Corporate stress and bank nonperforming loans in emerging markets

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February 14, 2021

Abstract

In principle, an increase in corporate stress should be associated with an increase in bank nonperforming loans. However, first using a cross-country sample, we show that there is no correlation between these two measures in emerging market economies while there is positive correlation for advanced economies. Second, using detailed Pakistani credit registry data, we tease out how firms and banks react to nonperforming loans. Relative to other explanations, we find strong evidence that banks with lower capital ratios delay recognizing nonperforming loans while simultaneously reducing their exposure to such firms.

JEL Classification: G21, G33
Keywords: Credit markets, banks, corporate debt, evergreening, nonperforming loans.

*We would like to thank Ryan Banerjee, Bastian von Beschwitz, Mark Carey, Stijn Claessens, Ricardo Correa, Leonardo Gambarcorta, Yesol Huh, Christopher Karlsten, Logan Lewis, Annie McCrone, Camelia Minoiu, and seminar participants at the Bank for International Settlements (BIS), the Graduate Institute of International and Development Studies, and the International Finance and Banking Society for helpful comments. Anil Jain is grateful to the BIS, who provided substantial support through the BIS Central Bank Fellowship program. The findings and conclusions in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System, the views of any other person associated with the Federal Reserve System, or the State Bank of Pakistan. A previous of this paper was called "Bank lending to (zombie?) firms."

1 Introduction

The rapid growth in corporate debt in recent years suggests that a downturn in corporate health would pose a major financial risk for both firms and banks. Indeed, given the large share of bank corporate lending, you might expect that an increase in corporate stress, as measured by debt-at-risk, would be associated with rising bank nonperforming loans—especially in economies with small capital markets.[1] To the contrary, we find that the correlation between these two measures for emerging market economies is almost zero and significantly different from the correlation for advanced economies.

We start by documenting this surprising lack of correlation between corporate debt-at-risk and bank nonperforming loans in both a macro dataset (cross-country panel data) and a rich micro dataset (a unique merged firm-bank dataset that contains both corporate balance sheet data and the firm's bank loans). Our macro dataset demonstrates that this lack of correlation is a consistent feature across many emerging market economies over time, but crucially not for advanced economies.

What is causing this low correlation? Using our macro dataset, we first rule out many methodological explanations, such as volatile corporate earnings, a non-contemporaneous relationship between the two measures, bank lending to households, as well as firm investment and growth strategies.

Using our micro dataset, we provide partial evidence that this lack of correlation in emerging markets is caused by banks delaying the recognition of their nonperforming loans. Specifically, using an empirical strategy similar to Khwaja and Mian [2008], we isolate characteristics of bank lending by analyzing firms that receive multiple loans from different banks. We find that those banks with low leverage ratios are both significantly slower and less likely to recognize a loan as overdue than other banks. Moreover, we find suggestive evidence that this lack of recognition impedes loan curing, with banks with low leverage ratios reporting significantly higher final default rates than other banks for the same borrower (even after controlling for differences in loan terms). Our empirical findings are consistent with the theoretical prediction that classifying a nonperforming loan is more expensive for banks with less capital. By masking the status of a loan, banks reduce the required loan loss provisions, consequently artificially maintaining higher regulatory capital

[1] We define corporate debt-at-risk as the fraction of corporate debt for which a firm's earnings before interest, taxes, debt expense, and amortization (EBITDA) is less than their total debt expense.

and leverage ratios (Bushman and Williams [2015]). In turn, this potentially allows the bank to avoid raising new, costly, external financing and attract additional regulatory scrutiny.

Moreover, using our microdata, we examine whether there are other possible theoretical explanations for slower nonperforming loan recognition by banks with low leverage ratios. We examine three possibilities. First, do firms prefer to repay banks with lower leverage ratios more than other banks? For instance, due to more favorable lending terms. Second, do banks with low leverage ratios monitor their loans less, and consequently have higher loan defaults (Holmstrom and Tirole [1997], Allen et al. [2011], Mehran and Thakor [2011])? Third, did banks with low leverage ratios utilize superior information and efficiently forbear their loans to firms (Rajan [1992])? We do not find strong evidence to support any of these alternative explanations.

Finally, we follow the time-path of firm borrowing and bank lending. We first show that following an overdue loan, the number of bank lenders and the total amount of bank loans dramatically falls. Second, we show that banks with low leverage ratios did not increase their share of lending to distressed firms relative to other banks, but rather, reduced total lending to these firms.

What are the welfare implications of delaying the recognition of nonperforming loans? Theoretically, the implications are ambiguous. On one hand, if a borrower faces temporary liquidity shocks but is financially solvent, a lender providing additional funds and forbearing the initial loan can be both productive and welfare-improving (Tracey [2019] and Brunnermeier and Krishnamurthy [2020a]). For instance, Fukuda and Nakamura [2011] argue that Japanese banks were successful in reviving "zombie firms" and avoiding bankruptcy. Moreover, in response to the large financial shock stemming from the COVID-19 pandemic, many international regulators have promoted loan and regulatory forbearance (Financial Stability Board [2020]) with some arguing that banks should do *more* evergreening (Schivardi et al. [2020] and Brunnermeier and Krishnamurthy [2020b]).

On the other hand, there is substantial theoretical and empirical literature describing the negative effects of zombie lending. Increased bank lending to insolvent firms reduces bank profitability and increases financial stability risks (Blattner et al. [2019]). Moreover, the effects of zombie lending extend far beyond the direct banks and firms involved. Caballero et al. [2008], Kwon et al. [2015] structurally model how zombie lending in Japan caused a severe misallocation of capital by simultaneously propping up inefficient and unproductive firms while starving new, potentially more productive firms of venture capital, thereby distorting the allocative role of prices and subsequent

decisions on employment and investment.

Incomplete information on the true nature of banks' asset quality has financial stability implications. Indeed, banks that under-provision may have insufficient buffers for losses on their loan portfolio, and in extreme cases, insufficient capital. Moreover, a loss of confidence in banks' asset quality and a mere reduction in the credibility in banks' reported asset quality, can substantially undermine trust in already underdeveloped financial system, as depositors, investors, and bond holders withdraw funding to banks.

Our paper contributes to the large literature on such "zombie lending", also known as "evergreening." Zombie lending has been defined variously as lending to firms with negative profits (McGowan et al. [2017], Banerjee and Hofmann [2018]), subsidizing credit (Caballero et al. [2008], Fukuda and Nakamura [2011], Kwon et al. [2015], Acharya et al. [2019]), or lending to firms with low expected future growth rates (Banerjee and Hofmann [2018]). Similar to the definition of zombie lending in McGowan et al. [2017] and Banerjee and Hofmann [2018], in our paper we analyze corporate debt-at-risk using firms with negative profits—specifically, firms with interest coverage ratios below 1.[2] Using our macro dataset we compare measures of zombie firms from corporate balance sheet data to regulatory measures of bank asset quality. Moreover, in our micro dataset, we identify zombie lending by showing systemic differences in delayed loan recognition by banks with low leverage ratios relative to other banks.

We present evidence that banks are motivated to zombie lend due to incentives to ration scarce bank capital (similar to Peek and Rosengren [2005], Storz et al. [2017], Caballero et al. [2008], Acharya et al. [2019], Bonfim et al. [2020]). However, there a number of additional theoretical motivations for zombie lending. Rajan [1994] theoretically and Hertzberg et al. [2010] and Tantri [2021] empirically demonstrate how principal-agent problems, specifically career concerns, can facilitate zombie lending. Bruche and Llobet [2014] show that zombie lending can be an outcome of insolvent banks "gambling for resurrection". Hu and Varas [2020] theoretically show how banks may continue to lend to unprofitable firms due to the prospect of future market financing.

Zombie lending has been found to be pervasive with evidence cited in many different economies—both advanced and emerging market—for example, the "savings and loan crisis" in the United States (Kane [1989]); the Japanese banking crisis in the 1990s (Peek and Rosengren [2005], Ca-

[2] An interest coverage ratio below 1 is defined as a firm's earnings before interest, taxes, depreciation, amortization, or EBITDA, is less than the firm's debt expense.

ballero et al. [2008] and Giannetti and Simonov [2013]); European banks (Acharya et al. [2019]) and Italian banks (Schivardi et al. [2017] following the Great Financial Crisis); Indian rural lenders (Tantri [2021]); and in Argentina (Hertzberg et al. [2010]). Two recent papers have also documented the growth in the fraction of zombie firms, suggesting that zombie lending may be rising. McGowan et al. [2017] document increases in the share of zombie firms since the mid-2000s in nine advanced economies and Banerjee and Hofmann [2018] show an increase in zombie firms in fourteen advanced economies since the early 1980s.

By analysing the time-path of nonperforming loans (from performing, to overdue, to eventual potential default), we contribute to a nascent literature that is starting to examine in more detail the dynamics of nonperforming loan formation and resolution (Laeven and Valencia [2013, 2018], Ari et al. [2019]). To some extent, we are analyzing the dynamics of bank lending to zombie firms, in the way that Banerjee et al. [2020] analyse the path of zombie firms.

The main implication of our research is that although corporate debt-at-risk is a useful gauge for learning about bank asset quality, policymakers should be wary about assuming that corporate debt-at-risk is a strong predictor of bank nonperforming loans and future bank losses.

The rest of the paper is organized as follows: Section (2) examines how aggregate measures of corporate debt-at-risk and bank nonperforming loans are related; Section (3) analyzes the relationship between corporate debt-at-risk and bank nonperforming loans more directly by using a unique dataset of Pakistani firms that matches the firm's balance sheet data with its underlying bank loans; Section (4) provides robustness to alternative explanations and provides additional sensitivity checks. Finally, Section (5) concludes.

2 Cross-country regressions

In this section we utilize aggregate measures of corporate debt-at-risk and bank nonperforming loans across countries to examine the relationship between corporate profitability and bank asset quality. We start by outlining our data sources used for the project. Next, we visually demonstrate that there is zero correlation between these measures for emerging market economies, yet some correlation for advanced economies. In section (4), we show that this lack of correlation is robust to a number of candidate explanations.

2.1 Data

To examine the aggregate relationship between a country's corporate debt and banks' nonperforming loans, we use two different data sources: a panel dataset of corporate balance sheets and a panel dataset of banks' balance sheets. For our variables of interest, we collect data between 2005 and 2015 for a total of 44 economies, and categorize these economies into advanced economies and emerging market economies according to the IMF's World Economic Outlook Report (2005).[3]

We use S&P's Capital IQ database to collect data on firms' balance sheets, a dataset that is being used more frequently in the corporate finance literature with recent papers including Adams and Kirchmaier [2016], Berg et al. [2016], and Choi et al. [2018]. Two particular advantages of this dataset are that it includes firm information for both private and public firms, as well as an international set of firms. In our setting, we are interested in the following variables: total debt (short-term and long-term), total assets, total interest expense, return on assets, capital expenditure, and profits (measured using earnings before interest, tax, depreciation, and amortization, or EBITDA for short). We limit analysis to countries with at least 100 firms with data for EBITDA and debt expense. Overall, the total amount of corporate debt collected for the countries in our sample is quite high—the median total corporate debt observed in Capital IQ to total corporate debt reported by the IMF is 36 percent in 2012. The median firm in our dataset is large (total assets around $190 million USD), and moderately levered (total assets divided by total equity is just under 2), yet 27 percent of firms have earnings that are less than their total debt expense.

To collect data on bank's nonperforming loans, we utilize the widely used Bankscope dataset. Using this dataset, we calculate the aggregate nonperforming loan ratio (aggregate nonperforming loans divided by aggregate total loans by commercial banks) for each country for each year. A recurring issue when comparing nonperforming loan ratios is that the definition of a nonperforming loan is not standard across countries. To partially alleviate this concern we include a country fixed effect in our preferred specification.[4] The inclusion of a country fixed effect controls for

[3] We classify the following 23 countries as advanced: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom, and the United States. We classify the following 21 countries as emerging market economies: Argentina, Bangladesh, Brazil, Chile, China, Egypt, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, South Africa, Sri Lanka, Thailand, Turkey, and Vietnam.

[4] As an additional robustness check, we also used the IMF Financial Soundness Indicators to collect data on bank nonperforming ratios at the country level (that is, the IMF FSI includes country-level nonperforming loan ratios as opposed to Bankscope dataset that provides bank-level nonperforming loan ratios that we subsequently aggregate). The IMF FSI has less banking sector coverage than Bankscope but the aggregate nonperforming loan ratios are similar

(time-invariant) country-specific variation. Table (1) reports summary statistics for the combined Bankscope and Capital IQ datasets.

Table 1: Summary statistics for panel aggregate country nonperforming loan and interest coverage ratio data (2012)

	Obs.	Median	Mean	Std. Dev.
NPL Ratio	44	0.03	0.04	0.05
Debt with ICR below 0.5	44	0.05	0.06	0.06
Debt with ICR below 1	44	0.06	0.09	0.07
Debt with ICR below 2	44	0.17	0.21	0.13
Fraction of Corporate Debt in Capital IQ	34	0.36	0.39	0.22
Fraction of Loans to Corporates	33	0.36	0.36	0.18
Observations	44			

This table reports summary statistics for the combined S&P Capital IQ and Bankscope datasets for 2012, where the variable "fraction of corporate debt in Capital IQ' is calculated by dividing the sum of all a country's corporate debt in Capital IQ by the total corporate debt reported by the IMF and the variable "fraction of loans to corporates" is reported by the IMF Financial Soundness Indicators.

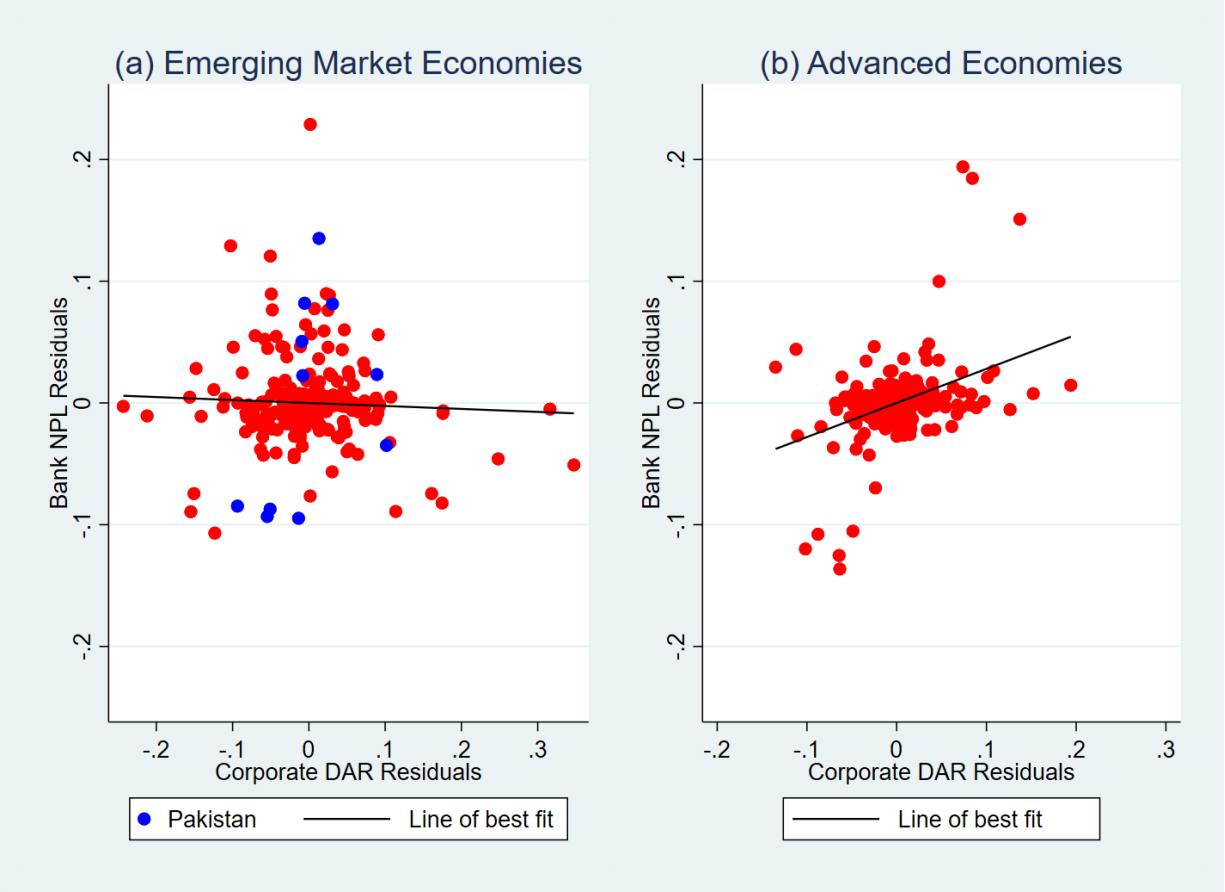
2.2 Correlation

To start, we show clear evidence that there is zero correlation between corporate debt-at-risk and aggregate bank nonperforming loan ratios for emerging market economies, but that there is positive correlation for advanced economies. In figure (1), we plot the partial correlation between corporate debt-at-risk and bank nonperforming loans (after partialling out country and year fixed effects). Each dot is a country-year observation. For emerging market economies, the left-panel, this figure shows that the estimated relation between corporate debt-at-risk and bank nonperforming loans is extremely weak and negative. However, for advanced economies, in the right-panel, we see a relatively stronger and positive relationship between these two measures.

Finally, in the left panel of figure (1), we also highlight Pakistan (denoted by blue dots)—the country on which we focus on in the next section—has a similar trend as other emerging market economies in our sample.

across both datasets.

Figure 1: For emerging market economies there is zero correlation between bank nonperforming loan ratios and corporate debt-at-risk.



Each dot is a country-year observation plotting a country's debt-at-risk and bank nonperforming loan ratio after partialling out country and time fixed effects. The figure plots data for a total of 44 countries between the years 2005 and 2015. The black line plots the line of best fit. The sample is split into 21 emerging market economies (left panel) and 23 advanced economies (right panel). After controlling for country and time fixed effects, the estimated relationship between corporate debt-at-risk and bank nonperforming loans in emerging markets is extremely weak (and negative). Given that the next section focuses on Pakistan, observations for Pakistan are highlighted in blue.

To complete the evidence for the lack of an empirical relationship between corporate debt-at-risk and bank nonperforming loans, in table (2), we regress bank nonperforming loans on corporate debt-at-risk. Specifically, we run the following regressions:

$$NPL_{ct} = \beta_1 \text{Debt with ICR below 1}_{ct} + \beta_2 \text{EME}_c \times \text{Debt with ICR below 1}_{ct} + \beta_3 \times \text{controls}_{ct} + \epsilon_{ct} \quad (1)$$

where "NPL_{ct} "is the ratio of bank nonperforming loans for country c in year t; "Debt with ICR below 1" is the fraction of corporate debt with interest coverage ratio below 1 for country c in year t; and "EME_c" is a dummy variable equal to one if the country is an emerging market economy. In column 1, a dummy variable for whether the country is a emerging market economy is the sole control variable, whereas in column 2, both country and time fixed effects are included. Our preferred specification includes country and time fixed effects (column 2) because this specification controls for country and time specific trends in our data, for instance some countries may have higher nonperforming loan ratios during our sample. For interpretation, summing the estimated coefficients β_1 and β_2 is the estimated association of a 1 percent rise in an EME's ratio of corporate debt with ICR below 1 on bank NPL ratios. Further β_2 estimates the relative difference between this association between advanced economies and emerging market economies.

The results show that the estimated relationship between corporate debt-at-risk and bank nonperforming loans is almost zero for emerging market economies. In our preferred specification, which includes country and time fixed effects, our results show that a 1 percent rise in corporate debt-at-risk is associated with a 0.05 percentage point *decline* in banks' nonperforming loan ratio in EMEs; an association going the wrong way.[5]

This lack of correlation between corporate debt-at-risk and bank nonperforming loans is robust to a number of different potential explanations, that are detailed in section (4) and the results are presented in the appendix. First, by averaging firm's earnings and debt expense over a number of years, table (22) shows that this lack of correlation is not caused by volatile firm earnings. Second, by lagging our indicator for corporate debt-at-risk, table (23) shows that this lack of correlation is not caused by corporate debt-at-risk being a leading indicator. Third, by examining firm capital expenditure and firm asset growth, tables (24) and (25) show that firms in emerging markets with interest coverage ratios below 1 were neither spending relatively more on capital expenditure, nor growing relatively faster suggesting that unprofitable firms in emerging markets were not "in-

[5]The calculated estimated effect of a 1 percent rise in corporate debt-at-risk for EMEs is completed by, in column 2, adding the estimated coefficient for "Debt with ICR below 1" (0.287) to the estimated coefficient for "EME X Debt with ICR below 1" (-0.333), which gives an estimate of -0.05 percentage points.

vesting for growth". Fourth, by examining the fraction of bank lending to corporations, table (26) shows that this lack of correlation is not caused by large lending to households or governments. Finally, by restricting our dataset to countries where Capital IQ captures at least 30 percent of total corporate debt, in table (27), we show that this result is not caused by a lack of representative corporate data.[6]

Table 2: Is there a correlation between bank nonperforming loans and corporate debt-at-risk?

	(1) NPL	(2) NPL
Debt with ICR below 1	0.348***	0.287***
	(0.109)	(0.0906)
EME X Debt with ICR below 1	-0.281**	-0.333***
	(0.116)	(0.0999)
EME country	0.0386***	
	(0.00768)	
Observations	468	468
Country FEs	No	Yes
Date FEs	No	Yes
ymean	0.043	0.043

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Debt with ICR below 1 is the fraction of corporate debt in country c at time t that has an interest coverage ratio (ICR) below 1. EME refers to an emerging market economy. More details on the variable definitions are provided in table (21).

3 Pakistan analysis

In this section, we directly examine the potential relationship between bank nonperforming loans and corporate debt-at-risk, and the possibility of bank evergreening, using Pakistani microdata. To do so, first, in section (3.1), we introduce our data sources that include Pakistan's corporate credit registry. Second, in section (3.2), we directly show there is weak correspondence between bank nonperforming loans and debt-at-risk at the firm-bank level. Third, in section (3.3), we show

[6]Specifically, we compare the total amount of debt reported by Capital IQ to the total amount of corporate debt reported by the IMF.

evidence that banks with low leverage ratios were delaying the recognition of nonperforming loans and rule out alternative explanations.

3.1 Data

In this section we utilize two key sources of data covering the period 2007-2012: (i) data on the universe of all Pakistani corporate loans from the Pakistan's central bank, the State Bank of Pakistan, and (ii) balance sheet and income data on Pakistani firms from the Capital IQ dataset that was introduced in section (2).

Pakistan's credit registry contains the universe of all corporate loans from all officially designated financial institutions in Pakistan, including loans from public banks, private banks, Islamic banks, and non-bank financial institutions such as trust lenders and leasing companies.[7] The data includes key information on firm loans, including information on the lender, the loan size, whether the loan is secured, and the performance status of the loan. The credit registry also contains information on interest rates and the maturity dates of loans, but data on these variables is sometimes missing for some firms. This dataset has been used in numerous papers including Khwaja and Mian [2005], Khwaja and Mian [2008], Choudhary and Limodio [2017], and Choudhary and Jain [2020].

We use this credit registry dataset in two ways. In section (3.2), we merge credit registry data with data on Pakistani firms' balance sheet and profit data from Capital IQ. Over the time period examined, this merged panel dataset includes 286 firms and 3,233 unique firm-bank pairs.[8] Using this dataset we directly test for correlation between changes in firm's interest coverage ratio and nonperforming loan status—similar to the tests in section (2) but using microdata. Tables (3) and (4) report summary statistics for the combined firm-bank loan dataset for the final quarter of our dataset 2012:Q4. This combined dataset represents a large proportion of outstanding corporate debt—over 20 percent of total corporate bank loans—but only includes the largest firms (median firm debt is close to USD $10 million) and the largest bank loans (median loan size is over USD $1 million). This merged dataset is at the annual level.

[7] For ease of exposition, we refer to all financial institutions as "banks", unless otherwise stated.

[8] Not all of these firm-bank pairs were active simultaneously; these firms had a median of 6 different lenders in 2012:Q4.

Table 3: Summary statistics for merged Capital IQ and credit registry data for Pakistani firm's loans that were borrowing in 2012:Q4

	Obs.	Median	Mean	Std. Dev.
Loan Size (Mil. USD)	2,216	1.29	4.38	11.74
Loan Overdue	2,216	0.00	0.14	0.34
Months to maturity	2,100	4.00	10.82	17.41
Public Bank	2,216	0.00	0.10	0.30
Non-Bank Financial Insitution	2,216	0.00	0.24	0.43
Domestic Private Bank	2,216	1.00	0.57	0.49
Foreign Private Bank	2,216	0.00	0.09	0.29
Observations	2216			

This table reports summary statistics for firm-bank relationships that had active loans in 2012. Our dataset includes 2,216 unique firm-bank lending relationships that have a median outstanding balance of USD $1.3 million and a mean outstanding balance of USD $4.4 million (both values are converted from Pakistani Rupees using the exchange rate at the time).

Table 4: Summary statistics for merged Capital IQ and credit registry data for Pakistani firm's borrowing in 2012:Q4

	Obs.	Median	Mean	Std. Dev.
Total Bank Debt (Mil. USD)	278	9.54	34.93	91.5
At Least One Loan overdue	278	0.00	0.26	0.4
Number of Loans Overdue	278	0.00	1.08	3.1
Number of Loans	278	6.00	7.97	6.6
Total Assets (Mil. USD)	171	33.66	189.78	502.7
Liquid Assets (Mil. USD)	248	0.57	10.74	51.7
Capital Expenditures (Mil. USD)	158	1.25	9.96	28.6
Total Revenue (Mil. USD)	179	42.13	226.32	884.0
Debt-to-equity ratio	173	0.62	1.19	5.1
Interest Coverage Ratio	235	2.93	147.91	1,225.2
Firms with ICR below 1	235	0.00	0.23	0.4
Observations	278			

This table reports summary statistics for firms that had active loans in 2012. Our dataset includes 278 firms that had an active loan in 2012. The number of observations is not consistent across all variables due to Capital IQ not reporting data for some firms.

In section (3.3), to expand our sample and subsequently explore deeper economic questions, we exploit all firms in the Pakistani credit registry (but do not have any additional information on firm income or balance sheets).

Our credit registry dataset stretches from 2007:Q1 to 2012:Q4, and over this time period, it contains 58,206 firms and 94,483 different bank-firm relationships. Similar to Khwaja and Mian [2008] and Choudhary and Jain [2020], since firms may have multiple loans at the same bank, we aggregate all the firm's loans at a specific bank to create measures of that firm's total debt at that bank. Because part of our paper's aim is to analyze how firm's transition from having a loan overdue more than 90 days to potentially loan default, and how banks respond to these different events, we exclude all firms that had a nonperforming at the start of our dataset, since we cannot track when their first loan went overdue.

Our paper focuses on analyzing nonperforming loans, so we exploit the three different definitions in the credit registry. First, the least severe, the loan is overdue more than 90 days but less than 365 days. Second, the loan is overdue more than 365 days but has not defaulted. Finally, loan default,

where we code a loan as defaulted if any of the following three events are reported to the credit registry: a loan is written off, the loan is restructured, or the bank initiates litigation to recover the loan.

For the majority of our regressions, we use a Khwaja and Mian [2008] strategy to analyze how two different banks that lend to the same borrower respond differently to specific events. Therefore, in table (5), we report summary statistics for bank loans to firms with at least two active bank loans in 2012:Q4.

Table 5: Summary statistics for bank loans for firms that had a two or more loans in 2012:Q4

	Obs.	Median	Mean	Std. Dev.
Loan Size (Mil. USD)	16,117	0.24	2.55	12.80
(Weighted) Months to maturity	9,550	4.37	6.48	6.29
(Weighted) Interest Rate	7,752	13.61	13.75	4.73
Unsecured loan	16,117	0.00	0.14	1.50
Public Bank	16,117	0.00	0.08	0.27
Non-Bank Financial Insitution	16,117	0.00	0.23	0.42
Domestic Private Bank	16,117	1.00	0.65	0.48
Foreign Private Bank	16,117	0.00	0.05	0.22
Observations	16117			

Note: Table (21) in Appendix (6.1) describes the variable definitions.

3.2 Descriptive Evidence

We start by directly examining the relationship between corporate debt-at-risk and bank nonperforming loans. To do so, in table (6), using our panel of Pakistani corporate bank loans and corporate profitability, we regress whether a firm's bank loan is nonperforming on whether the firm's debt is at risk (defined, as in the previous section, as: if the firm's interest coverage ratio is less than one), and additional controls. Specifically, we run the following regression:

$$NPL_{b,f,t} = \beta_1 \times \mathbb{1}_{(ICR<1)_{f,t}} + \beta_2 \times Controls_{f,b,t} + \epsilon_{b,f,t} \tag{2}$$

where $NPL_{b,f,t}$ is a dummy variable for whether the bank b's loan to firm f at time t is nonperforming, and $\mathbb{1}_{(ICR<1)_{f,t}}$ is a dummy variable for whether firm f's interest coverage ratio is below 1 at time t. This regression tests whether there is positive correlation between corporate debt-at-risk and bank nonperforming loans after controlling for firm fixed effects, year fixed effects, and bank

fixed effects.

In table (6) column 1, after controlling for firm, year, and bank fixed effects, we find that bank loans to firms with interest coverage ratios below 1 were slightly more likely to become overdue than bank loans to firms with interest coverage ratios above 1. The size of the coefficient is relatively small (just over 6 percentage points) and only statistically significant at the 10 percent level. In columns 2 and 3, we repeat the exercise but using different definitions for a nonperforming loan, namely, overdue more than 365 days, and loan default. For these regressions, we find neither statistically significant nor economically significant results, suggesting that at the micro-level there is little correlation between changes in firm's corporate debt-at-risk and bank nonperforming loans. Thereby confirming a similar trend as was evidenced by the use of a cross-country panel dataset in section (2).

Table 6: Testing correlation between corporate debt-at-risk and bank nonperforming loans in Pakistan

	(1) Overdue loan (90+)	(2) Overdue loan (365+)	(3) Loan default
ICR <1	0.062*	0.0091	-0.0031
	(0.034)	(0.022)	(0.011)
Constant	0.054***	0.033***	0.013***
	(0.0053)	(0.0036)	(0.0018)
Observations	9498	9498	9498
Firm FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
Bank FEs	Yes	Yes	Yes
ymean	0.064	0.034	0.012

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

3.3 Delayed recognition of nonperforming loans

To gain greater power and explore additional questions we turn to analysing the bank loan data for the universe of all Pakistani corporate loans. The key result from this section is that some banks—specifically, banks with lower leverage ratios—were more likely to delay the recognition of nonperforming loans. To identify this result we utilize a Khwaja and Mian [2008] strategy. Specifically, we compare loan outcomes for a firm that borrowed from multiple banks. Our empir-

ical findings are consistent with the theoretical prediction that classifying a nonperforming loan is more expensive for banks with less capital. By masking the status of a loan, banks reduce the required loan loss provisions, consequently artificially maintaining higher regulatory capital and leverage ratios (Bushman and Williams [2015]). In turn, this potentially allows the bank to avoid raising new, costly, external financing and attract additional regulatory scrutiny.

3.3.1 Examining rates of loan nonperformance by bank

We start by examining if there are systemic differences across banks in the designation of nonperforming loans. Specifically, for those firms that had a nonperforming loan during our dataset, we examine if banks with less capital (lower capital ratios or lower leverage ratios) were less likely to be the first bank to designate this loan as nonperforming. Since banks with lower capital ratios may lend to different firms (who have differing rates of having nonperforming loans), in this test, we restrict our attention to those firms that borrow from multiple banks. That is, we rely on within-firm variation.

We run the following regression:

$$\text{First overdue bank (NPL)}_{b,f} = \beta_1 \times \text{Measure of bank capital}_b + \beta_2 \times \text{Controls}_{b,f} + \epsilon_{b,f} \quad (3)$$

where "First overdue bank $(\text{NPL})_{b,f}$" is a dummy variable if bank b was the first bank to designate a loan from firm f as nonperforming. "Measure of bank capital$_b$" is a measure of bank capital; for our preferred regressions it is a dummy variable for whether bank b's leverage ratio is in the bottom quartile in 2007. In alternative specifications, in the robustness section (section (4.2)), we use a dummy variable for whether bank b's capital ratio is in the bottom quartile in 2007 [table (19)] and a continuous variable for bank b's leverage ratio in 2007 [table (19)]. Additionally, we investigate differences in loan outcomes using different nonperforming loan definitions: overdue more than 90 days, overdue more than 365 days, and loan default.

The key result from table (7) is that for those firms that borrowed from multiple banks, banks with low leverage ratios were relatively slower to designate a loan as overdue than other banks. In column 1, for firms that borrowed from multiple banks, we see that banks with low leverage ratios were over 5 percentage points less likely to be the first bank to designate a loan as overdue more than 90 days than other banks. In column 2, we see a similar pattern, with banks with low

leverage ratios more than 6 percentage points less likely to be the first bank to designate a loan as overdue more than 365 days. Interestingly, when it comes to designating a loan as defaulted, banks with low leverage ratios were equally, or more, likely to be the first lender to designate a loan as defaulted. A finding we expound in the next set of tables.

Table 7: First lender to designate a loan as nonperforming: Banks with low leverage ratios

	(1)	(2)	(3)
	First overdue bank (90+)	First overdue bank (365+)	First default bank
Low leverage bank	-0.056***	-0.077***	0.014
	(0.020)	(0.025)	(0.027)
Observations	5602	3161	2382
Firm FEs	Yes	Yes	Yes
ymean	0.27	0.28	0.27

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

In table (8), we examine whether banks with low leverage ratios are less likely to designate a loan as nonperforming relative to other banks that also lend to the same firm. To do so, we restrict attention to firms with active lending relationships from multiple banks at the start of our dataset (2007:Q1) and use the following regression:

$$\text{Nonperforming loan}_{b,f} = \beta_1 \times \text{Low leverage bank}_b + \alpha_f + \epsilon_{b,f} \tag{4}$$

where "Nonperforming loan$_{b,f}$" is a dummy variable for whether the loan from bank b to firm f becomes nonperforming during the length of our dataset (2007:Q2 to 2012:Q4) and α_f is a firm fixed effect.

The results in table (8) show that banks with lower capital ratios were relatively less likely to declare a loan as overdue more than 90 days (column 1) or declare a loan as overdue more than 365 days (column 2) than other banks. However, banks with low leverage ratios were significantly *more* likely to declare a defaulted loan than other banks (column 3). Loans by low leverage banks were 130 basis points more likely to default than loans from other banks to the same firm—a default rate that is more than 20 percent higher than other banks (the mean rate of loan defaults on loans to borrowers with multiple banks was around 6 percent).

The results in table (8) are consistent with the explanation that banks with low leverage ratios are

delaying the recognition of overdue loans (negative and statistically significant results in columns 1 and 2), and in turn, leading to worse loan outcomes (higher rates of loan defaults in column 3); in other words banks are willing to choose short term gain for potentially larger long term pain. For instance, banks with higher leverage ratios may have taken more immediate corrective actions to recover overdue loans than banks with low leverage ratios causing relatively higher loan defaults for banks with lower leverage ratios. Additionally, since banks with low leverage ratios may be delaying the recognition of loan defaults (as well as overdue loans) we may be underestimating the extent of evergreening by banks with low leverage ratios, and consequently, the result in column 3 would be biased downwards.

Table 8: Loans by banks with low leverage ratios were relatively less likely to be overdue than loans by other banks to the same firm but more likely to default

	(1) Loan overdue (90+)	(2) Loan overdue (365+)	(3) Loan defaulted
Low leverage bank	-0.038***	-0.012*	0.013**
	(0.0082)	(0.0065)	(0.0059)
Observations	8215	8215	8215
Firm FEs	Yes	Yes	Yes
ymean	0.17	0.10	0.060

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

Taking the results in tables (7) to (8) together, we show that banks with low leverage ratios are both slower to designate a loan as overdue and less likely to designate a loan as overdue than other banks who lend to the same firm. These results suggest that banks with low leverage ratios are evergreening some of their loans. However, there are other plausible theoretical explanations that are consistent with these results, in section (3.3.4), we explore three alternative explanations. First, do firms selectively choose to relatively repay banks with lower leverage ratios more? Second, do banks with low leverage ratios monitor their loans less and consequently cause higher loan defaults? Third, did banks with low leverage ratios efficiently forbear their loans to firms?

3.3.2 Relative exposure of low leverage banks to firms with overdue loans?

In section (3.3.1) we found suggestive evidence that banks with low leverage ratios mask non-performing loans. One additional prediction of the concept of bank evergreening found in the

literature is that banks roll over the existing debt into new, larger, performing loans. We investigate this possibility in three ways. First, were banks with low leverage ratios more likely to keep lending to firms with an overdue loan at a different bank? Second, did banks with low leverage ratios increase their relative share of total lending to a firm with an overdue loan at a different bank? Finally, were banks with low leverage ratios more likely to start a new bank-firm relationship with a firm that recently had an overdue loan at a different bank. Overall, we find that banks with low leverage ratios did not materially increase their exposure to firms that recently had a nonperforming loan at a different bank. This bodes well for the allocation for credit, as banks (on average) tend to reduce their credit risk to financially vulnerable firms.

To start, we examine whether banks with low leverage ratios were more likely to keep lending to a firm that has an overdue loan at a nonperforming loan at a different bank. To do so, we examine the set of banks that still lend to a firm four quarters after the firm's first nonperforming loan at a different bank. Specifically, we conduct the following regression:

$$\text{Active loan}_{b,f,t+4} = \beta_1 \times \text{Low leverage bank}_b + \alpha_f + \epsilon_{b,f,t+4} \tag{5}$$

where 'Active Loan $_{b,f,t+4}$' is a dummy variable equal to one if bank b has an active loan to firm f four quarters following the firm's first nonperforming loan at a different bank. As before, we include a firm fixed effect, α_f, to ensure we're only estimating the effect from firms with multiple lenders.

Banks with low leverage were as likely as other banks to keep lending to firms with a nonperforming loan, as shown in table (9). Across all the different definitions of nonperforming loan, four quarters following the firm's first nonperforming loan, low leverage banks were equally likely to stop lending (on average between 12 and 18 percent of banks stopped lending to firms following a nonperforming loan).

Table 9: Low cap banks were equally likely to keep lending to a firm that had an overdue loan

	(1) Active Loan	(2) Active Loan	(3) Active Loan
Low leverage bank	-0.0011	-0.019	-0.0037
	(0.022)	(0.026)	(0.021)
Observations	11479	7756	4439
Event type	Overdue 90+	Overdue 365+	Default
Firm FEs	Yes	Yes	Yes
ymean	0.82	0.86	0.88

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

Second, we examine whether the relative share of lending by low capital banks increased to firms with a nonperforming loan. To examine this question we create a new variable, "Change in Debt share$_{b,f,t}$", which is defined as the following:

$$\text{Change in debt share}_{b,f,t} = \text{Debt share}_{b,f,t} - \text{Debt share}_{b,f,t-4} \tag{6}$$

where "Debt share$_{b,f,t}$" is defined as:

$$\text{Debt share}_{b,f,t} = \begin{cases} \dfrac{\text{Debt of firm } f \text{ to bank } b \text{ at time } t}{\text{Total debt of firm } f \text{ at time } t} & \text{if Total debt of firm } f \text{ at time } t > 0 \\ 0 & \text{if Total debt of firm } f \text{ at time } t = 0 \end{cases} \tag{7}$$

Therefore, "Change in debt share$_{b,f,t}$", measures the change in bank b's share of lending to firm f at time t relative to the bank's share of lending four quarters previously. In our regression, we restrict attention to the set of banks that were lending at the time of the firm's first nonperforming loan and examine whether banks with low leverage ratios relatively increased their share of lending four quarters later. The specific regression we run is:

$$\text{Change in debt share}_{b,f,t} = \beta_1 \times \text{Low leverage bank}_b + \alpha_f + \epsilon_{b,f,t} \tag{8}$$

Table (10) shows that banks with low leverage ratios did not increase their share of lending to firms that had a nonperforming loan, suggesting that banks with low leverage ratios did not roll

over the firm's debts into new loans relatively more than other banks.

Table 10: Banks with low leverage ratios did not relatively increase lending to firms with nonperforming loans

	(1) Change in debt share	(2) Change in debt share	(3) Change in debt share
Low leverage bank	0.0069	0.0098	-0.00037
	(0.015)	(0.018)	(0.010)
Observations	11479	7756	4439
Event type	Overdue 90+	Overdue 365+	Default
Firm FEs	Yes	Yes	Yes
ymean	-0.14	-0.11	-0.053

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

Finally, we examine whether banks with low leverage ratios were more likely to start new lending relationships with firms with an overdue loan at a different bank. Firms that are overdue on their loans may try to repay their loans by taking new loans at different banks. To test this possibility, we examine whether banks with low leverage ratios start relatively more new lending relationships with a firm with a nonperforming loan.[9]

We run the following regression:

$$\text{New loan}_{b,f,t+4} = \beta_1 \times \text{Low leverage bank}_b + \alpha_f + \epsilon_{b,f,t+4} \tag{9}$$

where 'New Loan$_{b,f,t+4}$' is a dummy variable for whether bank b started a new loan relationship with firm f within four quarters of the firm's first nonperforming loan event, and α_f is a firm fixed effect.

The results in table (11) shows weak evidence that banks with low leverage ratios were more likely to start new lending relationships with firms that recently had a nonperforming loan. Banks with low leverage ratios were 13 basis points more likely to start a new banking relationship with a firm that had an overdue loan more than 90 days than other banks (column 1), but there was no sizeable or statistically significant effect for loans overdue more than 365 days or loan defaults (columns 2 and 3). Moreover, even though banks with low leverage ratios were more likely to start

[9]For this regression we create a dummy variable for all new possible bank-firm relationships; hence the number of observations in table (11) are significantly larger than for all other regressions.

a new relationship with a firm with an overdue loan at another bank, the effect is economically very small. For instance, we found that 18 *percent* of banks, one year after the firm's first overdue loan, stopped lending to that firm.

Table 11: Weak evidence that banks with low leverage ratios were more likely to create a new lending relationship following an overdue loan at a different bank

	(1) New Loan	(2) New Loan	(3) New Loan
Low leverage bank	0.0013***	0.00038	0.00029
	(0.00026)	(0.00026)	(0.00046)
Constant	0.0031***	0.0026***	0.0033***
	(0.00012)	(0.00012)	(0.00020)
Observations	248535	167404	75746
Event type	Overdue 90+	Overdue 365+	Default
Firm FEs	Yes	Yes	Yes
ymean	0.0037	0.0027	0.0034

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

3.3.3 Time path of firms' credit following a nonperforming loan

In sections (3.3.1) and (3.3.2) we established that banks with low leverage ratios were more likely to delay the recognition of nonperforming loans but did not increase their overall exposure to firms with nonperforming loans. In this section, we examine the time-path of firm credit characteristics (total loan size outstanding and the number of lenders) before and after a firm's loan is first classified as nonperforming. To increase the power of our results, and since we are interested in how firms respond, we include all firms in the credit registry (that is, in contrast to the previous section, we also include firms that borrow from only a single lender). The main result from this section is that firms total debt and the number of lenders dramatically falls following the firm's first nonperforming loan.

To examine how firm's total debt changes over time, we define a new variable, "Indexed Debt$_{f,t}$", which measures firm f's total debt in quarter t relative to the to the firm's total debt in the quarter in which the firm's first loan becomes nonperforming.[10] Specifically,

[10]We use the variable indexed debt because we want to both measure relative changes in credit (therefore, not using absolute values) and be able to account for the firms' total debt being zero (thereby, excluding the use of taking logs of

$$\text{Indexed Debt}_{f,t} = \frac{\text{Firm } f\text{'s total firm debt at time } t}{\text{Firm } f\text{'s total firm debt at occurrence of first nonperforming loan}} \tag{10}$$

Furthermore, since we define a nonperforming loan in three ways (overdue more than 90 days, overdue more than 365 days, or loan default), we analyse how indexed debt changes in response to each of these three different events.

The specific regression we run is[11]:

$$\begin{aligned}\text{Indexed Debt}_{f,t} = \beta_B \times \text{Quarters till first loan nonperforming}_{f,t} \\ + \beta_A \times \text{Quarters since first loan nonperforming}_{f,t} + \epsilon_{f,t}\end{aligned} \tag{11}$$

In this regression, we estimate how the firm's path of total debt changes in the 8 quarters before (β_B) and 8 quarters after (β_A) the firm's first loan becomes nonperforming.[12] The results are presented in table (12). Column 1 assesses how the debt changes with the first occurrence of loan being overdue more than 90 days, similarly, columns 2 and 3, assess how the debt changes but for the first occurrence of loan being overdue more than 365 days, and a loan defaulting, respectively.

Table (12) shows two main results. First, a firm's total debt was relatively steady before the first occurrence of a loan being overdue more than 90 days (statistically and economically insignificant coefficient on the variable "quarters till first overdue loan more than 90 days"). Second, following a loan going overdue more than 90 days, the firms' total debt started to dramatically *fall* (negative coefficient on the variable "quarters since first overdue loan more than 90 days"). For the firms that subsequently have either a loan overdue more than 365 days or a loan default, this reduction in credit continues with a firm's total debt falling both before a loan goes overdue more than 365 days and before the first loan default (as observed by the large and statistically significant coefficients on "quarters till first overdue loan more than 365" and "quarters till first loan default").

firm debt). Since the firm must have some debt at the point at which the loan becomes overdue, using that loan amount seems an appropriate denominator for the index.

[11] "Quarters till first loan nonperforming" is the number of quarters before the first loan is overdue. This variable is zero if it is the quarter with the first occurrence of a nonperforming loan. Symmetrically, "Quarters since first loan nonperforming" is zero if it is the quarter before the first occurrence of a nonperforming loan.

[12] To ensure we have a balanced panel we include only those firms for which their first nonperforming loan occurred between 2009 and 2011. This restriction ensures that we have both observations for the firms' total debt for the eight quarters before and after the first loan becomes nonperforming.

The key inference from the results in table (12) is that banks do seem to take prudent actions following a firms' loans going overdue with banks subsequently significantly reducing lending to the firm—by just over 5 percent per quarter. A key financial stability concern would be if banks systemically continued to increase lending to firms that were in financial stress, which is not the case here.

Table 12: Bank debt falls after the first loan became 90 days overdue

	(1) Indexed Debt	(2) Indexed Debt	(3) Indexed Debt
Qtrs. till first overdue loan (90+)	0.0030		
	(0.0039)		
Qtrs. since first overdue loan (90+)	-0.052***		
	(0.0029)		
Qtrs. till first overdue loan (365+)		0.036***	
		(0.0044)	
Qtrs. since first overdue loan (365+)		-0.032***	
		(0.0026)	
Qtrs. till first loan default			0.011**
			(0.0047)
Qtrs. since first loan default			-0.021***
			(0.0030)
Observations	45334	33146	15138
Firm FEs	No	No	No
ymean	0.89	0.95	0.96

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. A negative coefficient for "Quarters *till*..." implies that total debt was *rising* before the first loan was denoted as overdue. A negative coefficient for "Quarters *since* ..." implies that the total debt *fell* following the first loan was denoted as overdue. Standard errors clustered at the firm level.

In addition to examining how total debt responded to changes in a firm's nonperforming loans we can observe how the number of bank relationships changes before and after a loan becomes nonperforming. To do so, we run regressions that are similar to those in equation (11), specifically:

$$\begin{aligned}\text{Number of bank relationships}_{f,t} = {} & \beta_B \times \text{Quarters till first loan nonperforming}_{f,t} \\ & + \beta_A \times \text{Quarters since first loan nonperforming}_{f,t} \\ & + \alpha_f + \epsilon_{f,t}\end{aligned} \tag{12}$$

where "Number of bank relationships$_{f,t}$" is the number of active lending relationships for firm f's at time t, and α_f are firm fixed effects.[13] "Quarters till first loan nonperforming" and "Quarters since first loan nonperforming" are defined as in equation (11).

In this regression, we estimate how the number of lenders to a firm changes in the eight quarters before and eight quarters after the firm's first loan becomes nonperforming.[14] The results are presented in table (13).

Table (13) shows two main results. First, the number of lenders was increasing before the first occurrence of a loan being overdue more than 90 days, by over 0.05 lenders per quarter. Second, following a loan going overdue more than 90 days, the number of lenders started to dramatically *fall*, by about 0.04 lenders per quarter.

The results presented in tables (12) and (13) together show that banks, on aggregate, significantly reduced exposure to firms following their first nonperforming loan. Moreover, the designation of a nonperforming loan seems to have large real effects on the firm's capacity to borrow with a sharp change in the firms' credit growth and number of lending partners following the designation.

[13] The use of a firm fixed effect ensures that we control for the average number of bank relationships a firm has over the period. However, in regression (11) we did not include firm fixed effect because the outcome of interest, firm's total debt, had already been indexed to that firm's total debt at the time of the first nonperforming loan.

[14] Similar to table (12), we include only those firms for which their first nonperforming loan occurred between 2009 and 2011.

Table 13: The number of lenders to a firm falls following the first occurrence of a nonperforming loan

	(1) Number of bank rel.	(2) Number of bank rel.	(3) Number of bank rel.
Qtrs. till first overdue loan (90+)	-0.053***		
	(0.0028)		
Qtrs. since first overdue loan (90+)	-0.043***		
	(0.0023)		
Qtrs. till first overdue loan (365+)		-0.017***	
		(0.0028)	
Qtrs. since first overdue loan (365+)		-0.038***	
		(0.0026)	
Qtrs. till first loan default			-0.0070
			(0.0064)
Qtrs. since first loan default			-0.039***
			(0.0045)
Observations	46564	34244	15778
Firm FEs	Yes	Yes	Yes
ymean	1.37	1.50	2.31

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. A negative coefficient for "Quarters *till*..." implies that the number of bank-firm relationships was *rising* before the first loan was denoted as overdue. A negative coefficient for "Quarters *since* ..." implies that the number of bank-firm relationships fell *fell* following the first loan was denoted as overdue. Standard errors clustered at the firm level.

3.3.4 Alternative potential explanations

This section examines whether there are other possible theories that would be consistent with the results. We examine three possibilities. First, do firms prefer to repay banks with lower leverage ratios more than other banks? Second, do banks with low leverage ratios monitor their loans less and consequently have higher loan defaults? Third, did banks with low leverage ratios efficiently forbear their loans to firms? We do not find strong evidence to support any of these alternative explanations.

A key possibility is that firms may value their relationships with banks with low leverage ratios more, or receive more favorable loan terms from these banks. In turn, this may cause firms to strategically repay other banks first. We explore this possibility in two ways. First, we examine

whether the results in section (3.3.1) are robust to the inclusion of loan-level controls. Second, we examine whether banks with low leverage ratios offer more favorable loan terms.

Table (14) shows that firms are more likely to go overdue first on larger and unsecured loans. Similarly, table (15) shows that firms are more likely to be overdue on larger and unsecured loans. However, the results in both tables show that banks with low leverage ratios—even after controlling for loan level terms—are slower to designate a loan as overdue and less likely to designate the loan as overdue. These results suggest that differences in loan terms are not the principal cause for relatively lower overdue rates for banks with low leverage ratios .

Table 14: First lender to designate a loan as nonperforming: Banks with low leverage ratios and including loan-level controls

	(1)	(2)	(3)
	First overdue bank (90+)	First overdue bank (365+)	First default bank
Low leverage bank	-0.066***	-0.072***	0.0044
	(0.021)	(0.025)	(0.025)
Ln. bank loan	0.027***	0.038***	0.046***
	(0.0049)	(0.0065)	(0.0067)
Unsecured loan	0.0080	0.0065	0.019*
	(0.012)	(0.013)	(0.010)
Observations	5377	3565	3016
Firm FEs	Yes	Yes	Yes
ymean	0.28	0.28	0.28

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

Table 15: Loans by banks with low leverage ratios were relatively less likely to be overdue than loans by other banks to the same firm

	(1) Loan overdue (90+)	(2) Loan overdue (365+)	(3) Loan defaulted
Low leverage bank	-0.050***	-0.018***	0.011*
	(0.0086)	(0.0067)	(0.0062)
Ln. bank loan	0.025***	0.018***	0.012***
	(0.0021)	(0.0017)	(0.0013)
Unsecured loan	0.0050	0.0077	0.00029
	(0.0063)	(0.0057)	(0.0054)
Observations	7552	7552	7552
Firm FEs	Yes	Yes	Yes
ymean	0.18	0.11	0.062

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

In table (16), we explore differences in initial loan terms for firms with multiple loans between banks with low leverage ratios and other banks. Specifically, we run the following regression for firms with multiple loans in the final quarter of our dataset (2012:Q4):[15]

$$\text{Outcome of interest}_{b,f} = \beta_1 \times \text{Low leverage bank}_b + \alpha_f + \epsilon_{b,f} \tag{13}$$

where the Outcome of interest$_{b,f}$ are the firm's loan size with bank b, the length of the firm's relationship with bank b, the interest rate of the firm's loans with bank b (weighted over all the firm's loans with bank b), and the months to maturity for the firm's loans with bank b (weighted over all the firm's loans with bank b).[16]

The evidence is mixed as to whether banks with low leverage ratios offer more favorable ratios. This presented in table (16). One key measure, interest rates (column 3), shows that banks with low leverage ratios charged higher rates. Also, two key measures of the lending relationship are relatively similar across the banks, namely loan size (column 1) and the months to maturity (col-

[15] We use the final quarter of our dataset so that we can examine the length of the firm's lending relationship with that bank.

[16] Data for loan maturity and loan interest rates are missing for some firms; therefore, there are fewer observations in columns 3 and 4 than columns 1 and 2.

umn 4). These three results suggest that loan terms from banks with low leverage ratios were not more favorable than other banks. However, in the opposite direction, we also find that firms had significantly longer lending relationships to banks with lower leverage ratios (column 2). Given the long empirical and theoretical literature on the importance of relationship lending (such as Rajan [1992], Petersen and Rajan [1994], Boot and Thakor [2000], Boot [2000]), this result suggests that firms may receive greater benefits from their long-term relationships with the banks with low leverage ratios. Overall, we can neither rule out that firms received greater benefits, nor conclusively say that firms received less benefits from the lending relationships from banks with low leverage ratios.[17]

Table 16: Do loan terms vary across banks?

	(1) Ln. bank loan	(2) Length of Relation. (Qtrs.)	(3) Interest Rate	(4) Months to maturity
Low leverage bank	0.055	2.17***	0.46**	0.28
	(0.054)	(0.17)	(0.20)	(0.21)
Observations	13087	14228	6344	8256
Firm FEs	Yes	Yes	Yes	Yes
ymean	17.1	15.9	12.8	5.36

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

A further theoretical possibility is that banks with low leverage ratios monitored their loans less than other banks causing both, a relatively slower designation of overdue loans, and greater defaults for these banks (Holmstrom and Tirole [1997], Allen et al. [2011], Mehran and Thakor [2011]). If low-leverage banks monitored their loans less, we would expect larger effects for unsecured loans because these are the loans where monitoring is the most relevant since the bank has larger expected loss given default and the borrower has less incentive to repay. We find no evidence to support this potential explanation.

We test whether banks with low leverage ratios were relatively more likely to have greater default rates on unsecured loans relative to other banks (similar to the test in table (8) but concentrating on differences between secured and unsecured loans for banks with low leverage ratios).

[17] There is the additional possibility that the finding that banks with low leverage ratios have longer lending relationship is an outcome of evergreening. Specifically, if banks with low leverage ratios forbear their loans more than other banks then this relationship will be mechanically longer.

In table (17) we present the results of the following regression on the set of firms with multiple lending relationships:

$$\begin{aligned}\text{Nonperforming Loan}_{b,f} = \beta_1 \times \text{Low leverage bank}_b \times \text{Unsecured Loan}_{b,f} \\ + \beta_2 \times \text{Unsecured Loan}_{b,f} + \beta_3 \times \text{Low leverage bank}_b + \alpha_f + \epsilon_{b,f}\end{aligned} \tag{14}$$

where 'Unsecured $\text{Loan}_{b,f}$' is a dummy variable for whether bank b's loan to firm f is unsecured, and all other variables are defined as previously.[18]

Starting with the results in the third column of table (17), we find that the coefficient on our variable of interest "Low leverage $\text{bank}_b \times$ Unsecured $\text{Loan}_{b,f}$" is both negative and statistically significant, which is inconsistent with the prediction that banks with low leverage ratios were monitoring loans less. Specifically, if banks with low leverage ratios were monitoring loans less, we would expect this coefficient to be positive—that is, banks with lower leverage ratios would have relatively higher default rates for unsecured loans—because loans which are unsecured require the most monitoring. We include firm fixed effects and restricting attention to only those borrowers that borrow from multiple banks, therefore this result is robust to banks with low leverage ratios lending to a different set of firms as other banks.

Turning to the results in the first column of table (17), we find that the coefficient on our variable of interest "Low leverage $\text{bank}_b \times$ Unsecured $\text{Loan}_{b,f}$" is both positive and weakly statistically significant. The interpretation of this coefficient with respect to the theory of lower monitoring by less capitalized banks is difficult. For instance, if banks with less capital were monitoring loans less we could expect this coefficient to be negative—because banks may be slow to recognize the loan as overdue due to their lack of monitoring capacity. Alternatively, we may expect higher rates of overdue loans for these banks due to the lack of monitoring of borrower behaviour causing more loans to become overdue.

[18] This regression is the analogue of the regressions in table (8) but includes both a dummy variable for an unsecured loan and the interaction of our measure for low bank leverage with the dummy variable for whether the loan is unsecured.

Table 17: Did low leverage banks monitor less? No evidence for greater defaults for unsecured loans for banks with low leverage ratios

	(1) Loan overdue (90+)	(2) Loan overdue (365+)	(3) Loan defaulted
Low leverage bank x Unsecured	0.024*	0.0073	-0.029**
	(0.013)	(0.011)	(0.012)
Low leverage bank	-0.041***	-0.012*	0.017***
	(0.0084)	(0.0066)	(0.0062)
Unsecured loan	-0.00017	0.0085	0.020**
	(0.0099)	(0.0087)	(0.0088)
Observations	8215	8215	8215
Firm FEs	Yes	Yes	Yes
ymean	0.17	0.10	0.060

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

As a final possible explanation, we analyse if banks with low leverage ratios efficiently forbear their loans. That is, do these banks provide necessary liquidity to solvent firms but facing either cash-flow difficulties or overcoming a temporary demand shock (Fukuda and Nakamura [2011]). In effect, rather than banks delaying the recognition of problem loans to protect their balance sheet, were banks with low leverage ratios using their discretion to improve loan outcomes? We present two pieces of evidence that do not support this view.

First, in table (8) in section (3.3.1), we find that banks with low leverage ratios had *higher* default rates than loans by other banks to the same firm (column 3). Therefore, this result strongly refutes the suggestion that banks with low leverage ratios were inducing better loan outcomes.

Second, if banks with low leverage ratios were effectively forbearing strictly productive loans, then you would anticipate than at an overdue loan at a bank with low leverage ratio would be a strong predictor for a future loan default. To explore this idea, we examine directly whether overdue loans by banks with low leverage ratios are more predictive of future loan defaults than loans issued by other banks that lend to the same firm. Specifically, we examine the conditional probability of a loan default between 2007:Q3 and 2012:Q4 on the likelihood of the loan being designated as overdue more than 90 days in 2007:Q2. We run regressions similar to:

$$\begin{aligned}\text{Loan default}_{b,f,2007:Q3-2012:Q4} = \beta_B \times \text{Overdue loan (90+)}_{b,f,2007:Q2} \times \text{Low leverage bank}_{b,f} \\ + \beta_B \times \text{Overdue loan (90+)}_{b,f,2007:Q2} + \alpha_f + \epsilon_{b,f,2007:Q3-2012:Q4}\end{aligned} \tag{15}$$

where "Loan default$_{b,f}$" is a dummy variable for whether the loan from bank b to firm f defaults between 2007:Q3 to 2012:Q4 and α_f is a firm fixed effect. This regression tests whether overdue loans from banks with low leverage ratios were a better predictor of a future loan default than overdue loans from other banks.

The results in table (18) show that overdue loans by banks with low levels of capital (as measured by capital or leverage ratios) were less predictive of a future default by economically significant magnitudes (11 percent for banks with low capital banks and 3.5 percent for banks with low leverage ratios) *for the same firm*. These results strongly refute the interpretation that banks with low leverage ratios may have been efficiently forbearing productive loans.

Table 18: Loans that were overdue 90 days were less predictive of a future loan default for banks with relatively less capital

	(1) Loan defaulted	(2) Loan defaulted	(3) Loan defaulted
Overdue loan (90+)	0.15***	0.22***	0.20***
	(0.032)	(0.071)	(0.075)
Low cap. bank x Overdue loan (90+)		-0.11	
		(0.080)	
Low capital bank		-0.0049	
		(0.012)	
Low lev. bank x Overdue loan (90+)			-0.035
			(0.081)
Low leverage bank			0.015
			(0.013)
Observations	42680	29719	29719
Firm FEs	Yes	Yes	Yes
ymean	0.11	0.11	0.11

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

Taken together, we do not find strong evidence that the alternative explanations can explain our

results. This supports our main explanation that banks with low leverage ratios were delaying the recognition of their nonperforming loans to mitigate the hit on their capital.

4 Robustness

This section provides additional sensitivity checks to the analysis in sections (2) and (3) to show that our findings are robust to a number of alternative explanations.

4.1 Robustness: Cross-country evidence

In section (2) we showed that there is no correlation between debt-at-risk and bank nonperforming loans in emerging market economies. Beyond zombie lending, there are a number of alternative explanations. We examine each in turn, and show the evidence is not consistent with these explanations. Due to space constraints, all tables are provided in the Appendix.

We empirically rule out the following potential sources of the low correlation in emerging market economies: (i) volatile corporate firm earnings, (ii) corporate debt-at-risk may be a leading indicator for bank nonperforming loans, (iii) negative firm profits may be generated by large R&D expenditure, (iv) substantial non-corporate bank lending, and (v) insufficient data on corporate debt.

4.1.1 Volatile firm earnings

Volatile firm earnings can skew measures of firm debt-at-risk because firms that have volatile earnings will likely have years with negative profits but still be viable and solvent companies. For clarity, consider the following thought experiment. Assume a firm has volatile cash flows but is generally profitable and makes losses on average once every four years. Assuming this firm is a representative firm of the industry, this volatility in income would mechanically cause an average corporate debt-at-risk ratio of 25 percent, suggesting that corporate debt has significant vulnerabilities, yet, the microdata would suggest firms are in quite strong financial health.

In table (22), to expand on the possibility that corporate debt-at-risk is a misleading measure due to volatile firm earnings we repeat our initial exercise but calculate corporate debt-at-risk by averaging the firms' interest coverage ratio over two years (columns 1 and 2) and averaging the firms'

interest coverage ratio over three years (columns 3 and 4). The main takeaway is that volatile firm earnings is not driving the low correlation for emerging market economies: A 1 percentage point increase in corporate debt-at-risk in emerging markets is associated with only a 5 *basis* point rise in banks' nonperforming loans, after including country and time fixed effects. Similar small results hold if we average firm's interest coverage over three years.

4.1.2 Non-contemporaneous relationship

An alternative explanation is that corporate debt-at-risk is a leading measure for bank nonperforming loans. Low firm profitability or high interest costs may not immediately lead to higher bank nonperforming loans. For instance, in some countries loans are only classified as overdue if a loan is past due for 90 days or more. Additionally, if a firm makes insufficient profits to repay their loan payments this may not lead the firm to not repay their loan—the firm may initially sell assets, especially more liquid assets, to meet their loan obligations.

To explore whether corporate debt-at-risk is a leading indicator for bank nonperforming loans, we repeat the earlier regressions but use a one year-lagged corporate debt-at-risk measure. For emerging market economies, table (23) shows that corporate debt-at-risk is not a strong leading indicator for bank nonperforming loans. The coefficient estimate for the relationship for a one percentage point increase in corporate debt-at-risk is a 1.8 basis points fall in an emerging market economy's banks' nonperforming loan ratio after including country and time fixed effects (compared to nearly a 27 basis point rise for advanced economy banks).

4.1.3 Mismeasurement

Could the debt-at-risk mismeasure the riskiness of firm debt? The definition of corporate debt-at-risk is rather broad. For instance, those firms that make negative profits are defined as having debt-at-risk. However, there are many profitable and solvent firm strategies (in expectation) that could lead to such an outcome. For instance, some firms may be investing in capital and research, generating short-run negative cash flows but long-term profits. For instance, Amazon.com, Inc. had losses for many years but this was partly driven by high R&D expenditure.

To investigate this possibility we analyze the capital expenditure of those firms with debt-at-risk. In table (24), we test whether firms with debt-at-risk had higher capital expenditure (as a fraction

of total assets) than those firms that do not have debt-at-risk. We find that firms with debt-at-risk have higher capital expenditure than those firms that do not. On average, firms with debt-at-risk spend close to 1 percentage point of total assets more on capital expenditure than those firms that do not have debt-at-risk. Given that the mean capital expenditure to capital assets across the set of firms in our dataset is only 5.4 percent, our results suggest that those firms with debt-at-risk are spending significantly more on research and development than other firms (more than 15 percent)—even after controlling for the sector of the firm.

To analyze this result further, we separate the results between advanced economies and emerging market economies in columns 3 and 4. Our results clearly show that it is *only* in advanced economies that firms with debt-at-risk have relatively higher capital expenditure spending than those firms that do not have debt-at-risk. However, for firms in emerging markets we find that those firms with debt-at-risk spend significantly *less* on capital expenditure—both statistically and economically. Our results show that these firms spend between 3-4 percentage points less on capital expenditure than other emerging market firms. The results in columns 3 and 4 clearly show that greater spending on R&D in emerging markets cannot explain the low correlation between bank nonperforming loan ratios and corporate debt-at-risk. However, there is some evidence that greater spending on R&D by advanced economy firms could partially explain the low correlation in advanced economies.

Finally, to explore whether the firms that have debt-at-risk were just growing faster than other firms, in table (25) we regress firm growth (proxied by growth in a firm's total assets) on whether the firm had debt-at-risk. In line with our results in table (24), we find that emerging market firms with debt-at-risk grew economically and statistically significantly slower than other emerging market firms. The results in columns 3 and 4 show that emerging market firms with debt-at-risk grew 9 to 10 percent per year slower than other emerging market firms.

4.1.4 Non-corporate lending

Banks invest in many different asset classes beyond corporate loans. For instance, banks may buy government securities and lend to households. If the performance of these securities are markedly different to that of corporate loans this may cause the lack of correlation between corporate debt-at-risk and overall bank nonperforming loans. To test this possible explanation we examine whether those banking sectors that have a larger relative share of corporate loans are

associated with a greater relationship between corporate debt-at-risk and bank nonperforming loans.

Table (26) shows that those banking sectors that have a higher share of corporate loans do not exhibit significantly larger relationships between corporate debt-at-risk and bank nonperforming loans. For an emerging market economy, raising the share of corporate loans would cause the estimated relationship of an increase in corporate debt-at-risk on bank nonperforming loans to fall. In contrast, repeating the same exercise for an advanced economy would give a small rise.

4.1.5 Non-representative data

To compute our debt-at-risk measures we rely on using data for the largest corporate firms in a country. It is highly plausible that the largest corporate firms are not representative of the whole corporate sector. To explore this possibility, we restrict our dataset to those countries where we observe at least 30 percent of total corporate debt (that is, we compare the total amount of debt reported by Capital IQ to the total amount of corporate debt reported by the IMF). If the lack of representative data was driving the low correlation between corporate debt-at-risk and bank nonperforming loans, then we would expect higher coefficient estimates in our restricted sample.

The results in table (27) demonstrate that this restriction has little effect on our coefficient estimates for emerging markets. The estimated relationship of a 1 percentage point increase in corporate debt-at-risk on bank nonperforming loans is a *negative* 3 basis points, after controlling for country and time fixed effects.

4.2 Robustness: Microdata evidence

4.2.1 Delayed recognition of nonperforming loans

In section (3.3.1) we found that banks with low leverage ratios were slower to designate a loan as overdue. In table (19), we show this result is robust to including a continuous measure of bank leverage and, in table (20), we show this result is robust to using a measure of risk-based capital instead of leverage.

Table 19: First lender to designate a loan as nonperforming: Bank leverage ratios

	(1) First overdue bank (90+)	(2) First overdue bank (365+)	(3) First default bank
Leverage ratio	0.0044***	0.0064***	0.00067
	(0.0012)	(0.0015)	(0.0015)
Observations	4944	3358	2958
Firm FEs	Yes	Yes	Yes
ymean	0.26	0.26	0.26

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

Table 20: First lender to designate a loan as nonperforming: Risk-based capital ratios

	(1) First overdue bank (90+)	(2) First overdue bank (365+)	(3) First default bank
Low capital bank	-0.0099	-0.076***	0.0071
	(0.020)	(0.022)	(0.024)
Observations	5602	3706	3151
Firm FEs	Yes	Yes	Yes
ymean	0.27	0.28	0.28

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table (21) in Appendix (6.1) describes the variable definitions. Standard errors clustered at the firm level.

5 Conclusion

We identify, and subsequently, study a missing relationship between corporate stress and banks' nonperforming loans. We provide a progression of evidence on a weak relationship for emerging market economies. This result is true for both aggregate measures of debt-at-risk and bank nonperforming loans at the country level, as well as micro measures at the firm-bank pair level.

A natural question is why this relationship is weak for emerging economies. We provide partial evidence that banks intentionally delay classifying their loans as nonperforming thereby postponing the regulatory hit to their capital ratios. Moreover, we find suggestive evidence that this delay in recognizing bad loans, although improving the banks' capital position in the short-term, causes worse final loan outcomes, with evidence that the banks with a greater delay in recognizing bad loans also had greater resultant loan defaults. This evidence, though only partly satisfactory,

overcomes to some extent other potential explanations for the lack of correlation between corporate debt-at-risk and bank nonperforming loans, including volatile corporate earnings, a non-contemporaneous relationship between the two measures, bank lending to households, as well as firm investment and growth strategies.

Three perspectives for the policymaker are noteworthy. One, caution must be exercised in inferring too much from measures of corporate risk for banks' underlying asset quality given the limited relationship between these measures. Two, greater oversight and regulation of banks' designation of nonperforming loans may be useful—especially for those banks that may already be struggling to meet regulatory minimum capital ratios. Third, banks with low leverage ratios may misreport information to public credit registries, potentially reducing their usefulness.

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6 Appendix

6.1 Definitions

Table 21: Definitions

Advanced Economy (AE)	We classify the following 23 countries as advanced, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom, and the United States.
Change in debt share	Measures the change in the banks share of lending to that firm from four quarters previously
Corporate debt-at-risk	The fraction of corporate debt for which a firm's earnings before interest, taxes, debt expense, and amortization (EBITDA) is less than their total debt expense
Corporate loan share	The fraction of corporate bank loans to total banks loans in an economy
Debt with interest coverage (ICR) below 1	The fraction of corporate debt in a country for which the firm's ICR is below 1
Emerging Market Economy (EME)	We classify the following 21 countries as emerging market economies, Argentina, Bangladesh, Brazil, Chile, China, Egypt, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, South Africa, Sri Lanka, Thailand, Turkey, and Vietnam.
First default bank	The first bank to classify a firm's loan as defaulted (dummy variable)
First overdue bank (365+)	The first bank to classify a firm's loan as overdue more than 365 days in our dataset (dummy variable)
First overdue bank (90+)	The first bank to classify a firm's loan as overdue more than 90 days in our dataset (dummy variable)
Indexed debt	The firm's total debt in that quarter relative to the firm's total debt in the quarter in which the firm's first loan becomes nonperforming
Interest coverage ratio (ICR)	A firm's earnings divided by the firm's total debt expense (EBITDA/total debt expense)
Interest rate	The interest rate of the firm's existing loans with that bank (weighted by the total size of each loan)
Length of relationship (Qtrs)	The number of quarters that firm has had an active loan with that bank over the last 24 quarters
Ln. bank loan	The natural logarithm of a firm's debt with that bank
Loan default	The bank classifies the loan as either: written off, restructured, or litigation has been started to recover the amount due.
Low capital bank	A bank with a risk-based capital ratio below the 25th percentile in our dataset in 2007, equal to below XX percent
Low leverage bank	A bank with a leverage ratio below the 25th percentile in our dataset in 2007, equal to below XX percent
Months to maturity	The months to maturity of the firm's existing loans with that bank (weighted by the total size of each loan)
New loan	Dummy variable for whether the bank started a new lending relationship with a firm within four quarters of the firm's first nonperforming loan event
Nonperforming loan (NPL)	A loan where the borrower is currently overdue on their obligated payments. The specification definition varies across countries.
Nonperforming loan ratio (NPL ratio)	The fraction of nonperforming loans to total loans in a country
Number of bank relationships	Number of active lending relationships for firm
Overdue loan (365+)	The bank classifies the loan as overdue more than 365 days but not defaulted
Overdue loan (90+)	The bank classifies the loan as overdue more than 90 days but less than 365 days
Unsecured loan	The bank has at least one unsecured loan with that firm

6.2 Additional Tables

Table 22: Could volatile corporate firm earnings generate misleading measures of corporate debt-at-risk?

	NPL	NPL	NPL	NPL
Debt with ICR below 1 (ave. 2 yrs)	0.394***	0.374***		
	(0.123)	(0.120)		
EME X Debt with ICR below 1 (ave. 2 yrs)	-0.292**	-0.323**		
	(0.134)	(0.128)		
Debt with ICR below 1 (ave. 3 yrs)			0.413***	0.409***
			(0.130)	(0.131)
EME X Debt with ICR below 1 (ave. 3 yrs)			-0.293**	-0.309**
			(0.142)	(0.139)
EME country	0.0360***		0.0347***	
	(0.00772)		(0.00773)	
Observations	468	468	468	468
Country FEs	No	Yes	No	Yes
Date FEs	No	Yes	No	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Debt with ICR below 1 is the fraction of corporate debt in country c at time t that has an interest coverage ratio (ICR) below 1. EME refers to an emerging market economy. More details on the variable definitions are provided in table (21).

Table 23: Could corporate debt-at-risk be a leading measure for bank nonperforming loans?

	(1) NPL	(2) NPL
Debt with ICR below 1 (Lagged one year)	0.344***	0.269***
	(0.120)	(0.104)
EME X Debt with ICR below 1 (Lagged one year)	-0.251*	-0.287**
	(0.128)	(0.113)
EME country	0.0341***	
	(0.00820)	
Observations	427	427
Country FEs	Yes	Yes
Date FEs	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Debt with ICR below 1 (Lagged one year) is the fraction of corporate debt in country c at time $t-1$ that has an interest coverage ratio (ICR) below 1. EME refers to an emerging market economy. More details on the variable definitions are provided in table (21).

Table 24: Capital Expenditure: Could the debt-at-risk mismeasure the riskiness of firm debt?

	(1) Cap Ex/TA	(2) Cap Ex/TA	(3) Cap Ex/TA	(4) Cap Ex/TA
Debt with ICR below 1	0.0105	0.00710	0.0197**	0.0150***
	(0.00861)	(0.00586)	(0.00921)	(0.00539)
EME country			0.00774*	0.00678*
			(0.00407)	(0.00354)
EME*Debt with ICR below 1			-0.0369***	-0.0307***
			(0.00967)	(0.00614)
Constant	0.0514***	0.0523***	0.0489***	0.0500***
	(0.00291)	(0.00233)	(0.00383)	(0.00280)
Observations	319532	319250	319532	319250
Sector FEs	No	Yes	No	Yes
Year FEs	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

"Cap Ex/ TA" is an abbreviation for "Capital expenditure as a fraction of a firm's total assets". To remove the possibility of outliers biasing our results, we winsorize the variable "Capital Expenditure to total Assets" at the 1 percent level. Debt with ICR below 1 is the fraction of corporate debt in country c at time t that has an interest coverage ratio (ICR) below 1. EME refers to an emerging market economy. More details on the variable definitions are provided in table (21). Standard errors are clustered at the country-level.

Table 25: Total Assets: Could the debt-at-risk mismeasure the riskiness of firm debt?

	(1) Asset growth	(2) Asset growth	(3) Asset growth	(4) Asset growth
Debt with ICR below 1	-0.0551*	-0.0650**	-0.0254	-0.0378
	(0.0310)	(0.0286)	(0.0259)	(0.0246)
EME country			0.0529	0.0548*
			(0.0324)	(0.0323)
EME*Debt with ICR below 1			-0.103***	-0.0907***
			(0.0339)	(0.0332)
Observations	278225	278067	278225	278067
Sector FEs	No	Yes	No	Yes
Year FEs	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

"Asset growth$_{ft}$" is computed by subtracting "Ln total assets$_{f,t-1}$" for firm f in year t-1 from "Ln total assets$_{f,t}$" for firm f in year t. Debt with ICR below 1 is the fraction of corporate debt in country c at time t that has an interest coverage ratio (ICR) below 1. EME refers to an emerging market economy. More details on the variable definitions are provided in table (21). Standard errors are clustered at the country-level.

Table 26: Could bank lending to households reduce the correlation between bank nonperforming loans and corporate debt-at-risk

	NPL	NPL
Debt with ICR below 1	0.167	0.161*
	(0.260)	(0.0924)
Debt with ICR below 1 X Corporate loan share	-0.00285	0.00409
	(0.00510)	(0.00418)
Observations	163	219
EME countries	X	
AFE countries		X
Country FEs	Yes	Yes
Date FEs	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Debt with ICR below 1 is the fraction of corporate debt in country c at time t that has an interest coverage ratio (ICR) below 1. EME and AE refers to an emerging market economy and advanced economy respectively. Corporate loan share is the fraction of corporate bank loans to total banks loans in a country c at time t. More details on the variable definitions are provided in table (21).

Table 27: Is a lack of representative corporate data skewing the results?

	NPL	NPL
Debt with ICR below 1	0.412***	0.354***
	(0.129)	(0.128)
EME X Debt with ICR below 1	-0.343**	-0.400***
	(0.136)	(0.136)
EME country	0.0448***	
	(0.00850)	
Observations	336	336
Country FEs	Yes	Yes
Date FEs	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports results where we restrict our dataset to those countries where we observe at least 30 percent of total corporate debt (that is, we compare the total amount of debt reported by Capital IQ to the total amount of corporate debt reported by the IMF). Debt with ICR below 1 is the fraction of corporate debt in country c at time t that has an interest coverage ratio (ICR) below 1. EME refers to an emerging market economy. More details on the variable definitions are provided in table (21).