DETERMINANTS OF CORPORATE LOAN INTEREST RATE: CASE OF UKRAINE

SOLOMIYA SHPAK[ab1]

[a]National Bank of Ukraine
[b]Kyiv School of Economics
E-mail: sshpak@kse.org.ua

Abstract This paper estimates the effect of loan, borrower, and bank characteristics on corporate loan pricing in Ukraine using rich loan-borrower-bank monthly panel data from 2013 and 2020 combined with data from borrowers' financial statements. Examining an extensive set of fixed effects, we find that larger loans, loans with a shorter maturity period and larger collateral value have lower interest rates even after controlling for borrower characteristics. We also find that larger borrowers, borrowers with more tangible assets, lower indebtedness, and a higher interest coverage ratio who operate in concentrated industries secure lower interest rates. Our findings suggest that it is crucial to take into consideration both loan and borrower characteristics when estimating the effects of banks' health on the loan interest rate.

JEL Codes G21, E51, L11, P34

Keywords credit supply, credit demand, cost of debt, Ukraine

1. INTRODUCTION

Banks are essential sources of external financing in many countries. Evidence shows that bank loan markets account for a larger share of external financing than equity or bond markets have in most economies (e.g. Drucker and Puri, 2007; Bae and Goyal, 2009). Therefore, it is of great academic and financial stability policy interest to investigate the factors that affect bank loan pricing. Discerning firm and bank determinants of loan rates is crucial for informing the public about policy decisions, given the importance of lending for financial stability and economic growth.

Bank loan financing in Ukraine has been slow. In recent years, demand from the corporate sector has been limited, and many potential borrowers were not ready to ensure the completeness and quality of information disclosure (Financial Stability Report, 2020). At the same time, the Ukrainian government has been calling for the resumption of large-scale loan financing for businesses. There have been extensive discussions about the high cost of borrowing for the corporate sector. Indeed, the Ukrainian economy and businesses need resources, and Ukrainian banks' liquidity is enough to meet the demand (Financial Stability Report, 2020). But among other factors, the ownership structure and financial reporting of potential borrowers are often nontransparent, preventing banks from financing Ukrainian businesses.

This study examines the factors that affect the cost of loans for Ukrainian businesses. We aim to establish the relative importance of firm-specific risk factors and bank-level characteristics and the effect of the length of a bank-firm lending relationship. Using matched data on firms, loans, and banks between 2013 and 2020, we can control for unobserved firm and bank characteristics to discern the unbiased estimates of the variables of interest.

The goal of this study is to answer the following research questions:

1. What are the firm-level determinants of loan prices?
2. Do bank-level characteristics affect the price of lending?
3. Do weak firms borrow from weak banks?

2. RELATED LITERATURE AND HYPOTHESES

We start with the observation that the loan interest rate charged by a bank to a borrower should reflect the borrower's risk characteristics and the bank's cost of funds. At the beginning of a lending relationship, the bank assesses the borrower's risks characteristics affecting the interest rate for the borrower. There is extensive literature showing that higher interest rates are charged to riskier firms such as smaller firms, those with low levels of tangible assets, less profitable businesses, and those with assets that have high information costs (see, for example, Strahan, 1999).

In this study, we explore 20 firm-level characteristics that might potentially affect the cost of borrowing for businesses. We can group these borrower characteristics observed by the bank in four categories: borrower size, borrower profitability, borrower indebtedness, and other characteristics. We

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hypothesize that *larger firms* tend to pay lower interest rates as they encounter less information asymmetry on the credit markets than small firms do. Also, larger firms usually have longer track records and are followed by more financial analysts. We also expect more *profitable* firms to pay lower interest rates as they might have lower probabilities of default compared to smaller firms. One of the indicators of the borrower's *indebtedness* is the borrower's observable default risk. Other relevant borrower characteristics include such variables as *tangible assets* where we hypothesize that firms with more tangible assets are likely to secure lower interest rates as more tangible assets may offer higher recovery values in default states.

Another important empirical question is whether the borrower's *industry* has any influence on the cost of borrowing. Our hypothesis comes from Valta (2012), who showed that banks charge significantly higher loan spreads to U.S. publicly traded firms in industries with the high product-level competition. We are interested in verifying whether the same correlation exists in Ukraine: firms in more competitive environments might face a higher interest rate because more competition might mean a higher likelihood of defaults on interest payments. Also, competition affects a firm's liquidation value. We use the Herfindahl-Hirschman Index (HHI) for every NACE 2-digit industry to measure its competitiveness.

However, banks can only partly monitor firms' characteristics, which causes information asymmetry. This may include adverse selection and a moral hazard problem. Banks might use different ways to handle information problems, and one of them is through *repeat lending*. There is extensive literature on the importance of firm-bank relationship for credit access for small borrowers (Petersen and Rajan, 1994; Berger and Udell, 1995; Chakraborty et al., 2010) as well as large publicly traded borrowers (Ivashina and Kovner, 2011; Karolyi, 2018). As a result of multiple interactions with a borrower, a bank learns private information about the borrower. As the literature suggests, benefits of repeat lending might be realized through "the ability to share sensitive information (Bhattacharya and Chiesa, 1995), more flexible contracts compared to public debt (Berlin and Mester, 1992), the ability to monitor collateral (Rajan and Winton, 1995), and the ability to smooth out loan pricing over multiple loans (Berlin and Mester, 1999)."

When studying determinants of loan interest rates, it is also essential to consider *loan-specific characteristics* that, according to the literature, affect interest rates (Graham, Li, and Qiu, 2008). They include loan size, loan maturity, the currency of a loan, and the characteristics of collateral. There might be economies of scale in bank lending, so that loan size is likely to be associated with lower interest rates. Loan maturity is expected to be associated with a lower interest rate as banks face greater uncertainty and higher credit risk in loans with long maturities. Collateral might be used in loan contracts for two reasons: adverse selection and moral hazard. In the adverse selection models, collateral may signal a better-quality borrower, suggesting that better borrowers post collateral to obtain lower interest rates on the loan (Bester, 1985; Besanko and Thakor, 1987). On the other hand, the moral hazard model suggests banks might require riskier borrowers to post collateral to compensate for possible risk of nonrepayment and increase incentives for monitoring (Berger and Udell, 1990; Jimenez et al., 2006; Francis et al., 2012).

We are further interested to know whether *bank-level characteristics* affect loan costs, keeping borrower characteristics constant. Specifically, we are interested to see whether firms that borrow from banks with weak capital face a higher cost of debt. Our key regressors are indicators of banks' strength. The main measure of bank strength is the regulatory capital ratio. Other bank characteristics may be relevant for lending. For this reason, we follow the literature when defining a set of bank controls for lending regressions such as bank size, several measures of bank profitability and effectiveness as well as bank liquidity (Khwaja and Mian, 2008; Iyer et al., 2014).

There is also evidence from the literature about the *sorting of firms according to banks*. For example, previous research shows that foreign banks tend to lend to transparent, large, and less risky borrowers and offer them lower lending rates. Dell'Ariccia and Marquez (2004) also suggest that foreign banks face considerable information disadvantages and target more transparent clients (relying on transaction-based lending). In contrast, domestic banks tend to lend to firms based on soft information (relationship lending) (Althammer and Haselmann, 2011). More recent studies such as Michelangeli et al. (2020) find evidence of borrower-lender assortative matching where safer banks have more credit relations with less risky firms.

In this study, we first examine whether borrower-lender assortative matching exists in the Ukrainian economy; if present, we document and quantify it. We further employ methodology (described in Section 3) to examine possible firm-bank matching when studying the relative importance of firm- and bank-level characteristics.

3. DATA AND METHODOLOGY

This paper uses data from Form No. 613 combined with the information on firm performance from the balance sheet, report on financial results, and National Bank of Ukraine supervisory statistics on bank performance. Our goal is to create monthly panel data of firm-loan-bank relationships between 2013 and 2020.

Bank-borrower-loan-level data come from Form No. 613 *Report on Risk Concentration under Bank Exposures to Counterparties and Insiders*, which is submitted by banks to the National Bank of Ukraine monthly. In this form, the banks list active operations for all the borrowers for which the total amount of all claims of a bank and financial liabilities is UAH 2 million, or more. The data contain information on the loan amount, maturity, currency of the loan, and loan terms, among others. The unit of observation is loan contract l of firm i at bank j month-year t. We restrict the sample to new loans only as we are primarily interested in the cost of new loans for businesses. We classify a loan as a new loan on a specific date if it is the first month when the loan appears in Form No. 613.

Bank-level data come from the National Bank of Ukraine supervisory statistics on bank performance available quarterly from 2013 to 2020. We match each month-year from Form No. 613 to the corresponding quarter-year in the bank-level data. We restrict banks only to those that were solvent as of January 2020 and drop PrivatBank as the inclusion of insolvent banks might distort the results given the poor quality of their reporting. Out of 185 ever registered banks in Ukraine, a mere 71 banks make it to our sample. Firm-level data come from the balance sheet and financial results report

annually from 2013 to 2019. For each firm, we take the values of economic variables as of the beginning of each year.

In total, our final sample consists of 141,525 new loan contracts corresponding to 13,612 distinct firms taking loans from 71 banks between 2013 and 2020.

Methodology and Variables

To test our hypotheses about the determinants of corporate loan pricing, we estimate the following model:

$$Interest_{ijlt} = \alpha_i + \beta_j + \kappa_t + \gamma X_{ilt} + \lambda R_{it\text{-}1} + \delta B_{jt} + \epsilon_{ijlt}, \quad (1)$$

where i, j and l index borrowers, banks, and loans, respectively, while t indicates month-year (e.g. January 2020). *Interest* is a natural logarithm of the interest rate charged by the bank j on the loan l for the borrower i. X represents nonprice loan characteristics such as currency of the loan, maturity, and loan size; R represents observed borrower risk characteristics, and B denotes bank-level characteristics that might affect the cost of loans for businesses. Borrower characteristics are measured as of the previous year to mitigate the possible impact of reverse causality. Both groups of variables are described below in detail. We also include month-year controls κ_t to consider aggregate shocks that affect all banks in month-year t. These include changes in the key policy rate, changes in a macroeconomic situation such as inflation, economic downturns as well as seasonal changes in interest rates, among others. We also control for NACE 2-digit industry-specific controls β_j capturing industry variation in the cost of loans. These unique data on loan-borrower-bank relationships on a monthly basis allow us to include these fixed effects and compare borrowers operating in the same 2-digit industry and receiving loan in the same month and year.

The estimation of (1) using the Ordinary Least Squares (OLS) model is based on the assumption that there is no correlation between observed loan, bank, and borrower characteristics and other factors that affect loan prices represented by the error term ϵ. The problem with this assumption is that unobserved borrower heterogeneity may introduce a nonzero correlation between the error term and the right-hand-side variables and lead to at least two estimation problems. First, if there is the correlation between the error term and loan characteristics X when, for example, a bank grants better loan terms to better firms, the estimates of loan characteristics $\hat{\gamma}$ will be biased upward. Second, sorting borrowers among banks according to private information might bias the estimate of bank effects $\hat{\delta}$ upward. Examples of such assortative borrower-bank matching include cases when firms with high unobserved risk tend to borrow from weak banks (Dell'Ariccia and Marquez, 2004), and foreign banks tend to lend to more transparent firms (Michelangeli et al., 2020). The richness of our data allows us to address potential unobserved borrower heterogeneity by the inclusion of borrower-level fixed effects α_i in some specifications.

Our loan-level characteristics X include loan size measured in the UAH equivalent, collateral value measured in the UAH equivalent, maturity measured in months, the loan currency (a dummy for the USD, euro, and other currency with loans in hryvnias as a base category), and the loan interest rate. All loan level characteristics are expressed as natural logarithms. Following Hasan et al. (2012), Francis et al. (2012), and others, we explore several firm characteristics that may affect the price of corporate loans in our analysis. These firm characteristics belong to four broad groups: borrower size, profitability, indebtedness, and other variables. Although we start with 20 borrower-level variables, our final regressions include only five of them as many of these variables are highly correlated and capture similar aspects of borrower risk. For example, initially, we look at five measures of borrower size such as total assets, revenue, gross profit, EBIT, and EBITDA, and only revenue makes it to the final regression. Similarly, we look at five measures of firm indebtedness, including net debt-to-asset, net debt-to-revenue, net debt-to-EBIT, net debt-to-EBITDA, and interest coverage ratios, but only net debt-to-EBIT and interest coverage ratios are included in the final estimation. Table A1 illustrates the correlations between 20 borrower characteristics initially explored.

In this paper, we measure the effect of firm size by *Log (Revenue)*, the natural logarithm of the firm's revenue in the previous year *t-1*. Previous literature shows that larger firms tend to secure lower interest rates as they suffer less from information asymmetries on the credit markets. Therefore, we expect to find a negative relationship between firm size and the interest rate. We proxy firm indebtedness with the *Interest Coverage Ratio* (ICR) measured as the ratio of EBIT to the net financial cost of the firm. Larger ICR values correspond to lower default risk, so we expect that borrowers with a higher ICR indicator will have lower interest rates. We also consider the borrower's *Tangibility* defined as the ratio of net property, plant, and equipment to total assets. We expect that firms with a higher share of tangible assets will enjoy a lower cost of borrowing, as tangible assets serve as a primary source of collateral thus are associated with the lower cost of financing. We also monitor the profitability of borrowers defined as the EBIT-to-revenue ratio. Finally, we include the *Current Ratio* (the ratio of current assets to current liabilities), which measures the borrower's ability to pay short-term liabilities with its short-term assets such as cash, inventory, and receivables. We expect that more profitable firms and firms with larger current ratios will have lower interest rates on corporate loans.

Following the literature, our regressions include bank characteristics that might affect the cost of credit. The first two measures – return on assets (ROA) and return on equity (ROE) represent bank profitability. We expect that borrowers who take loans at the more profitable banks will enjoy lower interest rates. We also consider regulatory capital ratio (H2) and liquidity ratios (H4, H5, H6).[2] Since there is a high correlation between some of the bank-level measures, we include only some of them in the final regressions. The share of nonperforming loans (NPLs) is another determinant of the corporate interest rate. It is important to note that the definition of NPLs changed during the sample period. Specifically, between 1 January 2013 and February 1, 2017, NPLs are measured by nonperforming exposures – exposures with payments past due 90+ days; individual exposures past due 30+ days with low counterparty financial class.[3] Starting 1 February 2017, NPLs are defaulted loans where default is determined by the fact of payments on assets past due 90+ days, or the inability of the borrower to repay the debt without repossession of collateral.[4]

[2] H2 denotes adequacy ratio of bank's regulatory capital while H4, H5, and H6 denote liquidity ratios: instant liquidity (H4), current liquidity (H5) and short-term liquidity (H6).
[3] From January 2013, nonperforming exposures are determined in accordance with NBU Board Resolution No. 23 dated 25 January 2012.
[4] From February 2017, NPLs are determined in accordance with NBU Board Resolution No. 351 dated 30 June 2016.

Before estimating determinants of corporate loan pricing, we document patterns for loan, borrower, and bank characteristics by the borrowers' size group. Using the definition of firm size provided in Article 55 of the Commercial Code of Ukraine, we split all borrowers into four groups based on their revenue measured in the euro equivalent. Table 1 shows that most of the new loans between 2013 and 2019 were taken by firms with revenue between EUR 2 million and EUR 50 million. The largest firms (whose revenue exceeds EUR 50 million) enjoyed the most loan contracts per firm: around 15 contracts compared to only two contracts per firm for the smallest size group. On average, larger firms had lower interest rates and took loans that were larger in size and shorter in maturity. As we move from the smallest to the larger size group, firms tend to have a higher level of indebtedness (measured by the ratio of net debt to EBIT) and tangibility.

Table 1. Average Loan and Firm Characteristics by Borrower Size

		Loan			Borrower		
Firm size	No. of loan contracts	Interest rate	Loan size	Maturity	Net debt/ EBIT	Tangibility	Prior relationship
<=2 mln	41,075	18.65	189.20	19.54	2.55	0.11	0
<=10 mln	48,310	18.15	183.30	13.15	2.64	0.17	1
<=50 mln	47,525	17.58	311.20	8.52	3.43	0.18	2
>50 mln	23,524	15.32	1,737.10	5.85	4.12	0.21	2

Note: Firm size, loan size, and net assets measured in the EUR equivalent for a given year.

Table 2 illustrates that, on average, larger firms tend to borrow from larger banks and banks with lower ROA and ROE. In addition, there is some evidence of the relationship between firm size and the capital adequacy ratio (H2) and liquidity ratios (H4 and H6): larger firms tend to borrow from banks with lower values of all three ratios; however, this does not hold for the largest size group.

Table 2. Average Bank Characteristics by Borrower Size

Firm size	Bank net assets	Bank ROA	Bank ROE	H2	H4	H6
<=2 mln	1,706	2.13	12.91	19.23	52.88	93.43
<=10 mln	1,845	1.56	6.98	18.93	50.14	91.38
<=50 mln	1,876	1.14	3.34	18.81	51.32	89.72
>50 mln	2,150	0.93	2.02	19.84	53.58	89.83

Note: Firm size, loan size, and net assets measured in the euro equivalent for a given year.

These numbers provide preliminary evidence of borrower-lender assortative matching that we will consider when estimating our regression models. However, this sorting is based on observable characteristics only and does not capture sorting that might arise from the matching of borrowers by their private information not observable to the bank. Also, these tables do not take into account the effects of macroeconomic conditions and other shocks that might partly drive this sorting. We will take into consideration both unobservable borrower characteristics and time effects when testing our hypothesis in the formal regression setting.

4. REGRESSION RESULTS

We start with using loan-level data to investigate loan-level determinants of corporate loan prices. The first three columns of Table 3 represent the results of the whole sample and illustrate that all loan characteristics have expected signs and are significant at the 1% level. These results show that larger loans face lower interest rates while loans with longer maturity tend to have a higher interest rate. This finding is consistent with Graham, Li, and Qiu (2008) and might indicate that banks face greater uncertainty and higher credit risk in loans with long maturities. Collateral value also has positive association with the interest rate implying that larger collateral might be used by Ukrainian banks to mitigate a moral hazard problem as suggested by the previous literature (Berger and Udell, 1990; Jimenez et al., 2006; Francis et al., 2012). As expected, currency matters for the pricing of loans, where loans in euros have the lowest interest rate, followed by loans denominated in U.S. dollars compared to loans in domestic currency. Depending on the specification, we probe into month-year and industry-related fixed effects.

Although these fixed effects change loan characteristics, making them smaller in magnitude, they have consistent signs and significance across the specifications. The estimate of the number of prior relations with a bank in our preferred specification presented in Column 3 suggests that on average, a history of lending relationships does not affect the interest rate. If we split the sample into two subsamples based on firm size, we find that number of prior relations is negatively associated with the interest rate charged to small firms while the effect for large firms is not significant. This finding is in line with the previous literature on the importance of the firm-bank relationship for credit access for small borrowers (Petersen and Rajan, 1994; Berger and Udell, 1995; Chakraborty et al., 2010). The results also suggest that collateral value has larger positive association with the interest rate among small firms compared to large firms suggesting that collateral might be used as insurance against a moral hazard problem among small firms to the larger extent than among large firms.

Table 3. Loan-Level Determinants of Loan Pricing

	(1)	(2)	(3)	(4)	(5)
	All borrowers			Large and medium borrowers	Small borrowers
Loan size	-0.049***	-0.027***	-0.025***	-0.018***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Maturity	0.033***	0.027***	0.029***	0.032***	0.019***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Collateral value	0.042***	0.017***	0.016***	0.012***	0.022***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
USD	-0.836***	-0.797***	-0.806***	-0.768***	-0.853***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.007)
Euro	-1.010***	-0.967***	-0.983***	-0.948***	-1.019***
	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)
Other currency	-0.238***	-0.161***	-0.178***	-0.117***	-0.295***
	(0.028)	(0.026)	(0.027)	(0.030)	(0.057)
Prior relations	0.028***	0.003***	-0.001	0.001	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month-year FE	No	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	Yes
N	141,525	141,525	141,523	71,873	69,650
R-squared	0.302	0.389	0.407	0.474	0.357

Note: Loan size, maturity, and collateral value are measured in natural logarithms. USD, Euro, and Other currency are dummies for currency of the loan, the Prior relations parameter measures the number of loan contracts in previous five years at a particular bank, Month-year Fixed Effects (FE) is a dummy for month and year of a loan contract. Standard errors in parentheses: *p<0.1; **p<0.05; ***p<0.01.

Although the regressions presented in Table 3 take into account a rich set of fixed effects, they do not consider the characteristics of the borrowers that take these loans. Excluding the borrowers' characteristics might be problematic if there is a selection of loans by the borrowers, as illustrated in Table 1, where large borrowers tend to take larger loans and those with shorter maturity. If we do not take this factor into consideration, our estimates of the loan characteristics will be biased. Indeed, as Table 4 shows, the inclusion of observable borrower characteristics lowers the magnitude of loan size, maturity, and currency coefficients across all specifications in the full sample. The results in our preferred specification (Column 3) suggest that doubling loan size is associated with a reduction in the interest rate by 1.5%.

Meanwhile, a twofold increase in maturity is associated on average with an interest rate increase of 2.3%. This implies that for an average loan in the sample with 12-month maturity and an average interest rate of 14.8%, our results suggest that an increase in maturity from 12 to 24 months will lead to an increase in the interest rate to 15.1% depending on industry-related and month-year effects.

Holding all other variables constant, the results suggest that compared to firms taking loans in domestic currency, firms receiving loans in U.S. dollars and in euros secure 79.4% and 97.8% lower interest rates, respectively. At the mean, this implies that compared to the cost of a loan in the Ukrainian hryvnia set at 14.8%, a corresponding U.S.-dollar loan of the same size taken by a borrower with the same observable characteristics in the same month-year will have an interest rate of 3.05%.

All borrower characteristics in Table 4 have expected signs consistent with the findings of recent studies such as Hale and Santos (2009) and Hasan et al. (2012). We find that the coefficient of borrower revenue is -0.025 and is significant at the 1% level, indicating that a 10% increase in the revenue translates into a 0.25% decrease in the interest rate. The current ratio and tangibility are also negatively associated with the interest rate: a one-unit increase in tangibility (from 0 to 1) is associated with a 4% reduction in the interest rate, while a one-unit increase in the current ratio is associated with a mere 0.1% decrease in the cost of corporate loans. Firm indebtedness as measured by the net debt-to-EBITA ratio is positively associated with the interest rate: an increase in firm indebtedness by two standard deviations (10 units) increases the interest rate by 0.3%. Finally, the HHI coefficient suggests that loans taken by firms which operate in less competitive industries bear a lower interest rate.[5] This result is consistent with Valta (2012) and indicates that Ukrainian firms in more competitive industries face a higher interest rate because more competition might mean higher default risk for interest payments.

The estimation results of large-/medium- and small-sized firms' samples suggest that both revenue and tangibility

[5] We focus on Column 2 to interpret HHI, as the effect indicated in Column 3 is absorbed in industry-year interactions partly capturing industry concentration in a given year.

Table 4. Loan and Borrower Determinants of Loan Pricing

	(1)	(2)	(3)	(4)	(5)	(6)
	All borrowers			Large and medium borrowers		Small borrowers
Loan size	-0.027***	-0.017***	-0.015***	-0.007***	-0.006***	-0.021***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Maturity	0.020***	0.019***	0.023***	0.030***	0.034***	0.017***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Collateral value	0.036***	0.017***	0.016***	0.010***	0.002	0.022***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
USD	-0.814***	-0.784***	-0.794***	-0.751***	-0.743***	-0.861***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.008)
Euro	-0.997***	-0.957***	-0.978***	-0.947***	-0.926***	-1.018***
	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)	(0.009)
Other currency	-0.185***	-0.126***	-0.148***	-0.087***	-0.084***	-0.294***
	(0.028)	(0.026)	(0.027)	(0.030)	(0.029)	(0.059)
Prior relations	0.035***	0.010***	0.005***	0.006***	0.004***	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Revenue	-0.039***	-0.024***	-0.025***	-0.034***	-0.033***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Current ratio	-0.002***	-0.002***	-0.001***	0.003***	0.003***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Tangibility	-0.100***	-0.064***	-0.044***	-0.071***	-0.091***	-0.026***
	(0.007)	(0.006)	(0.007)	(0.011)	(0.011)	(0.010)
Net debt/EBIT	0.002***	0.001***	0.000*	-0.001***		0.002***
	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)
ICR					-0.002***	
					(0.000)	
HHI	0.263***	-0.150***	0.002	-0.029	-0.080***	0.023
	(0.015)	(0.015)	(0.019)	(0.023)	(0.023)	(0.034)
Month-year FE	No	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	Yes	Yes
N	138,722	138,722	138,720	70,504	64,053	68,216
R-squared	0.313	0.390	0.408	0.476	0.510	0.356

Note: Loan size, maturity, and collateral value are measured in natural logarithms. USD, Euro, and Other currency are dummies for currency of the loan, the Prior relations parameter measures the number of loan contracts in previous five years at a particular bank, Month-year FE is a dummy for month and year of a loan contract. All firm-level controls are estimated in the year prior to the loan's initiation. Revenue is measured as a natural logarithm of revenue, all other variables are measured in absolute terms. Standard errors in parentheses: *p<0.1; **p<0.05; ***p<0.01.

matter more among large- and medium-sized firms. At the same time, indebtedness is a more crucial determinant among small firms if we compare the results with those of the full sample. Interestingly, firm indebtedness as measured by a net debt-to-EBIT ratio has a negative sign for large firms: one unit increase in the net debt-to-EBIT ratio is associated with a 0.1% decrease in the interest rate. This means that large firms that have higher debts enjoy a lower interest rate compared to similar firms with a lower net debt-to-EBIT[6] ratio. If we measure indebtedness with the interest coverage ratio, we find that one unit increase in the ICR is associated with a 0.2% decrease in the average interest rate. This means that firms with larger EBITDA-to-financial-cost ratios enjoy, on average, a lower interest rate.[7] Also, industry concentration does not have any effect on the interest rate charged to small firms.

Our final empirical question is about the extent to which bank characteristics affect the prices of a loan if we take into account the loan and borrower characteristics.[8] To illustrate the importance of examining the borrower and loan composition, we start our estimation with bank characteristics only. The results of this estimation are reported in Column 1 of Table 5 and suggest that with due regard for month-year

[6] Results on indebtedness hold if we alternatively use debt-to-EBITDA ratios available for large- and medium-firms only.
[7] Because results on two indebtedness measures for medium/large firms are not consistent, further research is needed to understand the mechanism of how they affect the corporate loan interest rate in Ukraine.
[8] Note that these regressions are based on the Q1 2013-Q3 2019 sample as NBU ceased calculation and publication of H4 in September 2019 (this liquidity ratio was replaced by the ICR) and we thus cannot estimate regressions for this period consistently.

Table 5. Bank Determinants of Loan Pricing

	(1)	(2)	(3)	(4)
Bank ROA	-0.005***	-0.006***	-0.005***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity ratio	-0.101***	-0.016***	-0.004	0.007
	(0.005)	(0.004)	(0.004)	(0.004)
Bank assets	-0.028***	-0.039***	-0.039***	-0.024***
	(0.002)	(0.001)	(0.001)	(0.002)
% of NPLs	0.379***	0.213***	0.210***	0.102***
	(0.013)	(0.011)	(0.011)	(0.014)
Loan size		-0.029***	-0.018***	0.003**
		(0.001)	(0.001)	(0.001)
Maturity		0.030***	0.026***	0.028***
		(0.001)	(0.001)	(0.001)
Collateral value		0.020***	0.019***	0.003**
		(0.001)	(0.001)	(0.001)
USD		-0.778***	-0.777***	-0.741***
		(0.004)	(0.004)	(0.005)
Euro		-0.956***	-0.976***	-0.891***
		(0.006)	(0.006)	(0.007)
Other currency		-0.142***	-0.129***	-0.175***
		(0.023)	(0.024)	(0.023)
Prior relations			0.007***	0.025***
			(0.001)	(0.001)
Revenue			-0.021***	-0.003
			(0.001)	(0.003)
Net debt/EBIT			-0.000	0.001**
			(0.000)	(0.000)
Current ratio			-0.000	-0.000
			(0.000)	(0.000)
Tangibility			-0.007	0.115***
			(0.006)	(0.012)
HHI			0.034**	-0.093***
			(0.017)	(0.015)
Month-year FE	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Firm FE	No	No	No	Yes
N	144,969	124,251	121,479	121,481
R-squared	0.140	0.438	0.461	0.368

Note: Loan size, maturity, and collateral value are measured in natural logarithms. USD, Euro, and Other currency are dummies for the currency of the loan, the Prior relations parameter measures the number of loan contracts in previous five years at a particular bank, Month-year FE is a dummy for month and year of a loan contract. All firm-level controls are estimated in the year prior to the loan's initiation. Revenue is measured as a natural logarithm of revenue, all other variables are measured in absolute terms. A bank's ROA is measured in absolute terms, a liquidity ratio (H4) and bank assets are measured in logs. Percent of NPLs is measured as a share of NPLs in total loans issued to legal entities and individuals. Standard errors in parentheses: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

fixed effects, loans initiated at banks with lower ROA were associated with a lower interest rate. Also, stronger banks, as measured by the liquidity ratio, offered lower interest rates than those with lower values of these requirements. Loans initiated at large banks as measured by net bank assets and banks with lower NPL ratios were associated with a lower interest rate.

In Columns 2 and 3, we introduce controls for loan and borrower compositions of the banks, respectively. All coefficients stay significant and have comparable magnitude except for the liquidity ratio: its magnitude decreases from -0.016 to -0.005 and becomes insignificant. A slight change in other coefficients confirms the direction of the selection presented in Tables 1 and 2. Finally, if we expand

unobservable borrower characteristics by adding borrower-level fixed effects, we see that the magnitude of all bank controls decreases in absolute terms. It is important to note that a bank's effect is determined by the change of the bank's characteristics within the same firm. These results suggest that once we include loan characteristics, observable borrower characteristics and unobservable borrower attributes that are fixed over time, the effect of bank controls decreases and even disappears (for the liquidity ratio). The interpretation of the bank controls suggests that an increase in bank ROA by one unit is associated with a decrease in the interest rate by 0.3%. Meanwhile, doubling net bank assets leads to a reduction in the interest rate by 2.4%. A change of the NPL ratio from 0 to 1 (change from the minimum to maximum value in an extreme case) increases the corporate interest rate by 10%.[9]

5. CONCLUSIONS

This paper estimates the effect of loan, borrower, and bank characteristics on the corporate loan prices in Ukraine using rich loan-borrower-bank monthly panel data from 2013 and 2020 combined with the data from borrowers' financial statements. Examining an extensive set of fixed effects, we find that larger loans, loans with a shorter maturity period and larger collateral value have lower interest rates even after controlling for borrower characteristics. We also find that larger borrowers, borrowers with more tangible assets, lower indebtedness, and a higher interest coverage ratio who operate in concentrated industries secure lower interest rates. Our results suggest some preliminary evidence of the role of repeat lending for small borrowers. We also estimate the role of banks' health in the cost of corporate loans. Our findings suggest that it is crucial to control loan and borrower characteristics when estimating the effects of banks' health on the loan interest rate. We find that larger, more profitable banks and those with a smaller share of NPLs tend to offer lower interest rates even when we look into the loan and borrower composition of a particular bank.

[9] These results are also robust to the inclusion of a bank's cost-to-income-ratio (CIR) as an additional bank-level determinant of a corporate loan interest rate. The sign of CIR is as expected, but this coefficient is not significant across the specifications.

REFERENCES

Althammer, W., Haselmann, R. (2011). Explaining foreign bank entrance in emerging markets. Journal of Comparative Economics, 39(4), 486-498. https://doi.org/10.1016/j.jce.2011.03.002

Berger, A. N., Udell, G. F. (1990). Collateral, loan quality and bank risk. Journal of Monetary Economics, 25(1), 21-42. https://doi.org/10.1016/0304-3932(90)90042-3

Berlin, M., Mester, L. J. (1992). Debt covenants and renegotiation. Journal of Financial Intermediation, 2(2). 95-133. https://doi.org/10.1016/1042-9573(92)90005-X

Berlin, M., Mester, L. J. (1999). Deposits and relationship lending. The Review of Financial Studies, 12(3), 579-607. https://doi.org/10.1093/revfin/12.3.0579

Besanko, D., Thakor, A. V. (1987). Collateral and rationing: sorting equilibria in monopolistic and competitive credit markets. International economic review, 28(3), 671-689. https://doi.org/10.2307/2526573

Bester, H. (1985). Screening vs. rationing in credit markets with imperfect information. The American economic review, 75(4), 850-855. https://doi.org/10.1006/jfin.1995.1014

Bhattacharya, S., Chiesa, G. (1995). Proprietary information, financial intermediation, and research incentives. Journal of Financial Intermediation, 4(4), 328-357.

Botsch, M., Vanasco, V. (2019). Learning by lending. Journal of Financial Intermediation, 37, 1-14. https://doi.org/10.1016/j.jfi.2018.03.002

Dell'Ariccia, G., Marquez, R. (2004). Information and bank credit allocation. Journal of Financial Economics, 72(1), 185-214. https://doi.org/10.1016/S0304-405X(03)00210-1

Francis, J., LaFond, R., Olsson, P. M., Schipper, K. (2004). Costs of equity and earnings attributes. The Accounting Review, 79(4). 967-1010. https://www.jstor.org/stable/4093083

Graham, J. R., Li, S., Qiu, J. (2008) Corporate misreporting and bank loan contracting. Journal of Financial Economics, 89(1), 44-61. https://doi.org/10.1016/j.jfineco.2007.08.005

Hubbard, R. G., Kuttner, K. N., Palia, D. N. (2002). Are there bank effects in borrowers' costs of funds? Evidence from a matched sample of borrowers and banks. The Journal of Business, 75(4), 559-581. https://doi.org/10.1086/341635

Iyer, R., Peydró, J.-L., da-Rocha-Lopes, S., Schoar, A. (2014). Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007–2009 crisis. The Review of Financial Studies, (27, 1), 347-372. https://doi.org/10.1093/rfs/hht056

Jimenez, G., Salas, V., Saurina, J. (2006). Determinants of collateral. Journal of financial economics, 81(2). 255-281. https://doi.org/10.1016/j.jfineco.2005.06.003

Khwaja, A. I., Mian, A. (2008). Tracing the impact of bank liquidity shocks: Evidence from an emerging market. American Economic Review, 98(4), 1413-1442. https://doi.org/10.1257/aer.98.4.1413

La Porta, R., Lopez-de-Silanes, F., Zamarripa, G. (2003). Related lending. The Quarterly Journal of Economics, 118(1), 231-268. https://doi.org/10.1162/00335530360535199

Michelangeli, V., Peydro, J.-L., Sette, E. (2020). Credit demand vs. supply channels: Experimental-and administrative-based evidence. Economic Working Paper, 1731. Barcelona: Universitat Pompeu Fabra. Retrieved from https://econ-papers.upf.edu/papers/1731.pdf

Rajan, R., Winton, A. (1995). Covenants and collateral as incentives to monitor. The Journal of Finance, (50, 4), 1113-1146. https://doi.org/10.1111/j.1540-6261.1995.tb04052.x

Strahan, P. E. (1999). Borrower risk and the price and nonprice terms of bank loans. FRB of New York Staff Report, 90. https://doi.org/10.2139/ssrn.192769

Valta, P. (2012). Competition and the cost of debt. Journal of Financial Economics, 105(3), 661-682. https://doi.org/10.1016/j.jfineco.2012.04.004

APPENDIX A

Table A1. Correlation Eable: Borrower Characteristics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 Assets	1.00																		
2 Revenue	0.55	1.00																	
3 EBIT	0.20	0.35	1.00																
4 EBITDA	0.49	0.45	0.90	1.00															
5 Gross profit	0.41	0.78	0.61	0.63	1.00														
6 EBIT/Assets	0.00	0.00	0.00	0.00	0.01	1.00													
7 EBIT/Margin	-0.02	-0.01	0.13	0.11	0.05	0.02	1.00												
8 EBITDA/Assets	0.00	0.00	0.00	0.00	0.00	1.00	0.01	1.00											
9 EBITDA/Margin	0.02	-0.03	0.11	0.12	0.03	0.02	0.95	0.01	1.00										
10 Profit/Margin	-0.02	-0.03	0.09	0.08	0.11	0.00	0.37	0.00	0.38	1.00									
11 Tangibility	0.07	-0.03	0.03	0.09	0.02	0.00	0.13	0.00	0.27	0.10	1.00								
12 Net debt/Assets	-0.02	-0.05	-0.03	-0.04	-0.07	-0.01	-0.10	-0.01	-0.11	-0.05	0.01	1.00							
13 Net debt/Margin	0.09	-0.05	-0.03	0.01	-0.05	0.00	-0.14	0.00	-0.02	0.14	0.18	0.49	1.00						
14 Net debt/EBITDA	0.01	0.03	-0.02	-0.01	0.00	0.00	-0.06	0.00	-0.06	-0.03	-0.02	0.11	0.08	1.00					
15 Net debt/EBIT	0.05	0.01	-0.06	-0.04	-0.04	-0.01	-0.23	0.00	-0.20	-0.11	0.04	0.40	0.34	0.12	1.00				
16 Interest coverage	0.02	-0.01	0.03	0.05	0.04	0.00	0.27	0.00	0.30	0.23	0.18	-0.30	-0.13	-0.06	-0.21	1.00			
17 Quick ratio	0.02	-0.12	-0.01	0.01	-0.10	0.00	0.27	-0.01	0.33	0.17	0.37	-0.42	-0.10	-0.07	-0.24	0.34	1.00		
18 Equity ratio	-0.03	-0.10	-0.03	-0.04	-0.10	0.00	0.19	0.00	0.21	0.14	0.07	-0.15	-0.04	-0.03	-0.12	0.23	0.52	1.00	
19 Payables turnover	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.01	0.00	0.03	0.00	0.01	0.00	0.00	0.00	1.00
20 Inventories turnover	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.07	0.00	-0.01	0.02	0.00	0.00	0.02	0.01	0.01	0.65