by contrast support the ex-ante theory (adverse selection model) instead.

We find that loans with pledged collateral are generally associated with lower loan risk premia. In addition, our study reveals that working capital loans are less desirable to banks and therefore associated with significantly higher risk premia than loans extended for other purposes, such as advance and trade finance loans. After controlling for different loan purposes, our results reveal a mixed result with both positive and negative effects from collateral on loan risk premia. Working capital loans secured with mortgage collateral pledges will lead to higher risk premia, while non-mortgage collateral pledges tend to decrease the latter. This outcome results from the fact that in the case of working capital loan defaults, mortgage collateral is illiquid and therefore much harder to cash in on than more liquid non-mortgage collateral. For advances loans, all collateral types are associated with higher risk premia, in view of the fact that Chinese banks typically demand collateral pledges from private firms, while state-owned enterprises (SOEs) can borrow without making such pledges at lower risk premia. It is therefore the heterogeneity in economic characteristics of different combinations of collateral and loan purposes which may explain how the mixed empirical relations between collateral and loan risk come about.

The remainder of the paper is structured as follows. Section 2 describes the loan data we use. Section 3 discusses our model. Section 4 presents our main empirical results. Section 5 concludes.

2. Data

Our commercial loan data set is obtained from the EAST (Examination & Analysis System Technology) database¹ from a major bank in China. Our sample includes more than 160,000 commercial loans for the period between June 1996 to March 2017. For each loan, our dataset contains the risk premium, loan amount, maturity, loan purpose and collateral types. The risk premium is defined as the floating rate spread over the benchmark interest rate, while the loan amount is defined as the amount borrowed from the bank in RMB. Finally, maturity is defined by the number of days associated with the loan's contract length.

[INSERT TABLE 1 ABOUT HERE]

Several loan purposes feature in our data sample. First, the trade financing loan constitutes a flexible, short-term lending vehicle related to commerce and international trade. Second, the discount loan is based on a bank's acceptance discount and commercial invoice discount. A firm raises funds by transferring the unexpired bank acceptance or invoice to the bank, so that the bank can pay the firm the discounted face value. The funds can be used without any additional restrictions imposed by the bank. Third, the working capital loan is typically extended in order to finance everyday operations of a firm. As a result, it is usually not employed in buying long-term assets or investments, but instead to cover accounts payable, wages, etc. Fourth, the advances loan is provided by the bank to its customer in order to pay the bill holder the face value of a bill on maturity. Fifth, the final miscellaneous loan category comprises all other types of loans which are not further specified by the bank.

Our data set also allows us to distinguish the various types of collateral pledged for each loan. First, for mortgage collateral pledges, a firm pledges the property value of its residential or commercial buildings so as to obtain loans from the bank. Non-mortgage collateral pledges, by contrast, come into play whenever a firm raises funds

¹ EAST is system that allow all banks in China submit prudential data to the central bank.

by pledging its deposits or securities to the bank. Third, the credit guarantee, strictly speaking, does not formally constitute a type of collateral, as it simply represents a loan extended by the bank to a firm with good creditworthiness. For reasons of parsimony and completeness, the credit guarantee will also be listed under the types of collateral employed in the analysis to follow below. Fourth and last, miscellaneous collateral includes all other types of collateral which are otherwise not further specified by the bank.

Tables 2 and 3 present summary statistics of the loan data used in this study. Figures 1 and 2 present differences in risk premia for the various loan purpose categories or collateral types, respectively.

[INSERT TABLE 2 ABOUT HERE]

[INSERT FIGURE 1 & FIGURE 2 ABOUT HERE]

Table 2 collects the names and summary statistics (observations, means, and standard deviations) of all variables used in our analysis. Our data set consists of 165,863 observations in total and the average risk premium is 4.797 (i.e. the bank charges 4.797% in excess of the benchmark interest rate). One noteworthy feature of our sample is that the majority of loans are comparatively short-term and also moderately sized, exhibiting an average loan amount of about 11 million RMB and an average maturity of 523 days.

Regarding loan purposes, most firms borrow money from the bank to meet their short-term operational liquidity needs (i.e. the proportion of working capital loans is the largest). The number of working capital loans is about 1.5 times the number of trade financing loans and discount loans, and almost 8 times the number of advances loans. The trade financing and discount loans are normally taken out in order to increase a firm's short-term liquidity position, which in turn correlates strongly with how that firm experiences general business cycle fluctuations. Not surprisingly, since the advances loan is often used during times when a firm experiences financial impasses, it is rarely

used.

With regards to the types of collateral, the number of non-mortgage is higher than the mortgage collateral pledges and, perhaps unsurprisingly, the number of the credit guarantees is the lowest. Clearly, non-mortgage collateral, which includes deposits and securities, is apparently being perceived as more liquid than mortgage collateral. Also, the operational process involved in approving non-mortgage collateral pledges is relatively simple compared to mortgage collateral pledges. For example, in order to approve mortgage loans a bank's risk manager often needs to personally check the property as well as consult a third party to carry out a real estate value appraisal. Also, such loan requests need to go to the real estate bureau to process property dismantling or mortgage. All of this suggests - consistent with findings from the existing literature - that banks prefer liquid over illiquid collateral.

Overall, there exist significant economic differences for the loan purposes and various types of collateral, all of which exert distinct effects on the pricing of the final lending interest rates quoted by banks. This motivates us to investigate the relationship between risk premia and loan purpose categories as well as collateral types.

[INSERT TABLE 3 ABOUT HERE]

[INSERT FIGURE 3 & FIGURE 4 ABOUT HERE]

Table 3 as well as figures 3 and 4 present various summary statistics (observations, means, and standard deviations) of risk premia charged for different loan purpose categories as well as loan collateral types.

For the different loan purpose categories, except for the working capital loan, we find that all loan purpose categories are charged with very low risk premia. For example, on average, the risk premium paid on the trade financing loan is only 0.023% in excess of the benchmark interest rate, while the equivalent excess premium paid on the discount loan is only 0.016% above the benchmark. Banks demand a slightly higher premium for the advances loan, but it remains still less than 0.1% in excess of the

benchmark rate. By contrast, while the working capital loan category accounts for only about 26% of the total loans, it is however charged with an excess premium of close to 18%. This suggests that banks do not favour uncertainty and hence choose to charge higher risk premia on working capital loans. It should be re-emphasized here again that working capital loans can be used for any operational activity, while the trade financing and discount loans are only used to increase a firm's short-term liquidity.

In light of our exploration of the summary statistics of all collateral types, it is apparent that banks clearly favour liquid over illiquid collateral types, a preference they clearly signpost by charging lower excess risk premia on the former collateral type.. For example, on average, the illiquid mortgage collateral is charged with an excess premium of 10.886%, which is considerably higher than the excess rate charged on liquid non-mortgage collateral (0.919%). In addition, the risk premium charged on loans made with credit guarantees is as small as only 1.968%.

We therefore tentatively conclude that the risk premia charged by banks in our sample vary by loan purpose as well as collateral type. To what extent the various loan purpose categories and collateral types jointly affect risk premia is an interesting question we will investigate in section 4.

3. Methodology

We empirically investigate the relationship between loan risk premia, collateral types and the various loan purpose categories we statistically summarized in the previous section. We embark on our inferential analysis by first by first carrying out three loan risk premium regressions using OLS which also take into account a set of control variables:

$$\text{Risk Premium}_i = a(\text{Loan Purpose}_j, \text{Amount}_i, \text{Maturity}_i) \quad (1)$$

In our first regression specification, we include two control variables: loan amount and loan maturity. Our computed summary statistics have already suggested that

distinct loan purpose categories result in a varying risk premium charged by banks. We therefore proceed by testing to what extent loan purpose j will affect the risk premium of loan i charged by the bank.

$$\text{Risk Premium}_i = b(\text{Collateral Types}_k, \text{Amount}_i, \text{Maturity}_i) \quad (2)$$

The different economic characteristics of collateral types further prompt us to also investigate any relationship which may exist between loan risk premia and collateral types. Therefore, in a second regression, we replace the loan purpose category in equation 1 with collateral types k . The estimated coefficients on the different collateral types may help us understand whether it may be the ex-ante adverse selection or the ex-post moral hazard model that is driving our empirical results.

$$\begin{aligned} \text{Risk Premium}_i \\ = c(\text{Loan Purpose}_j, \text{Collateral Types}_k, \text{Amount}_i, \text{Maturity}_i) \end{aligned} \quad (3)$$

In our third regression specification, we include both loan purpose categories and collateral types together, which also serves as a benchmark model. Due to multicollinearity problems, some variables are dropped from the model.

In the next step, we explore to what extent loan purpose categories and collateral types jointly affect risk premia. A combination of loan purpose and collateral types is assumed to explain the mixed relationship between loan risk premia and collateral observed in the existing literature to date. In order to explicitly account for such a possibility, an interaction term (interaction between loan purpose category and collateral type) is introduced into the regression specification:

$$\begin{aligned} \text{Risk Premium}_i \\ = d(\text{Loan Purpose}_j, \text{Collateral Types}_k, \text{Loan Purpose}_j \\ * \text{Collateral Types}_k, \text{Amount}_i, \text{Maturity}_i) \end{aligned} \quad (4)$$

There are $j * k$ different interaction terms in total, but in order to avoid multicollinearity problems, we only include one interaction term each time.

4. Empirical results

In this section we formally present and examine the relationship between loan risk and collateral. Specifically, we investigate the determinants of loan risk premia from three distinct angles: a. the influence of any particular loan purpose category on the loan risk premium; b. the influence of any particular collateral type on loan risk premium; c. the simultaneous influence of any loan purpose category and collateral type on the loan risk premium.

[INSERT TABLE 4 ABOUT HERE]

Table 4 reports the regression results for the determinants of loan risk premia based on different model specifications². Columns I-IV report estimation results from the baseline specifications of Eq. (1), (2) and (3), which investigate the linear relationship between loan risk premia, loan purpose category and collateral type without the incorporation of any non-linear interaction terms. Columns V-XII, by contrast, summarize estimation results obtained from the specification based on Eq. (4), which examines the joint effect of loan purpose category and collateral type on loan risk.

4.1 Loan purpose and risk premium

First, the estimated relationship between loan risk premia and the loan purpose categories shows that different loan purposes are generally significantly positively associated with the overall magnitude of observed average premia. The estimated coefficients are 2.9817, 3.2946, 21.9251, 4.0098, and 3.7777 for trade financing, discount, working capital, advances and miscellaneous loans, respectively. All estimated coefficients are significant at a 1% level of significance.

In particular, we find that, at more than 5 times the average excess risk premium charged on other loans, a substantial increase of the average risk premium is demanded

² To avoid the multicollinearity problem, some dummy variables are dropped when both loan purpose and collateral types are included in the regression.

for working capital loans. This result is very likely driven by the very idiosyncratic nature of working capital loans, which are not used to buy long-term assets or investments, but instead to finance a firm's everyday operations. By contrast, trade finance loans on average attract the lowest premia among all categories of loan purpose, in light of the fact that they are normally taken out in support of both domestic and international trade transactions. This specific loan purpose category is therefore typically of short-term nature and the expected future cash flow is stable. From the perspective of banks this is less risky, primarily because transactions are being settled directly on the bank's books resulting in a lesser degree of information asymmetry coupled with a very high probability of generating potential profits for firms in the futures. Discount loans are always associated with non-mortgage collateral (liquid collateral), and are used to meet a firm's short-term liquidity needs. They are therefore also associated with less uncertainty when compared directly to working capital loans. Finally, advances loans are extended by banks in order to provide funds for the payment of matured bills of a firm implying that such advances are repaid to the bank within a very short time span. Such loans are therefore also of very short-term nature and the bank usually possesses privileged information on the loan as well, thus resulting in a comparatively low excess premium charged.

4.2 Collateral type and risk premium

Second and consistent with previous studies, we also find that the collateral type matters for variation in loan risk premia. In general, the estimated coefficients on each type of collateral are negative and statistically significant, indicating that collateral can help decrease the default risk of a company and therefore lead to a lower risk premium. The negative relation supports the ex-ante asymmetric information theory (Bester 1985, 1987; Besanko and Thakor, 1987a, 1987b; Chan and Thakor, 1987; Boot et al, 1991). The coefficients are estimated at -8.4712, -0.2888, -7.7376, and -5.3433 for non-mortgage collateral pledges, mortgage collateral pledges, credit guarantees, and miscellaneous types, respectively.

Our results indicate that non-mortgage collateral pledges are more desirable to banks, as they significantly decrease the required premium. This result is intuitively to be expected, given that non-mortgage collateral pledges are generally much more liquid and less risky when compared to other types of collateral, also because they allow banks to readily take actual possession of pledged assets (e.g. securities, deposits, certificates, etc.) until the borrower repays the entire debt amount. In contrast, mortgage collateral pledges are less desirable when compared to other types of collateral (the estimated coefficient on mortgage pledges is even positive in Column III, when we include loan purpose and collateral types in one regression). This can be partially explained by the nature of mortgage collateral pledges. Mortgage assets are normally immovable property and therefore not as liquid as the non-mortgage assets. In addition, from the perspective of Chinese banks, mortgage collateral is becoming increasingly risky, not least because of a growing concern that the general rate of house price inflation in China can not be sustained indefinitely. In case of a sudden downward correction in this market, the value of mortgage collateral will be impaired.

4.3 Loan purpose, collateral type, and risk premium

Columns V-XII in table 4 present estimated results based on the specification of Eq. (4), which examines the joint effect of loan purpose categories and collateral type. In contrast to the results obtained from our benchmark models and similar to what has been reported in the existing literature to date, the estimated relationship between different combinations (i.e. the combinations of loan purpose categories and collateral types) and loan risk premia turns out to be mixed.

Both positive and negative correlations can be found³. The discount loan with non-mortgage collateral pledge, working capital loan with mortgage collateral pledge, advances loan with non-mortgage collateral pledge, advances loan with mortgage collateral pledge, and advances loan with credit guarantee all exhibit a positive

³ For parsimonies reason, we did not report the insignificant results of the interaction terms in table 3.

relationship with the dependent variable of the loan risk premium, with estimated coefficient 0.5246, 1.3714, 14.7495, 13.4198, and 10.692 respectively⁴. On the other side, a negatively estimated relationship is found for the working capital loan with non-mortgage collateral pledges as well as the working capital loan secured by basic credit guarantees, with coefficients of -4.0259 and -10.698, respectively⁵.

One interesting finding is the mixed relationship between working capital loans and loan risk premia. The results from our benchmark model show that at more than 5 times the excess risk premium of other loans, working capital loans attract a substantial increase in the required risk premium demanded by banks. Given the idiosyncratic nature of working capital loans, which are not used to buy long-term assets or investments but instead to finance the everyday operations of companies, our study suggests that the risk premium attracted by working capital loans is both statistically significant but also different in sign and this direction depending on what kind of collateral has been pledged. In particular, our results corroborate earlier findings that more liquid collateral will reduce the risk premium charged by the bank, which is for instance consistent with Berger et al. (2015).

In addition, the bank will demand much lower risk premia from firms with good creditworthiness. A potential explanation for this specific outcome is that the credit quality of large firms in China, such as state-owned enterprises, is directly derived from certain advantages in corporate governance, business strategy, profitability, and financing channels. Such firms often possess an exceptionally reliable ability to repay their debts, relatively small default risk, and a good standing with and recognition by banks as well (Borisova G. et al., 2015). Contrary to state-owned enterprises (SOEs), non-SOEs in China face more financial constraints as well as generally higher costs of debt. Chan et al. (2012) point out that small-sized, non-SOE firms face significant credit constraints, while large-sized SOE firms are nowhere near as much constrained financially resulting in a much lower risk premium paid by such larger conglomerates.

⁴ All significant at 1% confidence level.

⁵ All significant at 1% confidence level.

Our results also suggest that different types of collateral do not materially affect the premium of advances loan charged by the bank. We observe that both non-mortgage and mortgage collateral are associated with higher risk premia charged on advance loans. It is likely that this result is obtained because banks demand collaterals for advance loans made to non-SOEs, while no collateral requirements are imposed for SOE advance borrowings.

Overall, our empirical results suggest that different categories of loan purpose are significantly positively associated with the average magnitude of observed risk premia. Consistent with previous studies, we also find that the collateral type matters in explaining a mixed or variable effect on observable risk premia. This important result originates from a non-linear interactive relationship between different combinations of loan purpose categories and collateral types determining the risk premium in simultaneous fashion. .

5. Conclusion

An existing body of literature suggests that the relationship between collateral and the excess risk premia could either be positive or sometimes negative. This paper revisits and puts forward an explanation to this apparent puzzle by taking into account the economic characteristic of collateral and loan themselves.

Our research is based on a commercial loan data set sourced from the EAST database of a major bank in China. We study the information of more than 160,000 commercial loans over a time span of June 1996 to March 2017. We obtain the result that in general collateral is negatively correlated with loan risk premia, a finding which supports ex-ante theories of asymmetric information. Furthermore, both descriptive statistics as well as estimates computed from regression analysis demonstrate that different loan purposes can affect the risk premium charged by banks. By controlling for various categories of loan purposes, we find that mortgage collateral can statistically significantly increase risk premia, while considerably more liquid non-mortgage

collateral pledges tend to be associated with lower risk premia, a finding which is especially pronounced for working capital loans. We also find that banks charge higher risk premia for collateralized advance loans due to non-SOE borrowers' lower credit quality compared to SOEs, who are usually in a position to borrow without any collateral whatsoever. Therefore, our results suggest that various collateral types and loan purpose categories jointly and interactively in non-linear fashion generate a varying or mixed relationship with the loan risk premium. Our findings therefore reveal that the mixed empirical results of the relationship between loan risk premia and collateral found in the existing literature to date may be driven by the heterogeneity in economic characteristics of collateral types and loan purposes, where in particular liquidity may be of first-order importance in finally helping to demystify the mixed relationships which have been found in the literature to date.

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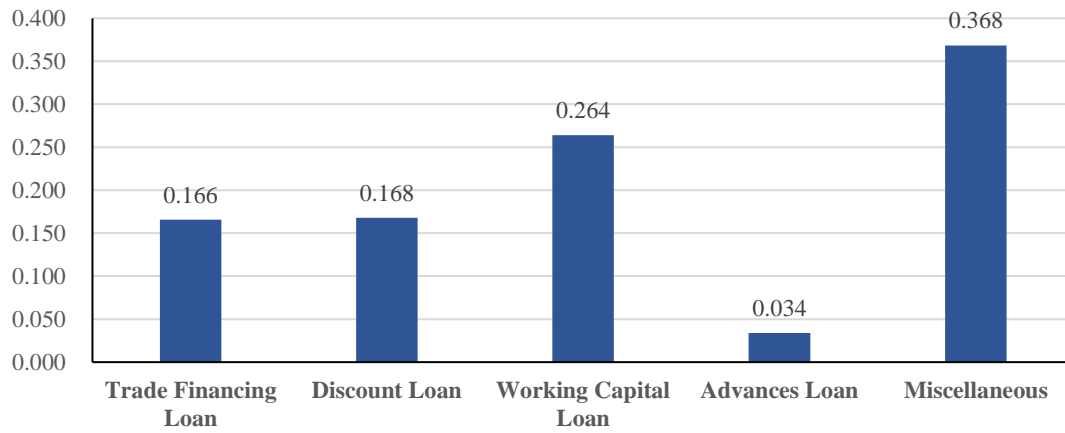


Figure 1. The average loan usage. For each loan purpose (trade financing loan, discount loan, working capital loan, advances loan, and miscellaneous), it's equal to one if it falls into a certain category.

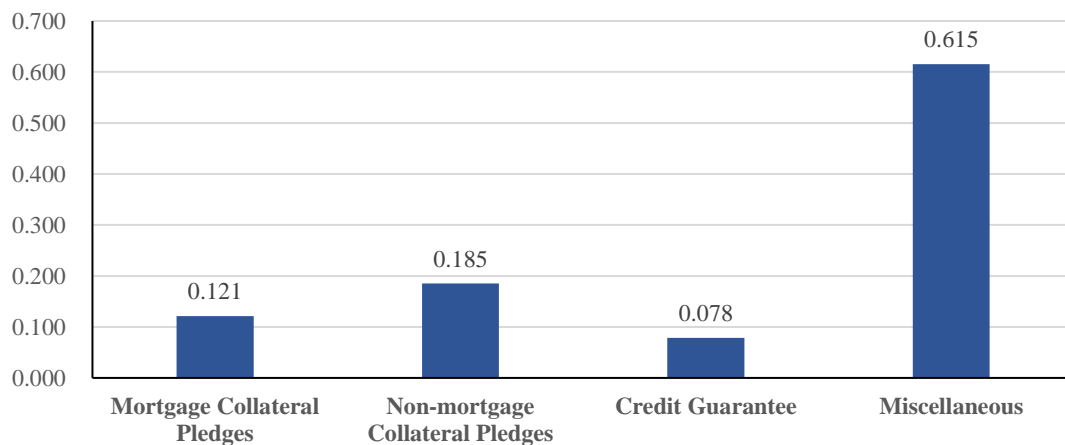


Figure 2. The collateral usage. For each type of collateral (mortgage collateral pledges, non-mortgage collateral pledges, credit guarantee, and miscellaneous), it's equal to one if it belongs to a certain category.

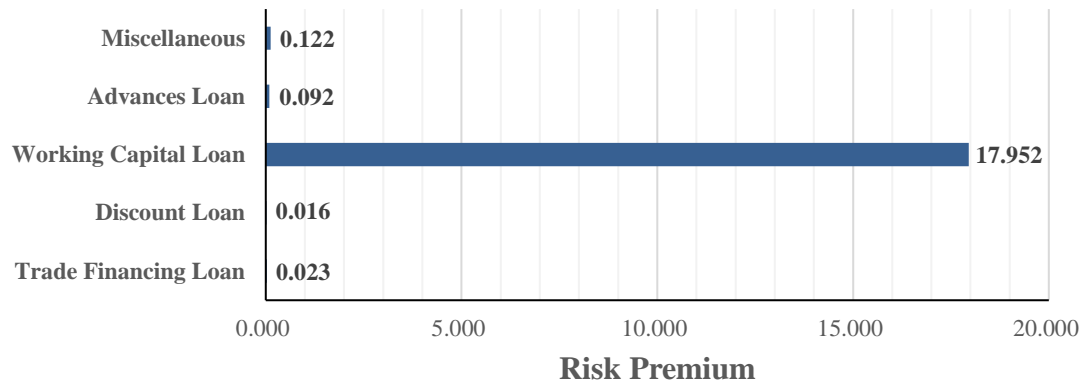


Figure 3. The average risk premium of different loan purpose. The loan purpose includes trade financing loan, discount loan, working capital loan, advances loan, and miscellaneous.

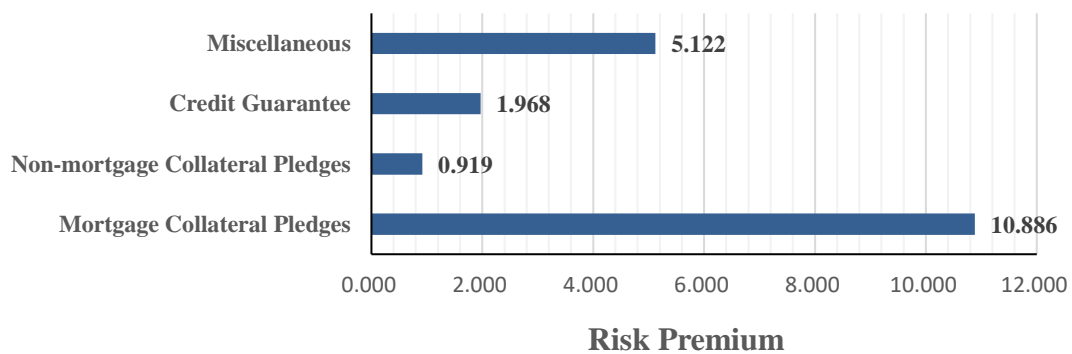


Figure 4. The average risk premium of different collateral types. The collateral types consist of mortgage collateral pledges, non-mortgage collateral pledges, credit guarantee, and miscellaneous.

Table 1**Variables.**

Variable	Variable Name	Definition
Loan characteristics	<i>Premium</i>	the floating rate spread over the benchmark interest rate
	<i>Amount</i>	the loan amount borrowing from the bank in RMB
	<i>Maturity</i>	the number of days of the loan's contract length
Types of Loan	<i>Trade Financing Loan</i>	Equals 1 if it's trade financing loan
	<i>Discount Loan</i>	Equals 1 if it's discount loan
	<i>Working Capital Loan</i>	Equals 1 if it's working capital loan
	<i>Advances Loan</i>	Equals 1 if it's advances loan
	<i>Miscellaneous</i>	Equals 1 if it's other types loan
Types of Collateral	<i>Mortgage Collateral Pledges</i>	Equals 1 if the collateral is mortgage pledges
	<i>Non-mortgage Collateral Pledges</i>	Equals 1 if the collateral is non-mortgage pledges
	<i>Credit Guarantee</i>	Equals 1 if loan is provided based on creditworthiness
	<i>Miscellaneous</i>	Equals 1 if the collateral is other types

Note: This table shows the names and definition of variables used in the analysis. The table explains loan characteristics (premium, amount, and maturity), types of loan (trade financing loan, discount loan, working capital loan, advances loan, and miscellaneous), and types of collateral (mortgage collateral pledges, non-mortgage collateral pledges, credit guarantee, and miscellaneous).

Table 2
Variables and Summary Statistics.

Variables	Obs.	Mean	St. Dev.
<i>Loan characteristics</i>			
<i>Premium (%)</i>	165863	4.797	12.206
<i>Amount (RMB)</i>	165863	11,406,269.299	48,437,726.338
<i>Maturity (days)</i>	165863	523.606	71,806.483
<i>Loan Purpose</i>			
<i>Trade Financing Loan</i>	27459	0.166	0.372
<i>Discount Loan</i>	27869	0.168	0.374
<i>Working Capital Loan</i>	43815	0.264	0.441
<i>Advances Loan</i>	5612	0.034	0.181
<i>Miscellaneous</i>	61108	0.368	0.482
<i>Collateral Types</i>			
<i>Mortgage Collateral Pledges</i>	20126	0.121	0.327
<i>Non-mortgage Collateral Pledges</i>	30697	0.185	0.388
<i>Credit Guarantee</i>	12977	0.078	0.269
<i>Miscellaneous</i>	102063	0.615	0.487

Note: This table reports the names and summary statistics (observations, means, and standard deviations) of variables used in the analysis. Premium is defined as the floating rate based on the benchmark interest rate. Amount is defined as loan amount at the bank in RMB. Maturity is defined as number of days of the loan's maturity. For each loan purpose, it's equal to one if it falls into a certain category. For each type of collateral, it's equal to one if it belongs to a certain category.

Table 3**Risk Premium and Summary Statistics.**

Risk Premium (%)	Obs.	Mean	St. Dev.
<i>Trade Financing Loan</i>	27459	0.023	0.352
<i>Discount Loan</i>	27869	0.016	0.539
<i>Working Capital Loan</i>	43815	17.952	17.969
<i>Advances Loan</i>	5612	0.092	1.586
<i>Miscellaneous</i>	61108	0.122	1.949
<i>Mortgage Collateral Pledges</i>	20126	10.886	16.359
<i>Non-mortgage Collateral Pledges</i>	30697	0.919	5.244
<i>Credit Guarantee</i>	12977	1.968	8.861
<i>Miscellaneous</i>	102063	5.122	12.575

Note: This table reports the summary statistics (observations, means, and standard deviations) of risk premium used in the analysis. Risk premium is defined as the floating rate spread based on the benchmark interest rate. We report the statistics of the risk premium for each loan purpose and the risk premium for loans with different types of collateral.

Table 4
Determinants of Loan Risk Premium.

	Benchmark				+ Interaction between Loan Purpose and Collateral Types							
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Loan Purpose												
Trade Financing Loan	2.9817*** (0.1466)		0.6666*** (0.0678)	1.6661*** (0.1058)	1.6786*** (0.1059)	1.4958*** (0.1062)	1.3411*** (0.1107)	0.8640*** (0.1062)	1.6825*** (0.1059)	1.6860*** (0.1059)	1.6784*** (0.1059)	0.6392*** (0.1108)
Discount Loan	3.2946*** (0.1600)		0.1997*** (0.0655)	1.2810*** (0.1086)	1.1488*** (0.1146)	1.1291*** (0.1088)	0.9805*** (0.1126)	0.9753*** (0.1079)	1.2982*** (0.1086)	1.3034*** (0.1086)	1.2924*** (0.1086)	0.8165*** (0.1175)
Working Capital Loan	21.9251*** (0.1847)		18.0175*** (0.0610)	19.4450*** (0.1121)	19.4192*** (0.1123)	19.5554*** (0.1122)	18.9992*** (0.1207)	19.9266*** (0.1116)	19.4634*** (0.1122)	19.4753*** (0.1122)	19.4578*** (0.1122)	20.0937*** (0.1218)
Advances Loan	4.0098*** (0.2180)		0.0041 (0.1313)									
Miscellaneous	3.7777*** (0.1715)			1.4841*** (0.1059)	1.4795*** (0.1060)	1.3511*** (0.1061)	1.2979*** (0.1076)	1.2818*** (0.1052)	1.5026*** (0.1060)	1.5111*** (0.1060)	1.4963*** (0.1060)	1.1476*** (0.1069)
Collateral Types												
Non-mortgage Collateral Pledges		-8.4712*** (0.1769)	-0.5411*** (0.0617)	-0.5054*** (0.0861)	-0.6193*** (0.0918)	-0.1253 (0.0886)	-0.0873 (0.1047)	-0.0321 (0.0860)	-0.5133*** (0.0861)	-0.4990*** (0.0861)	-0.5081*** (0.0861)	-0.5251*** (0.1103)
Mortgage Collateral Pledges		-0.2888 (0.2118)	0.2526*** (0.0750)									
Credit Guarantee		-7.7376*** (0.1987)	-2.3112*** (0.0911)	-2.1507*** (0.1091)	-2.1590*** (0.1091)	-2.0586*** (0.1091)	-1.4875*** (0.1278)	0.6415*** (0.1213)	-2.1533*** (0.1091)	-2.1425*** (0.1091)	-2.1608*** (0.1091)	0.9103*** (0.1353)
Miscellaneous		-5.3433*** (0.1858)		0.3038*** (0.0702)	0.3104*** (0.0702)	0.3619*** (0.0702)	0.9501*** (0.0956)	0.5494*** (0.0698)	0.3026*** (0.0702)	0.3133*** (0.0702)	0.3027*** (0.0702)	0.7010*** (0.0950)

Interaction Term												
Discount*Non-mortgage Pledge					0.5246***							-0.0816
					(0.1463)							(0.1469)
Working Capital*Non-mortgage Pledge						-4.0259***						0.1399
						(0.2248)						(0.1389)
Working Capital*Mortgage Pledge							1.3714***					-4.9468***
							(0.1378)					(0.2288)
Working Capital*Credit								-10.698***				-
								(0.2098)				11.0366***
Advances*Non-mortgage Pledge									14.7495***			13.9627***
									(3.0975)			(3.0685)
Advances*Mortgage Pledge										13.4198***		13.6499***
										(2.1914)		(2.1713)
Advances*Credit											10.6925***	7.8737***
											(3.0980)	(3.0693)
Other Loan Characteristics												
Amount	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Maturity	-0.2530***	0.7321***	0.0059**	-0.0948***	-0.0931***	-0.0941***	-0.1203***	-0.1051***	-0.0959***	-0.0972***	-0.0956***	-0.1113***
	(0.0115)	(0.0127)	(0.0027)	(0.0072)	(0.0072)	(0.0072)	(0.0076)	(0.0071)	(0.0072)	(0.0072)	(0.0072)	(0.0076)
Adj R-squared	0.4950	0.1958	0.4981	0.4988	0.4988	0.4988	0.4988	0.5066	0.4988	0.4989	0.4988	0.5082
Observations	164133	164133	164133	164133	164133	164133	164133	164133	164133	164133	164133	164133

Notes: this table reports the regression results for the determinants of loan risk premium with different model specifications. Columns I- IV show the results of

the baseline specifications of Eq. (1), (2) and (3), which investigate the linear relationship among load risk premium, loan purpose and collateral type without interaction terms. Columns V-XII show the results of the specifications of Eq. (4), which examine the joint effect of loan purpose and collateral type.