Loan Covenants and the Bank Lending Channel*

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Abstract

We use a new supervisory data set of bank loans to document the importance of covenant violations in transmitting the health of the financial system to the real economy. More than one-third of loans in our data breach a covenant during the 2008-09 period, providing lenders the opportunity to force a renegotiation of loan terms or to accelerate repayment. We find that lenders in worse health are less likely to grant a waiver and more likely to force a reduction in the loan balance. Quantitatively, the reduction in credit to borrowers with long-term credit but who violate a covenant accounts for an 11% decline in the volume of loans and commitments outstanding between 2007 and 2009, roughly the same magnitude as the total contraction in credit during that period.

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1. Introduction

A large literature documents the importance of the health of the banking sector for nonfinancial firm outcomes such as investment and employment.[1] Most recently, the 2008-09 period contained both a financial crisis and the deepest recession in the United States in 60 years. Yet, at any point in time as few as 10% of bank loans have remaining maturity of less than one year. If most firms do not have an expiring loan and do not want to expand their credit, then why does bank health transmit so quickly to such a large swath of borrowers?

We document the role of loan covenant violations as an answer to this puzzle. Loan covenants, also known as non-pricing terms, appear in nearly all loan contracts. They circumscribe the set of corporate actions a borrower may take (nonfinancial covenants) or specify minimum or maximum thresholds for cash flow or balance sheet variables (financial covenants). Breaching of a covenant threshold gives the lender the right to accelerate repayment of the loan. Far from unusual events, roughly one-quarter of corporate borrowers breach a covenant during a typical year before the 2008-09 financial crisis and one-third of borrowers breach a covenant each year during the financial crisis. Thus, loan covenant violations increase lenders' bargaining power and provide them opportunity to renegotiate contract terms when their own internal cost of funds rises. Since many more borrowers breach covenants each year than have loans due to roll over or need new credit, the covenant channel may transmit lender financial health broadly.

We quantify the covenant channel in the context of the 2008-09 financial crisis using a new supervisory data set of syndicated loans. The data contain the identities of borrowers and

[1] See e.g. Peek and Rosengren (2000); Lin and Paravisini (2012); Chodorow-Reich (2014); Benmelech et al. (2015) for evidence from the United States and Gan (2007); Amiti and Weinstein (Forthcoming); Bentolila et al. (2016) for evidence in other countries.

lenders and follow individual loans over time, including compliance with covenants. Following the violation of a covenant, a lender may accelerate repayment, force a renegotiation of the loan contract, or simply waive or reset the covenant with no further impact on the loan. Our data track each of these potential outcomes. Importantly, the supervisory data contain vastly more loan observations per year and more accurately identify covenant violations than do other existing data sets. Our main sample consists only of loans not due to mature within the year. Absent changes, these loans should have insulated borrowers from the immediate consequences of the financial condition of the lenders providing them.

The 2008-09 financial crisis offers a useful laboratory to assess the covenant channel. The write-downs on assets linked to real estate loans led to an enormous decline in the market equity of the U.S. financial sector and coincided with a sharp increase in bank funding costs. Both factors increased the internal cost of funds at lenders. A body of evidence documents the transmission from the reduction in credit supply at lenders to outcomes at nonfinancial firms during the crisis (Campello et al., 2010; Duchin et al., 2010; Campello et al., 2011; Chodorow-Reich, 2014; Duygan-Bump et al., 2015; Siemer, 2016). However, banks varied greatly in their exposure to the crisis.

Our empirical exercises test whether the outcome of a covenant violation during the 2008-09 crisis depends on the lead lender's financial health. We measure lender health by combining three measures constructed in Chodorow-Reich (2014). These measures capture banks' exposure to the crisis through counterparty risk, mortgage-related writedowns, and funding stability. Identification requires that covenant violators of less healthy and healthier lenders have otherwise similar characteristics. We show that borrowers of healthy and less healthy lenders have

similar propensities to violate a covenant, similar overall leverage, and similar supervisory and bank ratings of the borrower and the loan.

We find strong evidence of less healthy lenders using covenant violations to contract credit. Conditional on breaching a threshold, the likelihood of a reduction in the loan balance rises by 24 p.p. for borrowers of the least healthy lenders relative to the healthiest lenders and the average loan commitment falls by 20%. A number of results support the causal interpretation of these findings. First, we find no effect on credit from unhealthy lenders to borrowers who do not violate a covenant, a result at odds with borrowers of less healthy lenders experiencing a correlated decline in loan demand. Second, we add borrower and loan-level controls. Adding covariates increases the explanatory power of the regression, but consistent with ex ante balancing of firms and borrowers, the point estimates remain extremely stable. Third, within a syndicate, the lead's share of the credit provision after a violation declines if the lead has poor health. Fourth, we report results from two placebo exercises in which we reestimate the baseline specification in the non-crisis period of 2006-07. We do not find any evidence of differential treatment of borrowers who breach a covenant in 2006-07 based on the health of the lenders in 2008-09.

We next turn to the consequences of the credit contraction for the borrower. If borrowers whose previous relationship lender decides to contract credit could easily switch to a new lender, idiosyncratic fluctuations in bank health would have little real effect. The concentration of credit contraction by unhealthy lenders on covenant violators makes such switching difficult because of the difficulty of obtaining new credit while in technical default. Indeed, covenant violators of unhealthy lenders in our data appear unable to substitute at all toward other lenders or toward non-bank credit. Instead, we show that these borrowers increase the utilization on their

existing credit lines, draw down cash holdings, and reduce investment and employment relative to firms which violate a covenant but have a healthier lender. These results echo previous literature which has found an adverse effect of a covenant violation on debt issuance (Roberts and Sufi, 2009a; Nini et al., 2012), investment (Chava and Roberts, 2008; Nini et al., 2012), and employment (Falato and Liang, 2016), but with the added twist that the health of the lender crucially affects the consequences for the borrower.

Finally, we perform an aggregation calculation to gauge the importance of the covenant violation channel to the transmission of lender health to borrower outcomes. We find that total credit and commitments outstanding contracted by 5.8% in 2008 and 5.9% in 2009 solely as the result of borrowers who started the year with a long-term loan contract but nonetheless had their borrowing limit lowered by an unhealthy lender following a covenant violation. This magnitude is economically significant. For example, it exceeds the 4.5% contraction in the total stock of credit (including commitments) outstanding in each year.

We discuss related literature next. Section 2 describes our data. Section 3 provides summary statistics and balancing tests and compares our measure of covenant violations to previous work. Section 4 presents borrower and loan-level results results of the effect of lender health on the aftermath of a covenant violation. We perform the aggregation exercise in section 5. Section 6 concludes.

Related literature. Our paper lies at the intersection of multiple literatures. The first studies the transmission of bank health to the real economy and the importance of firm-bank relationships. Bernanke (1983) is a seminal reference and Chodorow-Reich (2014) overviews more recent papers. As discussed above, the prevalence of long-term contracts poses a challenge for this liter-

ature insofar as they may insulate many borrowers from the health of their lender. We show how covenant violations create a transmission channel even to borrowers with nominally long-term contracts. Other explanations include lumpiness or granularity in the economy together with strong effects in exactly the subset of borrowers needing to refinance or new credit (Almeida et al., 2012; Benmelech et al., 2015; Siemer, 2016) and precautionary saving by firms anticipating credit contraction from relationship lenders in the future (Almeida et al., 2004; Bacchetta et al., n.d.; Melcangi, 2016). We view these channels as complementary and our contribution as highlighting the quantitative importance of the covenant channel. Additionally, since lower quality borrowers are more likely to violate covenants, the covenant channel offers a novel explanation for why the effects of bank health might concentrate on smaller, lower quality borrowers.

A second literature, already cited, documents the negative consequences to the firm of violating a covenant (Chava and Roberts, 2008; Roberts and Sufi, 2009a; Nini et al., 2012; Falato and Liang, 2016). Our results suggest that the overall effect reported in these studies may mask important response heterogeneity based on changes in the lender's internal cost of funds.

A third literature concerns the renegotiation of debt contracts and the purpose and consequences of including covenants. The theoretical literature has traditionally viewed covenants as a means to overcome the agency problem inherent in lending contracts by limiting the possible actions taken by the borrower and shifting control to the lender if the borrower's financial condition deteriorates (Aghion and Bolton, 1992; Nini et al., 2009; Gârleanu and Zwiebel, 2009; Acharya et al., 2014; Bradley and Roberts, 2015). Yet, covenant violations occur routinely, and lenders often provide waivers for the violation while taking minimal additional action. Our paper complements the borrower-centric view by showing that covenants also allow lenders to

adjust loan terms when *lender* health deteriorates, consistent with a more symmetric view of incomplete contracting as in Hart and Moore (1988).

More broadly, as emphasized by Roberts and Sufi (2009b), Mian and Santos (2011), Denis and Wang (2014), and Roberts (2015), almost all long-term debt contracts undergo renegotiation prior to maturity. Roberts and Sufi (2009b), Denis and Wang (2014), and Roberts (2015) find evidence of borrower characteristics affecting the timing and outcome of such negotiations but do not consider individual lender health as a determinant. Yet, the violation of a covenant shifts bargaining power sharply toward lenders, allowing them to pass on increases in their cost of funds following a violation. The ubiquity of renegotiation even in the absence of a violation suggests lender health may affect recontracting for an even larger set of borrowers than those which violate covenants. Through this lens, our focus on covenant violations offers a particularly stark and well-identified example of how lender health affects loan renegotiation.

Finally, a macroeconomic literature studies the link between banks and the real economy in dynamic general equilibrium models (Gertler and Kiyotaki, 2010; He and Krishnamurthy, 2013; Brunnermeier and Sannikov, 2014). These models typically assume one period or continuously updated contracts. Our results provide some justification for this simplification by showing that even long-term contracts have de facto much shorter horizons due to loan covenants. These models also have the implication that unhealthy banks will especially want to reduce credit to riskier borrowers because the value of a marginal dollar of losses rises as the bank moves closer to its default boundary, consistent with the evidence in this paper.

2. Data and Main Variable Definitions

We describe the main features of our data and provide additional details in appendix A.

2.1. Loan and Covenant Data

SNC. The Shared National Credit Program (SNC) data set is a joint supervisory data set of the Federal Reserve, FDIC, and Office of the Comptroller of the Currency. Employees of these institutions may use the data for research purposes. The SNC collects information on all loans of at least $20 million shared by three or more unaffiliated financial institutions under the regulatory purview of one of the SNC supervisors. For each loan in the data set, SNC reports the borrower, loan type, drawn and undrawn balance on December 31st of the reporting year, and the ownership shares of all syndication leads and participants including institutions not regulated by a SNC supervisor.[2]

Beginning in 2006, SNC began collecting detailed information on non-price terms and covenant compliance for a subset of loans covering about 1/3 of the loan volume in the SNC universe. We refer to loans in this subset as the covenant sample.[3] For each loan in the covenant sample, SNC obtains information on covenants and compliance from loan documentation augmented by supervisory inquiries to the banks when information is missing or incomplete.

DealScan. We obtain information on loan pricing from the Thomson Reuters DealScan database. DealScan collects information on newly originated syndicated loans from lenders, publicly available filings, and media reports. The major advantage for our purpose of SNC over DealScan

[2]The official term for the unit of observation in the SNC data set is a credit. A credit may consist of multiple facilities jointly arranged by the same syndicate and signed on the same date. The corresponding term in DealScan is a package. For simplicity, in the text we use "loan" interchangably with SNC credit.

[3]SNC parlance also refers to this subset as the "Review sample."

is SNC's tracking of loans after origination, including subsequent modifications and covenant violations. However, SNC does not collect pricing information.

Covenant violations. For each loan in the covenant sample, SNC reports whether the loan remains in compliance throughout the year. If the loan remains compliant, SNC reports whether it would have been noncompliant but for a covenant waiver or reset granted by the lender. We consider a covenant to bind in either circumstance. We therefore define the variable $Bind_t$ to equal 1 if a loan breaches any covenant threshold during year t. Following a violation, a lender may choose to waive or reset the covenant or may force either repayment or restructuring of the loan. In practice, the resolution of a loan restructuring process can take a few months to achieve. To ensure our results reflect the final resolution of a covenant breach, we use as our main measure the variable $Bind_{t-1:t} = \max\{Bind_{t-1}, Bind_t\}$ which equals 1 if a loan breached a covenant in either the current or previous year.[4]

Comparison to other data sets. The SNC covenant sample offers important advantages over previous data sets. First, and crucial to a cross-sectional study, it contains many more observations per year. For example, the data hand-collected from SEC filings by Nini et al. (2009) and extended in Freudenberg et al. (2015) follow roughly 400 originations per year. Moreover, they do not include comprehensive information on the lender's response to a violation. Denis and Wang (2014) and Roberts and Sufi (2009b) collect some of this information but only for subsets of roughly 100 originations per year, while Roberts (2015) collects information on renegotiations over the life of a loan contract but for a sample of 114 firms. Likewise, studies

[4]Loans often contain cross-default provisions by which a covenant breach on one loan triggers technical default on another. We have experimented with defining $Bind_{t-1:t}$ based on whether any loan to the borrower breaches a covenant with no meaningful changes in our loan-level analysis. Similarly, our results remain quantitatively similar if we use $Bind_t$ as our main measure of a violation instead.

which rely on matching to Compustat (Chava and Roberts, 2008; Falato and Liang, 2016) or scrape SEC filings (Nini et al., 2009, 2012) to identify financial covenant violations do not have information on the lender's response to a violation. Second, the SNC data identify a covenant breach even if it results in a waiver. Such violations may not appear in data sets constructed from public filings. Third, the SNC data set contains a representative share of non-public borrowers, whereas data sets based on either public filings or matching to Compustat contain only publicly-traded borrowers.

2.2. Lender Health Measures

The 2008-09 period offers a useful laboratory for studying the transmission from banks to corporate borrowers because the origins of the financial distress lay outside the corporate loan sector. Rather, prominent explanations include the exposure of financial institutions to real estate markets and toxic assets, counterparty risk and network proximity to failing institutions, and liability structure and susceptibility to shadow bank runs (see e.g. Ivashina and Scharfstein, 2010; Cornett et al., 2011; Erel et al., 2011; Fahlenbrach et al., 2012; Santos, 2011). Our measures of lender health, adopted from Chodorow-Reich (2014), reflect each of these forces.

The first measure, originally proposed by Ivashina and Scharfstein (2010), identifies a bank's exposure to Lehman Brothers through the fraction of the bank's syndication portfolio in which Lehman Brothers had a lead role. This exposure affected banks directly through the syndicated market as firms with credit lines provided by Lehman Brothers drew down the remainder of their credit line as a precautionary measure following the Lehman bankruptcy, resulting in a draining of liquidity from other syndicate members. The second lender health variable measures a bank's exposure to private-label mortgage-backed securities through the correlation of its daily

stock return with the return on the ABX AAA 2006-H1 index in the fourth quarter of 2007. The ABX AAA 2006-H1 index follows the price of residential mortgage-backed securities issued during the second half of 2005 and with a AAA rating at issuance. The correlation indicates the market's perception of the bank's exposure to the mortgage crisis. The third measure combines a variety of balance sheet items: 2007-08 trading revenue as a share of assets, 2007-08 real estate net charge-offs, and the 2007 ratio of bank deposits to assets, weighted using regression loadings for predicting loan growth.[5]

The validity of these measures requires that they have predictive power for bank lending behavior and that they reflect "as good as random" assignment of borrowers and lenders before the crisis. Regarding predictive power, Chodorow-Reich (2014) shows that each measure can explain a substantial part of the cross-section of new lending during the 2008-09 crisis. While the origin of the 2008-09 crisis outside of the corporate loan sector makes "as good as random" assignment a priori plausible, sorting of banks and borrowers might nonetheless occur. However, Chodorow-Reich (2014) finds that borrowers of different lenders appear ex ante similar along observable characteristics such as the employment declines in the borrower's industry and county. We report below similar ex ante balancing using variables available only in the SNC data, including importantly the fraction of loans which breach a covenant and ex ante risk rating. Chodorow-Reich (2014) also finds balancing along unobserved characteristics using a specification with borrower fixed effects. Finally, financial markets before the crisis, as embodied in spreads on credit default swaps, did not predict which banks would become most distressed, making it unlikely higher quality borrowers could have purposefully chosen more stable lenders.

[5]We use the version of these measures provided at http://scholar.harvard.edu/files/chodorow-reich/files/final_bank_variables.xlsx.

For brevity of presentation, we extract the first principal component of the three measures of lender health and create a rank-normalized variable *Bad Lender* as the rank of the first principal component relative to all lenders divided by the number of lenders. The variable *Bad Lender* therefore lies on the unit interval, with the lender in worst health receiving a value of 1. Our main results are not sensitive to using this measure or one of the three subcomponents.

Syndicated loans such as those in the SNC data include a lead lender and participant lenders. The lead lender manages the servicing of the loan, provides the largest share of the funds, and typically cannot sell its share of the loan in the secondary market. Most loans require the agreement of lenders providing at least 51% of the commitment to accelerate repayment or modify loan terms following a covenant breach. Because the lead lender retains the largest share of the loan and because as the servicing agent the lead lender has responsibility for renegotiation, in our main results we assign lender health on the basis of the lead lender only.[6] Effectively, we assume the lead lender is always pivotal in resolving a covenant violation. We explore and relax this assumption in section 4.2.

3. Summary Statistics and Balancing Tests

Our main sample consists of all loans to nonfinancial borrowers in the SNC covenant sample with a lead lender in the Chodorow-Reich (2014) data set and which start the year with at least one year of maturity remaining.[7] The last restriction means that our empirical exercises focus

[6] Unlike in DealScan where many loans list multiple lead arrangers, the SNC supervisors always identify a single lead arranger as the servicing agent.

[7] Chodorow-Reich (2014) constructs measures of lender health for the 43 most active lead lenders in the DealScan data prior to the 2008-09 crisis. However, about one-quarter of these lenders are foreign-owned or otherwise not under the regulatory purview of the SNC supervisors and therefore excluded from the SNC data unless the participants include multiple supervised lenders.

only on loans which, absent a covenant violation, would have been insulated from the health of the lender over the course of the year.

Sample comparison. Table 1 reports summary statistics for the pre-crisis and crisis periods for the full SNC universe of loans to nonfinancial borrowers (columns 1 and 4), the covenant sample (columns 2 and 5), and for loans in the covenant sample for which we have a measure of the health of the lead lender (columns 3 and 6). Syndicated lending accounts for a large share of total lending volume in the U.S. economy. The full SNC universe contains $1.2 trillion of loans drawn and $2.79 trillion of loans and unused commitments outstanding as of the end of 2007. For comparison, the Consolidated Reports of Condition and Income (Call Reports) show $1.44 trillion of commercial and industrial loans drawn and $2.37 trillion of unused commitments not associated with real estate or credit cards from all U.S. commercial banks on that date.[8]

The coverage of the SNC covenant sample increases over time. During the crisis years of 2008-09, the covenant sample contains about one-third of the number of loans and loan volume as the full SNC universe, up from roughly one-quarter before the crisis. Loans in the covenant sample are of similar average size and maturity, have similar albeit slightly higher utilization rates, and have similar propensities to get refinanced or modified as those in the full universe. They are slightly more likely to be credit lines. While the covenant sample overweights loans

[8]Besides the $20 million threshold and syndication requirement for inclusion in the SNC data, these totals may differ because SNC includes the part of loans provided by non-bank lenders if they are part of a syndicate covered by SNC, because SNC may include some lending not classified as commercial and industrial in the Call Reports, and because the residual category for unused commitments in the Call Report data may contain non commercial and industrial loans. Aggregated Call Report data from the FDIC Quarterly Banking Profile: https://www.fdic.gov/bank/analytical/qbp/timeseries/BalanceSheet.xls (accessed November 2, 2016). As an alternative benchmark, since November 2012 the Federal Reserve Survey of Terms of Business Lending has reported the fraction made under syndication of all origination volume of commercial and industrial loans made by commercial banks; averaged across all months from November 2012 through August 2016, this fraction is 47.5%. Data from: https://www.federalreserve.gov/datadownload/Output.aspx?rel=e2&filetype=zip (accessed November 2, 2016).

rated below best quality or "pass," the composition of borrower credit quality remains similar to the SNC universe.[9] Roughly 80% of the loan volume in the covenant sample comes from loans with lead lenders in our lender data set.[10] Loans from these lenders appear similar to the full covenant sample along essentially all dimensions.

Maturity. The vast majority of bank loans are of long maturity. In both the full SNC data and the covenant sample, roughly 90% of all loans and commitments outstanding at the end of 2007 had at least 1 year of maturity remaining and more than three-quarters had maturity remaining of at least 2 years.[11] The long maturity of bank debt constricts the channels through which bank health can transmit to borrower outcomes. As a corollary, imposing the sample restriction of only including firms with 1+ year maturity remaining in order to focus on seemingly insulated borrowers has only a small practical effect.

Covenant violations. Covenant violations occur routinely. Roughly one-quarter of loans in the SNC covenant sample violate a covenant during a typical year before the 2008-09 financial crisis, and one-third violate a covenant in each crisis year. This violation frequency exceeds that reported in previous studies and it is instructive to compare to two prominent earlier

[9]For example, in 2006 the share of credits whose borrowers are rated as best (worst) quality or "pass" ("loss") is about 83% (0.29%) in the SNC universe and about 82% (0.33%) in the covenant sample. Not shown in the table, the sector composition of loans in the covenant sample is similar to the SNC universe and broadly representative of the sectoral composition of the U.S. economy – more than one-quarter of loans are to firms in the services sector and roughly one-third are to firms in manufacturing or retail. Loans to bank borrowers ($< 0.5\%$) and loans to non-bank financial borrowers (8%) make up a small share of SNC and our results are robust to not excluding them.

[10]The coverage of the lender-covenant sample falls in the 2008-09 period. Recall however that we assign lender health based on the borrower's 2006 lender. The 2008-09 lender-covenant sample therefore excludes borrowers who enter the SNC data after 2006.

[11]The maturity of loans in SNC closely resembles the maturity structure of all long-term debt. Of firms in Compustat with positive long-term debt outstanding, the median amount due in less than one year is about 5% of the total and the 75th percentile less than 20%. Across all firms in Compustat, the median firm has long-term debt of less than 0.2% of assets maturing within a year and the 75th percentile firm debt of less than 2% of assets. These ratios are roughly the same for debt due in each of 2007, 2008, and 2009. The ratios are based on all firms in the Compustat Annual file with non-negative revenue, assets, investment, or cash, with assets greater than cash, investment, or property, plant, and equipment, and with assets of at least $10 million and asset growth of lower than 200%.

Table 1: Summary Statistics

Sample:	Pre-crisis (2006-07)			Crisis (2008-09)		
	Universe	Covenant	Lender-covenant	Universe	Covenant	Lender-covenant
	(1)	(2)	(3)	(4)	(5)	(6)
			Loans of any maturity			
Fraction 1+ year remaining	0.88	0.90	0.91	0.84	0.87	0.90
			Loans with 1+ year maturity remaining			
Loan characteristics						
Mean maturity (years)	2.98	2.95	3.09	2.55	2.21	2.38
Mean log total committed	18.54	18.74	18.85	18.62	18.66	18.89
Fraction credit line	0.53	0.59	0.57	0.49	0.52	0.59
Fraction *Credit reduced*	0.26	0.25	0.26	0.34	0.40	0.38
Fraction *Waiver*		0.30	0.31		0.36	0.38
Fraction *New credit*	0.15	0.16	0.14	0.09	0.07	0.06
Mean lead lender share	0.21	0.16	0.16	0.20	0.15	0.15
Mean loan utilization rate	0.52	0.56	0.55	0.61	0.64	0.63
Borrower characteristics						
Fraction publicly-traded	0.33	0.36	0.37	0.41	0.41	0.40
Mean log assets		12.63	12.37		12.66	12.75
Mean leverage		0.50	0.48		0.53	0.52
Fraction passing risk rating		71.10	69.62		47.02	47.73
Covenant violation frequency						
$Bind_t$		0.25	0.24		0.36	0.35
$Bind_t$, private borrowers		0.27	0.26		0.38	0.37
$Bind_t$, excluding waivers		0.10	0.09		0.14	0.12
$Bind_{t-1:t}$		0.29	0.28		0.41	0.40
Loan-year observations	16,432	3,649	2,969	17,244	5,479	3,427
Unique borrowers	6,815	1,797	1,370	6,825	2,332	1,326
Total committed ($Tr)	2.55	0.63	0.51	2.66	0.91	0.66

Notes: The table reports summary statistics for the pre-crisis (2006-07) and crisis (2008-09) periods and for three samples. Columns with header "Universe" report summary statistics for the universe of loans in the full SNC data set to nonfinancial borrowers. Columns with header "Covenant" report summary statistics for the subset of these loans in the SNC covenant sample. Columns with header "Lender-covenant" report summary statistics for our final sample of loans in the covenant sample to nonfinancial borrowers and where the lead lender is in the Chodorow-Reich (2014) lender health data set. *Credit reduced* equals 1 if either the loan is terminated before maturity or the loan commitment is reduced. *Waiver* equals 1 if the lender grants a covenant waiver or resets the covenant. *New credit* equals 1 if the borrower obtains new credit. $Bind_t$ and $Bind_{t-1}$ are indicator variables equal to 1 if a loan breached a covenant in the current or either the current or previous year, respectively. Total committed is the sum of loans outstanding and unused commitments averaged over the two year period.

approaches. Dichev and Skinner (2002), Chava and Roberts (2008), and Falato and Liang (2016) use Compustat to follow current ratio and net worth covenants reported at inception in DealScan. Dichev and Skinner (2002) report that roughly 30% of loans violate one of these covenants at some point during the life of the loan. However, this approach mechanically understates the frequency of total violations because it considers only two types of covenants.[12] In an innovative approach, Roberts and Sufi (2009a), Nini et al. (2009), and Nini et al. (2012) scrape SEC 10-Q and 10-K filings of all publicly-traded firms looking for phrases associated with violations. Roberts and Sufi (2009a) find just 1% of firms rated A or above report a violation in a typical year, rising steadily to 9% for B rated borrowers and 18% for borrowers rated CCC or worse. Nini et al. (2012) use an improved version of the text-scraping algorithm and find roughly 12% of all loans to publicly-traded firms are in violation during each of 2006 and 2007, or roughly half the frequency in the SNC data. Yet, while their data cover all covenant types, firms do not need to report violations if they obtain an amendment or waiver before the end of the reporting period. Indeed, while each year roughly 25% of loans in the SNC covenant sample violate a covenant during 2006 or 2007, only 9% of loans violate a covenant and do not receive a waiver.[13] Finally, both previous approaches necessarily cover only publicly-traded borrowers. In the SNC data, private borrowers exhibit modestly higher violation propensities than publicly-traded borrowers.

[12]It also contains measurement error because covenant thresholds change after the initial loan contract (Denis and Wang, 2014; Roberts, 2015).

[13]On the other hand, to the extent the SNC covenant sample overweights lower quality loans, the sample propensity may exceed that of the typical loan in the U.S. economy. We can distinguish these possibilities by making a direct comparison of firm-years appearing in both the Nini et al. (2012) data set and the SNC covenant sample. In the XXX overlapping firm-years, the Nini et al. (2012) procedure identifies ZZZ violations, whereas SNC identifies YYY, or about double the violation propensity using the public filings. We are grateful to Amir Sufi for providing us with an updated version of the Nini et al. (2012) data set. The data are described in greater detail in the data appendix to that paper.

Table 2: Balancing

	All borrowers			$Bind_{t-1:t} = 1$		
	Less healthy lenders	Healthier lenders	t-stat. of equality	Less healthy lenders	Healthier lenders	t-stat. of equality
Variable mean:						
$100 \times Bind_{t-1:t}$ (crisis)	37.96	36.59	0.82			
Log assets (pre-crisis)	12.72	12.81	1.12	10.98	11.11	0.35
Leverage (pre-crisis)	0.50	0.49	1.21	0.54	0.53	0.93
Loan risk rating (pre-crisis)	70.04	71.51	0.56	42.20	44.69	0.93
Observations (crisis)	1,673	1,747	3,420			
Observations (pre-crisis)	1,215	1,263	2,478	358	335	693

Notes: The table reports selected summary statistics by lender health. "Healthier lenders" are those for which *Bad Lender* <median and "Less healthy lenders" are those for which *Bad Lender* >median, where *Bad Lender* is the rank of the lead lender's health normalized to lie on the unit interval, with a value of 1 corresponding to the least healthy lender.

Balancing. Table 2 assesses the balancing of covariates by lender health. The left panel includes all loans in the covenant sample, while the right panel restricts to loans which violate a covenant. Starting with the left panel, borrowers of lenders below and above the median of crisis lender health had statistically indistinguishable mean assets, leverage, and supervisory risk rating at the start of the crisis. The balancing along these variables, all drawn from SNC data, complements the similarities in geography and industry reported in Chodorow-Reich (2014). Of particular interest here, loans from lenders in good and bad health exhibit similar propensities to violate a covenant.

The balancing of ex ante characteristics of borrowers and loans which violate a covenant most directly affects the validity of our analysis below. Comparing the left and right panels, covenant violators overall tend to be smaller and have ex ante riskier loans and higher pre-crisis leverage. Crucially, violators who had borrowed from healthier and less healthy lenders have

nearly identical size and pre-crisis leverage and loans with similar risk ratings. We cannot reject equality of means for any variable. Together, these results all suggest that what differed across borrowers of lenders in different health was the response to a covenant violation and not ex ante characteristics of the borrowers.

4. Empirical Results

We present four sets of empirical results at the borrower and loan level. First, we use linear probability models to assess how a lender's response to a covenant violation depends on its own health, including presenting placebo exercises and a "within borrower" estimator to bolster our causal interpretation of the results. Next, we explore the heterogeneity of the response along various dimensions related to syndicate structure and borrower characteristics. Third, we measure the change in total credit at the loan and borrower level and show that affected borrowers do not substitute toward other sources of credit. Last, we report evidence on balance sheet adjustment and real outcomes such as investment.

4.1. Loan-Level Outcomes

We start with linear probability models to explore how loan terms change following a covenant violation, depending on lender health. Our main outcome variable, *Credit reduced*, equals 1 if either the loan is terminated before maturity or the loan commitment is reduced. The structure of SNC allows us to follow a loan through amendments, modifications, and refinancing in constructing this variable. We consider *Credit reduced* to be the broadest measure of whether a loan changes in a way unfavorable to the borrower. As a caveat, we do not observe

in SNC whether the interest rate changes.

Non-parametric representation. Table 3 shows a non-parametric version of our first main result using the variable *Credit reduced* and comparing loans with lenders in the top and bottom quartile of lender health. Loans which do not have a covenant violation have a roughly one-third chance of receiving an unfavorable modification. This number may reflect renegotiation forced by the lender before a covenant violation occurred, a mutually agreed reduction in credit limit, or an offsetting decline in the interest rate which we do not observe. The propensity is similar for borrowers of healthy and less healthy lenders, suggesting bad lender health by itself does not negatively affect the provision of credit to borrowers who already have a loan. Borrowers who violate a covenant have a higher likelihood of experiencing a bad loan outcome. For borrowers of healthier lenders, the likelihood rises by 5.3 percentage points. For borrowers of less healthy lenders, the likelihood rises by 18.6 percentage points. The additional 13.3 percentage points rise in the probability of a bad outcome is the non-parametric difference-in-difference estimate of the effect of having a lender in bad health following a covenant violation on receiving a bad loan outcome.

Regression evidence. Table 4 reports the regression version of the difference-in-difference estimator. The regression version allows us to make lender health a continuous rather than binary variable and to control for covariates. The specification takes the form:

$$Y_{l,b,f,t} = \beta_0 + \beta_1[Bad\ Lender_b] + \beta_2\left[Bind_{l,t-1:t}\right] + \beta_3[Bad\ Lender_b \times Bind_{l,t-1:t}]$$
$$+ \gamma' X_{l,f,t} + \epsilon_{l,b,f,t}, \tag{1}$$

Table 3: Non-parametric Evidence

	Fraction *Credit reduced* = 1		
	$Bind_{t-1:t} = 0$	$Bind_{t-1:t} = 1$	Difference
Healthiest lenders (*Bad Lender* <25th percentile)	0.316 [N=489]	0.369 [N=365]	0.053
Least healthy lenders (*Bad Lender* >75th percentile)	0.320 [N=529]	0.506 [N=319]	0.186
Difference	0.004	0.137	0.133

Notes: The table reports the fraction of loans in each cell terminated before maturity or experiencing a decline in the loan commitment (*Credit reduced* = 1). The sample consists of all loans in the SNC covenant sample at the start of 2008 or 2009, with at least one year maturity remaining, and with a lead lender in the lender health data set. *Bad Lender* is the rank of the lead lender's health normalized to lie on the unit interval, with a value of 1 corresponding to the least healthy lender. *Bind* is an indicator variable which equals 1 if a borrower violated a covenant in either the current or previous year. The brackets report the number of observations in each cell.

where $Y_{l,b,f,t}$ denotes an outcome in period t for loan l to firm f with lead bank b and $X_{l,f,t}$ may include borrower or loan covariates. We report standard errors two-way clustered by borrower and lead lender. For readability, all coefficients in table 4 are multiplied by 100.

The first column of table 4 repeats the exercise of table 3 with no additional covariates but the continuous measure of lender health. Since we have normalized the lender health measure to lie on the unit interval, the coefficient on the interaction *Bad lender* × *Bind* of 23.9 has the interpretation of a borrower of the lender in worst health is 23.9 percentage points more likely to receive a credit reduction following a covenant violation than a borrower of the healthiest lender. The difference is statistically significant at the 1% level. In column (2), we add year and industry fixed effects, in column (3) control additionally for borrower size, leverage, and risk rating, and in column (4) control for the borrower covariates and loan purpose and type. While the explanatory power of the regression rises with the controls, the magnitude and statistical

Table 4: Binary Outcome: Loan Commitment Terminated or Reduced

	Dep. var.: *Credit reduced*			
	(1)	(2)	(3)	(4)
Bad Lender	−4.1	−3.0	−3.2	−0.8
	(5.8)	(5.7)	(5.7)	(5.2)
Bind	6.1**	4.6	4.2	5.2*
	(2.6)	(3.1)	(2.9)	(2.6)
Bad Lender × *Bind*	23.9***	25.2***	25.1***	23.7***
	(6.4)	(6.5)	(6.5)	(6.3)
Year, Industry FE	No	Yes	Yes	Yes
Borrower controls	No	No	Yes	Yes
Loan controls	No	No	No	Yes
R^2	0.066	0.085	0.087	0.116
Observations	3,420	3,420	3,420	3,420

Notes: The table reports linear probability model regressions of the form: $Y_{l,b,f,t} = \beta_0 + \beta_1[Bad\ Lender] + \beta_2[Bind] + \beta_3[Bad\ Lender \times Bind] + \gamma' X_{l,b,t} + \epsilon_{l,b,f,t}$. The sample consists of all loans in the SNC covenant sample at the start of 2008 or 2009 with at least one year maturity remaining and a lead lender in the lender health data set. *Bad Lender* is the rank of the lead lender's health normalized to lie on the unit interval, with a value of 1 corresponding to the least healthy lender. *Bind* is an indicator variable which equals 1 if a borrower violated a covenant in either the current or previous year. *Credit reduced* equals 1 if either the loan is terminated before maturity or the loan commitment is reduced. Reported coefficients are multiplied by 100. Borrower controls: log assets, leverage, risk rating. Loan controls: loan purpose, loan type. Standard errors two-way clustered by borrower and lead lender reported in parentheses. *,**,*** indicate significance at the 10, 5, and 1 percent levels, respectively.

significance of the interaction coefficient remains quite stable. The stability of the coefficient reflects the sample balancing in table 2 and is consistent with borrowers being "as good as randomly assigned" to lenders. Because the coefficient remains stable, in the remainder of the paper we report only specifications including the full set of borrower and (if applicable) loan controls and year and industry fixed effects. As in table 4, we find very similar quantitative results whether or not we include these control variables.

The small and statistically insignificant estimate of β_1, the coefficient on the main effect for *Bad Lender*, also merits comment. The near zero (indeed slightly negative) coefficient indicates that borrowers attached to bad lenders but who did not violate a covenant did not

experience any higher likelihood of having their credit diminished. This result makes sense if the positive estimate of the interaction term coefficient β_3 stems from covenant violations providing an opportunity for distressed lenders to reduce credit; borrowers who did not breach a covenant started the year with a loan contract with maturity remaining of one year or more, and the long-term contract insulated them from the health of their lender. If alternatively the positive estimate of β_3 obtains simply because borrowers of more distressed lenders experienced a correlated decline in loan demand and voluntarily reduced their credit lines, we would have found both β_1 and β_3 to be positive.[14]

Other binary outcome variables. Table 5 reports difference-in-difference results for two other binary outcomes, receiving a waiver or reset on a covenant violation and having the loan commitment increased. In column (1), the dependent variable *Waiver* equals 1 if the lender grants a covenant waiver or resets the covenant. Usually such waivers occur only after a violation occurs, but they can also happen without a violation imminent. Not surprisingly, the probability of receiving a waiver rises sharply if the loan would otherwise be in technical default. The main effect on *Bind* indicates that for the healthiest lender, 75% of violations receive a waiver. However, the coefficient on the interaction of -67 means that only about 8% of loans from lenders in the worst health receive a waiver.

Column (2) examines whether violating a covenant and having a lender in bad health also affects the likelihood of a borrower receiving an expansion in credit available. Specifically, *New credit* equals 1 if the existing loan commitment increases or the borrower obtains new

[14]The economic interpretation of the main effect on *Bad Lender* explains why we include it in the regression rather than a lender fixed effect. Nonetheless, if we replace the term $\beta_1[Bad\ Lender_b]$ in equation (1) with a lender fixed effect α_b, we obtain nearly identical estimates of the main effect on *Bind* β_2 and the interaction coefficient β_3. For example, in the specification with full controls, we obtain $\beta_2 = 5.2$ (s.e.=2.4) and $\beta_3 = 23.6$ (s.e.=6.1).

Table 5: Additional Binary Loan-Level Outcomes

	Dep. var.: *Waiver*	Dep. var.: *New credit*
	(1)	(2)
Bad Lender	3.8	3.9
	(3.4)	(2.3)
Bind	75.3***	−1.5
	(1.7)	(1.8)
Bad Lender × *Bind*	−66.5***	−8.9*
	(10.7)	(4.7)
Year, Industry FE	Yes	Yes
Borrower controls	Yes	Yes
Loan controls	Yes	Yes
R^2	0.511	0.224
Observations	3,420	3,420

Notes: The table reports linear probability model regressions of the form: $Y_{l,b,f,t} = \beta_0 + \beta_1[Bad\ Lender] + \beta_2\,[Bind] + \beta_3[Bad\ Lender \times Bind] + \gamma' X_{l,b,t} + \epsilon_{l,b,f,t}$. The sample consists of all loans in the SNC covenant sample at the start of 2008 or 2009 with at least one year maturity remaining and a lead lender in the lender health data set. *Bad Lender* is the rank of the lead lender's health normalized to lie on the unit interval, with a value of 1 corresponding to the least healthy lender. *Bind* is an indicator variable which equals 1 if a borrower violated a covenant in either the current or previous year. *Waiver* equals 1 if the lender grants a covenant waiver or resets the covenant. *New credit* equals 1 if the borrower obtains new credit. Reported coefficients are multiplied by 100. Borrower controls: log assets, leverage, risk rating. Loan controls: loan purpose, loan type. Standard errors two-way clustered by borrower and lead lender reported in parentheses. **,*** indicate significance at the 5 and 1 percent levels, respectively.

credit not connected to its existing outstanding loans. Unlike a reduction or canceling of a credit line, which a lender may have a statutory right to do following a violation, an expansion of credit constitutes a positive outcome for a borrower. Nonetheless, violating a covenant may restrict the borrower's outside option in obtaining financing from a different source and lenders can exploit their bargaining power against such borrowers by refusing to negotiate a refinancing or offer additional credit. The regression evidence is consistent with this theory. Loans which breach a covenant have a roughly 9 p.p. lower probability of having an expanded credit commitment if they come from the least healthy lender.

Specification tests. We provide four additional exercises in support of a causal interpretation of our main result in table 4. First, in column (1) of table 6 we estimate the difference-in-difference specification (1) with the dependent variable $Y_{l,b,f,t}$ the change in the lead lender's share of the loan commitment. If a decline in health caused the lead lender to force a tightening of credit provision following a covenant violation, we should expect the lead lender's share of the renegotiated loan to decline on average. If instead the tightening of credit reflected only some unobservable attribute of the borrower, the lead lender share should remain constant or even increase due to enhanced agency problems between the lead and the other syndicate members. Notably, using the change in the lead's share as the dependent variable in equation (1) is akin to having bilateral credit to a borrower as the dependent variable but including a borrower-loan fixed effect. This specification therefore closely resembles the "within estimator" of Khwaja and Mian (2008) in that it differences out any heterogeneity across borrowers in loan demand. The negative coefficient for the interaction term in column (1) indicates a reduction in lending by the lead lender relative to other syndicate participants, consistent with the tightening of credit reflecting the increase in internal cost of funds for the lead lender. The magnitude, a decline in commitment share of about 11 p.p., is equal to roughly two-thirds of the sample mean lead commitment share of 15% during the crisis reported in table 1.

Next, in column (2) of table 6 we return to the specification in table 4 with *Credit reduced* as the dependent variable but replace lender health with the health of the pre-crisis lead lender, where pre-crisis lead lender is determined using loans outstanding in June 2007. This date falls a few weeks before the implosion of the two Bear Stearns hedge funds which marked the start

Table 6: Specification Tests

Dependent variable:	Change in lead lender share	*Credit reduced* (2008-09 crisis)	*Credit reduced* (2006-07 placebo period)	
Lender health based on:	Crisis lead	June 2007 lead	Crisis lead	Placebo lead
	(1)	(2)	(3)	(4)
Bad Lender	1.2	−9.8	3.5	−2.2
	(2.5)	(6.3)	(4.0)	(6.4)
Bind	−4.1*	8.2**	13.9**	16.1***
	(2.4)	(3.3)	(5.7)	(5.3)
Bad Lender × *Bind*	−10.9**	27.3***	2.9	10.3
	(5.2)	(5.1)	(10.8)	(11.5)
Year, Industry FE	Yes	Yes	Yes	Yes
Borrower controls	Yes	Yes	Yes	Yes
Loan controls	Yes	Yes	Yes	Yes
Observations	2,289	2,844	2,047	2,478

Notes: The table reports regressions of the form: $Y_{l,b,f,t} = \beta_0 + \beta_1[Bad\ Lender] + \beta_2\,[Bind] + \beta_3[Bad\ Lender \times Bind] + \gamma' X_{l,b,t} + \epsilon_{l,b,f,t}$. In column (1) the sample and variable definitions are the same as in table 4 except that the sample excludes loans which disappear by the end of the year and the dependent variable is the change in the fraction of the loan commitment from the lead lender. In column (2) the sample and variable definitions are the same as in table 4 except that the sample excludes loans to borrowers without a loan in SNC as of June 2007 and lender health assignment is based on the lead lender as of June 2007. In columns (3) and (4) the sample consists of loans in the SNC covenant sample at the start of 2006 or 2007 with at least one year maturity remaining and the dependent variable is based on outcomes in 2006 and 2007. In column (3) lender health assignment is based on the lead lender at the start of the crisis. In column (4) lender health assignment is based on the lead lender at the start of 2006 or 2007. In all columns, *Bad Lender* is the rank of the crisis health of the assigned lender as of the period indicated in the table header normalized to lie on the unit interval, with a value of 1 corresponding to the least healthy lender, *Bind* is an indicator variable which equals 1 if a borrower violated a covenant in either the current or previous year, and *Credit reduced* equals 1 if either the loan is terminated before maturity or the loan commitment is reduced. Reported coefficients are multiplied by 100. Borrower controls: log assets, leverage, risk rating. Loan controls: loan purpose, loan type. Standard errors two-way clustered by borrower and lead lender reported in parentheses. *,**,*** indicate significance at the 10, 5, and 1 percent levels, respectively.

of the subprime crisis, but at a point when few observers expected any financial disruption.[15] Therefore, it eliminates the possible influence of endogenous matching of lenders and borrowers after lender health during the crisis began to be revealed. In practice, the stickiness of bank-borrower relationships makes lender health in June 2007 highly correlated with lender health at the start of 2008 or 2009, and we find very similar quantitative results using the June 2007

[15]For example, the Federal Reserve meeting statement from June 28, 2007 acknowledges "ongoing adjustment in the housing sector" but expects the economy to expand "at a moderate pace over coming quarters" and sees the "risk that inflation will fail to moderate as expected" as the "predominant policy concern."

Table 7: Heterogeneity

Notes:

health variable.

Columns (3) and (4) of table 6 report placebo exercises. In column (3), we keep the measure of lender health assigned to each borrower the same as in our baseline specification, but re-estimate the difference-in-difference regressions in table 4 for the likelihood of a credit commitment reduction in 2006 and 2007. This exercise asks whether borrowers of lenders in worse health during the crisis were treated differently before the crisis upon violating a covenant. In column (4), we keep the measure of lender health the same but reassign borrowers to their lender as of the start of 2006 or 2007. This exercise asks whether banks in worse health in 2008 and 2009 always treat covenant violators worse, or whether the differential treatment occurs only during the financial crisis. In neither case can we reject that the differential treatment occurred only during the crisis. The estimates of the interaction term coefficient β_3 are small in magnitude and statistically indistinguishable from zero. The harsh treatment of covenant violators by unhealthy banks during the crisis appears to reflect the health of the bank and not some time-invariant bank or borrower characteristic.[16]

4.2. Heterogeneity and Syndicate Structure

4.3. Effect on Credit Available and Substitution

We have seen that lenders react differently to covenant violations depending on their own health. We now examine the total effect on credit availability.

Whether the health of a borrower's lender matters to the borrower depends on the ease with which a borrower can substitute new credit from an alternative lender. Here we investigate the substitution margin for covenant violators. Previous literature has usually motivated costly switching from asymmetric information between old and new lenders (Williamson, 1987; Sharpe, 1990; Hachem, 2011; Darmouni, 2016). We conjecture an even simpler explanation may apply in this case – lenders will not make new loans to borrowers in technical default, as cross-default provisions mean that the triggering of a covenant on one loan puts the borrower in technical default on other loans and uncertain resolution of the violation deters new lenders from offering credit.

Column (1) of table 8 reports estimates of equation (1) where the dependent variable is the percent change in the total amount committed and the sample contains only loans which began the year with remaining maturity greater than one year and remain in existence at the end of the year. Thus, this column shows the intensive margin change in credit at the loan level. The interaction coefficient of -13.2 indicates a 13 percentage points intensive margin decline in loan commitment for loans which trigger a violation and where the lender is in poor health. In

[16] In contrast, we find positive and statistically significant evidence that unconditionally having a covenant binding lowers credit in the pre-crisis period ($\beta_2 > 0$ in columns (3) and (4)). Of course, this result does not invalidate the placebo exercise. We would expect lenders to use covenant violations to restrict credit on some loans even outside the crisis. But this outcome should not occur differentially at lenders more impacted by the crisis, exactly as we find.

column (2), we add to the sample loans which began the year with maturity greater than one year but are prematurely terminated and impute a value of 0 for the end of year commitment on terminated loans. We also add to the end of year commitment any new credit from syndicates with lead bank b to firm f.[17] Thus, column (2) captures the intensive and extensive margin of credit available from lead bank b to firm f. Including loan terminations causes the interaction coefficient to rise by about two-thirds in absolute value relative to the specification including only the intensive margin. Across these two columns and similar to the results in table 4, we find much smaller coefficients on the main effects for *Bad Lender* and *Bind*, reflecting the insulation of borrowers with long-term loan contracts who do not violate a covenant from the health of their lender in the case of *Bad Lender*, and the high frequency of covenant waivers granted by lenders in good health in the case of *Bind*.

Column (3) aggregates to the borrower level. Here and elsewhere, when we aggregate to the borrower level, we define *Bind* as the maximum across all loans and *Bad Lender* as the average across all lead lenders for firms with multiple loans in the covenant sample. The dependent variable is the percent change in all loans to the borrower in the full SNC universe. Analyzing the effect on loan commitment at the borrower level allows for any substitution margin by borrowers toward lenders already servicing different loans or the opening of new loans. We find even larger percent declines in credit available after aggregating to the borrower level. Because the denominator of the dependent variable in column (3) includes all loan commitments to the borrower and therefore (weakly) exceeds the denominator in column (2), the larger interaction

[17]While SNC treats amendments or refinancing as a continuation of the same loan, very large changes in loan structure or changes to the syndicate may result in the creation of a new loan identifier. Aggregating to the lender-borrower level ensures we do not erroneously impute a loan termination when in fact the lending relationship continued with a different loan identifier.

Table 8: Effect on Total Credit Available

Dependent variable:	%Δ (Total committed)			$\Delta \frac{\text{Non-SNC debt}}{\text{Assets}}$	$\Delta \frac{\text{Debt issuance}}{\text{Assets}}$
Aggregation:	Loan intensive margin	Loan all margins	Borrower	Borrower	Borrower
	(1)	(2)	(3)	(4)	(5)
Bad Lender	1.1	0.2	12.4	−0.3	1.3
	(2.0)	(4.4)	(9.4)	(6.2)	(1.6)
Bind	−2.6*	−3.2	−8.1***	4.4	0.1
	(1.1)	(4.0)	(2.6)	(3.3)	0.6
Bad Lender × *Bind*	−13.2***	−22.9***	−26.0***	−8.8	−4.5**
	(3.2)	(7.6)	(8.9)	(8.4)	(2.1)
Year, Industry FE	Yes	Yes	Yes	Yes	Yes
Borrower controls	Yes	Yes	Yes	Yes	Yes
Loan controls	Yes	Yes	No	No	No
Frequency	Annual	Annual	Annual	Annual	Long-difference
Dep. var. source	SNC	SNC	SNC	SNC	Compustat
Observations	2,289	3,420	1,803	1,525	376

Notes: The table reports OLS regressions of the form: $Y = \beta_0 + \beta_1[Bad\ Lender] + \beta_2\,[Bind] + \beta_3[Bad\ Lender \times Bind] + \gamma' X + \epsilon$. In column (1) the sample is the same as table 4 except it excludes loans which disappear by the end of the year; in column (2) the sample is the same as table 4; in column (3) the sample contains all loans in the SNC universe to a borrower in the table 4 sample and the data are collapsed to the borrower level; in column (4) the sample contains all borrowers in the table 4 sample with at least one SNC loan outstanding at the end of the year; and in column (5) the sample contains all borrowers in the table 4 sample which we match to Compustat. *Bad Lender* is the rank of the lead lender's health normalized to lie on the unit interval, with a value of 1 corresponding to the least healthy lender. *Bind* is an indicator variable which equals 1 if a borrower violated a covenant in either the current or previous year. In column (1) the dependent variable $Y_{l,b,f,t}$ is the percent change in total committed credit associated with loan l. In column (2) the dependent variable $Y_{b,f,t}$ is the percent change in total committed credit on loans from lead lender b to borrower f. In column (3) the dependent variable $Y_{f,t}$ is the percent change in total committed credit aggregated across all loans to borrower f in the SNC universe. In column (4) the dependent variable $Y_{f,t}$ is the change in total non-SNC debt, defined as total debt less the drawn portion of SNC loans, as a percentage of beginning of period total book assets. In column (5) the dependent variable is the change from 2007 to 2009 in issuance of long-term debt less reduction in long-term debt as a percentage of 2007 total book assets. SNC Borrower controls: log assets, leverage, risk rating. Loan controls: loan purpose, loan type. Standard errors two-way clustered by borrower and lead lender (columns 1 and 2) or clustered by borrower (columns 3-5) reported in parentheses. *,**,*** indicate significance at the 10, 5, and 1 percent levels, respectively.

coefficient in column (3) indicates that affected borrowers receive *less* credit from other lenders.[18]

[18]Recall that the SNC universe contains all loans of at least $20 million shared by three or more unaffiliated financial institutions under the regulatory purview of one of the SNC supervisors. If borrowers substitute toward loans from lenders which do not put them into the SNC sample, then the result in column (3) could overstate the magnitude of the total bank credit decline. However, we have estimated a similar specification for the number of new loans reported by a borrower in DealScan and also find a reduced likelihood of a new loan reported in DealScan for borrowers of unhealthy lenders who violate a covenant.

While this result implies the opposite of substitution toward other lenders, it is consistent with the result in column (2) of table 5 that affected borrowers are less likely to open a new loan, with cross-default provisions in loan contracts putting borrowers into technical default in their other loans, and with the reluctance of lenders to provide new loans to a borrower with an unresolved covenant violation.

Columns (4) and (5) examine whether borrowers substitute non-bank sources of credit. In column (4), we use the measure of total debt reported in SNC. This variable has the advantage that we observe it for all borrowers, including non-public borrowers, but the drawback that a borrower must appear in SNC at the end of the year for us to observe the debt measure. To isolate substitution toward non-SNC debt, we subtract from the total the sum of SNC term loans and the drawn part of SNC credit lines and compute the difference between the beginning and end of the year as a percentage of beginning of period total assets. We find no evidence of affected borrowers substituting toward non-SNC credit; the coefficient on the interaction term *Bad Lender* $\times$ *Bind* is statistically insignificant and the point estimate is negative.

In column (5) we study the effect on debt issuance reported in Compustat. While the restriction to publicly-traded which we can match to Compustat reduces the number of observations, it avoids the censoring problem of borrowers which leave the SNC data.[19] Therefore, in all specifications using a dependent variable from Compustat we report long-difference regressions

[19]The merge uses company names and the string matching algorithm SAS SPEDIS. We manually review each proposed match for accuracy. Appendix A provides additional details on the merge procedure. We winsorize all Compustat variables at the 1% level.

of the form:

$$Y_{f,2007-2009} = \beta_0 + \beta_1[Bad\ Lender_b] + \beta_2 Bind_{f,2007:2009} + \beta_3[Bad\ Lender_b \times Bind_{f,2007:2009}]$$
$$+ \gamma' X_f + \epsilon_{f,2007-2009}, \quad (2)$$

where $Y_{f,2007-2009}$ is the change in a variable between 2007 and 2009 associated with firm f which had loans from bank b. By differencing, we control for any unobserved level differences across borrowers. The coefficient β_3 identifies the effect of violating a covenant sometime between 2007 and 2009 and having a bad lender on the outcome. The interaction term in column (5) indicates that long-term debt issuance falls for the affected borrowers. Together, the results in columns (4) and (5) appear inconsistent with any ability to substitute toward non-bank debt for these borrowers, as technical default prevents the issuance of other debt.[20]

4.4. Balance Sheet Adjustment and Real Outcomes

We now turn to how borrowers adjust to lower credit. Previous research has found evidence of both lender health (e.g. Chodorow-Reich, 2014) and covenant violations (Chava and Roberts, 2008; Nini et al., 2012; Falato and Liang, 2016) negatively affecting firm investment and employment. Here we ask to what extent the interaction of these two variables matters above the main effects.

We first discuss financial margins of adjustment. Column (1) of table 9 shows using SNC data that the utilization rate on existing credit lines rises for covenant violators of less healthy lenders. Because borrowers with multiple credit lines may substitute across lines, we aggregate

[20]We have also investigated new issuance of public debt using the Mergent FISD database and again find a negative and statistically significant coefficient on new debt issuance for firms which violate a covenant and have a lender in bad health.

Table 9: Financial and Real Adjustment

Dependent variable:	Credit utilization	Δ Cash/Assets	Δ Capex/Assets	Employment growth
	(1)	(2)	(3)	(4)
Bad Lender	0.007	0.021	0.028	0.010
	(0.014)	(0.037)	(0.020)	(0.068)
Bind	0.027	0.015	−0.037	−0.008
	(0.050)	(0.017)	(0.036)	(0.046)
Bad Lender × *Bind*	−0.032**	−0.071**	−0.077**	−0.112**
	(0.012)	(0.031)	(0.037)	(0.049)
Industry FE	Yes	Yes	Yes	Yes
Borrower controls	Yes	Yes	Yes	Yes
Frequency	Annual	Long-difference	Long-difference	Long-difference
Dep. var. source	SNC	Compustat	Compustat	Compustat
Observations	1,525	376	376	376

Notes: The table reports OLS regressions of the form: $Y = \beta_0 + \beta_1[Bad\ Lender] + \beta_2 Bind + \beta_3[Bad\ Lender \times Bind] + \gamma' X + \epsilon$. In column (1) the sample contains all borrowers in the table 4 sample with at least one SNC loan outstanding at the end of the year and the data are collapsed to the borrower-year level. In columns (2)-(4) the sample is borrowers in the table 4 sample which also appear in Compustat and the data are collapsed to the borrower level. *Bad Lender* is the rank of the lead lender's health normalized to lie on the unit interval, with a value of 1 corresponding to the least healthy lender. *Bind* is an indicator variable which equals 1 if a borrower violated a covenant in either the current or previous year. In column (1) the dependent variable is the annual change in the utilization across all loans to borrower f. In columns (2)-(4) the dependent variable is the change from 2007 to 2009 in: the ratio of cash to total book assets (column 2); the ratio of capital expenditure to total book assets (column 3); or the log of the number of employees (column 4), winsorized at the 1% level. Borrower controls: log assets, leverage, risk rating. Standard errors clustered by lead lender reported in parentheses. *,**,*** indicate significance at the 10, 5, and 1 percent levels, respectively.

all credit lines to the borrower level and compute the change in utilization for borrowers with at least one loan outstanding at the beginning and end of the year. The coefficient of 0.086 in column (1) indicates an increase in utilization of 8.6 p.p., relative to a baseline utilization rate of 0.62 during the crisis reported in table 1.

The rest of table 9 relies on data from Compustat and reports the long-difference specification (2). Column (2) shows that firms adjust partially by drawing down cash reserves. Together, the drawing down of credit lines and cash reserves reinforce our causal interpretation that the decline in credit to these borrowers reflects a supply contraction and not a lower demand for borrowing by covenant violators of unhealthy lenders.

Columns (3) and (4) of table 9 report real outcomes. The harsher treatment of a covenant violation by less healthy lenders transmits into lower investment and employment. For both investment (3) and employment growth (4), the interation term is statistically significant at the 5% level and the magnitude is larger than any of the main effects.[21]

5. Aggregation

The previous sections showed that unhealthy lenders squeeze borrowers who trigger a covenant violation and that this interaction matters to loan and borrower-level outcomes. We now quantify the fraction of the total decline in the stock of credit, including commitments, during the crisis mechanically attributable to this interaction.

This calculation takes the following steps. In column (3) of table 8, we found an interaction coefficient of $\beta_3 = -26.0$ for the intensive and extensive margin percent change in loan volume for borrowers of unhealthy lenders who violate a covenant. Using this coefficient, we obtain the in-sample fitted decline in lending volume (including unused commitments) due to unhealthy lenders squeezing violators as:

$$\text{Fitted decline due to interaction} = (0.01 \times \beta_3) \times \sum_l Bad\ Lender_b \times Bind_{l,t-1:t} \times Commit_{l,t-1}, \tag{3}$$

where $Commit_{l,t-1}$ gives the loan commitment at the end of the previous year. The contribution to total credit growth in the SNC covenant sample is this sum divided by total initial credit

[21] The absence in Compustat of private borrowers as well as some borrowers with missing information in either 2007 or 2009 reduces the sample size by a factor of about four. As a result, many of the main effect coefficients are not statistically significant. The exclusion of private borrowers also likely reduces the employment effects relative to Chodorow-Reich (2014), who found the effects of lender health on employment were largest for small borrowers and borrowers without access to public debt markets.

Table 10: Aggregate Importance

	$t = 2008$	$t = 2009$
	(1)	(2)
SNC covenant sample decline due to interaction	−5.76%	5.94%
Total credit growth rate in SNC universe, $t-1$ to t	−4.50%	−4.50%

Notes: The first row of the table reports the ratio $(\beta_3 \sum_l Bad\ Lender_b \times Bind_{l,t-1:t} \times Commit_{l,t-1})$ / $(\sum_l Commit_{l,t-1})$. The second row reports the growth rate of all outstanding loans, including commitments, in the SNC universe between December 31st of year $t-1$ and t.

committed, and is reported in the first row of table 10. At the end of 2008, 5.8% of the dollar commitments outstanding as of the end of 2007 and with at least 1 year maturity remaining had disappeared due to unhealthy lenders contracting credit on loans which violated covenants. Another 5.9% of loans and commitments disappeared during 2009.

For comparison, the stock of total credit outstanding (including new commitments) in the full SNC universe from the lenders in our sample contracted by 4.5% in each of 2008 and 2009, shown in the second row of the table. Thus, the reduction in credit to borrowers who started the year with a loan maturity sufficient to insulate them from their lender's health but violated a covenant and had credit contracted as a result is larger than the decline in credit outstanding. Of course, credit might have otherwise grown if bank health hadn't deteriorated, so the covenant channel does not necessarily account for the entire decline in credit relative to a healthy financial sector counterfactual.

6. Conclusion

We have investigated the importance of lender health in determining the response to a covenant violation. Using a new supervisory data set of bank loans, we document a higher

covenant violation propensity than found in previous work, with more than one-third of loans breaching a covenant each year during 2008 and 2009. Lenders in worse financial condition are less likely to grant a waiver and more likely to force a reduction in the loan balance. Quantitatively, the reduction in credit to borrowers with long-term credit but who violate a covenant accounts for a 9% decline in the volume of loans and commitments outstanding between 2007 and 2009, nearly the same magnitude as the total contraction in credit during that period.

Our results have implications not explored in this paper. We highlight four. First, when writing loan contracts ex ante, do lenders and borrowers internalize the effective option to shorten maturity which covenants offer? Our results suggest they should. However, a body of research finds that managers may be overconfident in their outlook for their firm (Malmendier and Tate, 2015), in which case they may underestimate the likelihood of breaching a financial covenant. Second, our evidence comes from a particularly acute crisis period. While such episodes merit special attention due to their macroeconomic importance, the pervasiveness of covenant violations in non-crisis periods means that this channel may also matter in more tranquil times. Third, because on average lower quality and smaller firms violate covenants, the importance of this channel suggests credit tightening may affect the allocation as well as the quantity of credit. Fourth, the literature on covenants has almost exclusively used U.S. data. Yet, the transmission of bank health to corporate borrowers appears active in other countries as well. Do covenant violations abroad play as important a role as they do in the United States? Future research could take up these and other questions.

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Loan Covenant Violations and the Bank Lending Channel

Online Appendix

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A. Details of Sample Construction and Variable Definitions

This appendix gives additional details on how we construct the main sample and the variables used for our analysis. The variables used in this paper are extracted from four major data sources: the Shared National Credit Program (SNC), Loan Pricing Corporation's (LPC) Dealscan database, COMPUSTAT, and Capital IQ. For each data item, we indicate the relevant source in square brackets. The variables are defined as follows:

To construct our sample, we start with the universe of loans by firms incorporated in the United States that have covenant information available in SNC. While Chava and Roberts (2008) and Roberts and Sufi (2009) use quarterly data, we use annual data because SNC is an annual survey. From SNC we retrieve information on covenant compliance as well as loan (non-price) terms and basic borrower characteristics, which we use in our baseline analysis. The information on covenants and compliance is from the supervisory review of SNC loans, which covers annually about 1/3 of the loan volume in the SNC universe. The supervisors gather the information from loan documentation and follow up directly with the banks when needed, such as in instances when the information is either missing or incomplete. As such, we have a potentially broader

sample relative to existing studies that either use Dealscan (Chava and Roberts (2008) and Falato and Liang (2004)), whose covenant information is primarily from loan tear sheets, or hand-collected information from SEC filing (Roberts and Sufi (2009)), which are only available for publicly-traded firms or firms with publicly-traded debt outstanding. While the composition of the sample that is chosen for review each year is designed to include a larger share of credits that are rated below best quality or "pass," the composition of borrowers credit quality remains overall balanced. For example, as of 2006 the share of credits whose borrowers are rated as best (worst) quality or "pass" ("loss") is about 83% (0.29%) in the SNC universe and about 82% (0.33%) in the review sub-sample for which covenant information is available.

Because information on covenants is available only from 2006, we focus our attention on the sample of loans between 2006 and 2011. The basic unit of observation in SNC is a credit, which is comparable to a deal or package in Dealscan. SNC gives us information on covenant compliance for each credit-year surveyed. Each credit-year in SNC is classified as either non-compliant if the borrower has breached a covenant threshold as of the end of the year, or compliant if the borrower has not breached any its covenants' thresholds as of the end of the year, or compliant after receiving a waiver or an amendment if the borrower has not breached a covenant threshold after it was reset, but would have otherwise breached it (if it had not been reset) as of the end of the year. We classify a firm's loan covenants to be binding in a given year if the firm is either non-compliant or compliant after receiving a waiver or an amendment on one of its credits in that year.

While conceptually straightforward, the measurement of covenant violations poses several challenges. Specifically, SNC allows us to deal with four main measurement issues following the

standard practice in the literature. First, firms can have multiple loan deals during a given year in our sample period. For the case when multiple deals overlap (i.e., one deal matures after the start of another deal), we define covenant compliance to be the tightest (i.e., we classify a borrower covenants to be binding if they are binding on at least one of the borrowers' credits in any given year) unless it corresponds to a refinancing deal, in which case we define the relevant covenant status to be that specified by the refinancing credit regardless of whether or not it is tightest. Second, for the case when there are dynamic covenants that change over the life of the loan, SNC includes complete information on the covenant dynamics, which we use to define the compliance status over the life of the loan accordingly. Third, SNC also includes complete information on post-origination amendments to the loan contract, which we also use to define compliance status over the life of a loan Finally, since our data has a lower annual (and not quarterly) time frequency than existing studies, we opted for including a relatively small fraction (number) of the newly originated loans, 5.6% (181), that are classified as non-compliant in the year of the loan origination, a phenomenon also encountered by Dichev and Skinner (2002) and Chava and Roberts (2008).

Finally, we retrieved information on loan pricing from Dealscan, as well as borrower balance sheet information from Compustat for publicly-traded firms and from Capital IQ for privately-held firms. The final step of our data assembly process was to merge the SNC loan data with information from these sourced by matching company names. Firms in the SNC universe were compared to firms in each of these additional data sources using a standard matching algorithm (see, for example, Lee and Mas (2012)), which is the SAS SPEDIS function. This function matches company names in each of the additional data sources to company names in SNC based

on a "spelling distance," which considers those comparisons with a spelling distance below a predetermined threshold as candidate matches. For the cases when the algorithm matches a company in SNC to more than one company name in any of the additional data files we selected the lowest spelling distance as the candidate match. Research assistants reviewed every match and manually dropped those where, based on company headquarter location (state and city) and web searches from multiple sources including company web sites, Lexis-Nexis, Google, and Factiva, they assessed that the automated procedure resulted in an incorrect match. As a final quality check of the matching procedure, we retrieved an additional match file by using the same procedure for the Dealscan-Compustat linking file from Chava and Roberts (2008), which is available at Michael Robert's web page, and verified that the resulting firm identifiers (gvkeys) were the same as those from our merge with Dealscan.

The variables used in the analysis are defined as follows.

Main Explanatory Variables:

Bind is a dummy that takes value of one for any given loan-year when the borrower is either non-compliant with any of its loan covenants or compliant after receiving a waiver or an amendment in a given year, i.e., if the borrower either breaches a covenant threshold in any given firm-year or a covenant is reset or waived so that an otherwise non-compliant borrower would remain in compliance. [SNC]

Bad Lender is based on Chodorow-Reich (2014) and is the cumulative density (cdf) of lead-lender exposure to asset-backed securities as measured by the correlation of their daily stock return with the return on the ABX AAA 2006-H1 index (*ABX Exposure*), to balance sheet losses

not directly affected by the corporate loan portfolio as measured by the ratio of 2007-2008 trading account losses to total assets (*B/S Exposure),* and to the Lehman failure as measured by the fraction of a bank's syndication portfolio where Lehman Brothers had a lead role (*LEHMAN Exposure*), in turn. We also use factor analysis to aggregate over these individual exposure proxies and extract an overall exposure proxy which is measured as the cumulative density (cdf) of the (first) principal component of the three individual proxies calculated using the entire SNC universe (*ALL*).

Outcome Measures:

Termination or Unfavorable Amount Modification is a dummy that equals one for either existing loans that end before their most recently stated maturity in a given year and are not followed by a new loan to the borrower from the current lead lender or for existing loans that experienced a reduction in the total dollar amount limit the borrower is legally allowed to borrow up to according to the loan contract terms in a given year relative to the previous year. We are able to track loan paths over time because each loan in SNC is assigned a unique permanent credit identifier, which remains unchanged throughout the life of the loan including in those years when loan terms are amended or modified or when the loan is refinanced. [SNC]

New Loan or Favorable Amount Modification is a dummy that equals one for either new loans that are originated to a given borrower by a new lead lender (i.e., by a lead lender that had not previously extended a loan to the borrower) or for existing loans that experienced an increase in the total dollar amount limit the borrower is legally allowed to borrow up to according to the loan contract terms in a given year relative to the previous year. We are able to track loan paths over time because each loan in SNC is assigned a unique permanent credit identifier,

which remains unchanged throughout the life of the loan including in those years when loan terms are amended or modified or when the loan is refinanced. [SNC]

Refinancing is a dummy that equals one for existing loans that were set to mature in the previous year according to the earlier loan contract terms but whose maturity was extended in the following year. We are able to track loan paths over time because each loan in SNC is assigned a unique permanent credit identifier, which remains unchanged throughout the life of the loan including in those years when loan terms are amended or modified or when the loan is refinanced. [SNC]

Covenant Waived or Reset is a dummy that equals one if any of the loan covenants are waived or reset in a given year. [SNC]

Lead Lender Share (Committed) is the ratio of the dollar amount limit the lead lender is legally committed to lend divided by the total dollar amount limit the borrower is legally allowed to borrow according to the loan contract terms in a given year. [SNC]

Lead Lender Amount (Committed) is the natural logarithm of the dollar amount limit the lead lender is legally committed to lend up to according to the loan contract terms in a given year. [SNC]

Lender Share (Committed) is the ratio of the dollar amount limit the lender is legally committed to lend divided by the total dollar amount limit the borrower is legally allowed to borrow according to the loan contract terms in a given year. [SNC]

Lender Amount (Committed) is the natural logarithm of the dollar amount limit the lender is legally committed to lend up to according to the loan contract terms in a given year. [SNC]

Lender Utilization Rate is the ratio of the lender balance exposure (the dollar amount the lender

has extended which has not been repaid) divided by the dollar amount limit the lender is legally committed to lend up to according to the loan contract terms in a given year. [SNC]

Loan Utilization Rate is the ratio of the loan balance (the dollar amount the borrower has drawn which has not been repaid) divided by the total dollar amount limit the borrower is legally allowed to borrow according to the loan contract terms in a given year. [SNC]

Loan spread (%) is the all in spread on a given loan, including fees. [Dealscan]

Excess loan spread (%) is the difference between the all in spread on a given loan (including fees) and the average all in spread of a matched benchmark of loans originated in the same year and in the same (2-SIC) industry sector. [Dealscan]

Capex/Book Assets is capital expenditures (item 90) over net property, plant and equipment at the beginning of the fiscal year (item 42). [Compustat Quarterly for publicly-traded firms, Capital IQ for privately-held firms]

Employment Growth is the ratio of the total number of employees (item 29_t) minus the lagged total number of employees (item 29_{t-1}) divided by the lagged total number of employees (item 29_{t-1}). [Compustat]

Book Leverage is total book debt, which is the sum of total long-term debt and debt in current liabilities (item 51+item 45), over total book assets (item 44). [Compustat Quarterly for publicly-traded firms, Capital IQ and SNC for privately-held firms]

(Net) Debt Issuance is issuance of long-term debt (item 86) minus reduction in long-term debt (item 92) over lagged total book assets (item 44) [Compustat Quarterly]

Firm and Industry Variables:

Sample-Split Variables:

Public (Private) Borrower is a dummy that equals one for borrowers that have a matching observation in Compustat in a given year. [SNC and Compustat]

Small Borrower is a dummy that equals one for borrowers whose book value of assets is below median in a given year. [SNC]

Highly-Levered Borrower is a dummy that equals one for borrowers whose ratio of total book debt to book value of assets is above median in a given year. [SNC]

Risky Borrower is a dummy that equals one for borrowers whose loans are classified as special mention, substandard, doubtful, or loss by supervisors in a given year (see below for detailed definitions of the supervisory risk rating categories). [SNC]

Additional Controls:

Loan origination year is a full set of dummies that equal one for each year in which any given loan was originated. [SNC]

Loan purpose is a full set of dummies that equal one for each of the loan purpose categories included in SNC, such as, for example, M&As, CAPEX, working capital, general corporate purposes. [SNC]

Loan type is a full set of dummies that equal one for each of the loan type categories included in SNC, such as, for example, term loan, revolving credit, non-revolving line of credit. [SNC]

Borrower sector is a full set of dummies that equal one for each of the 8 borrower sector categories included in SNC, such as, for example, manufacturing, services, distribution. [SNC]

Loan size is the natural logarithm of the total dollar amount limit the borrower is legally allowed to borrow up to according to the loan contract terms in a given year. [SNC]

Borrower size is the natural logarithm of the book value of assets. [SNC]

Leverage is the ratio of total book debt to book value of assets. [SNC]

Risk rating is a score that ranges between 0 and 4 for each of the five supervisory risk rating categories assigned to a loan in a given year. The five supervisory risk rating categories are as follows: Pass (for loans that are considered to be in good standing), Special Mention (for loans that are in good standing but have potential weaknesses that, if left uncorrected, could result in further deterioration of the repayment prospects), Substandard (for loans that are inadequately protected by the current sound worth and paying capacity of the borrower or of the collateral pledged, if any), Doubtful (for loans that are considered substandard and, in addition, have weaknesses that make collection or liquidation in full, on the basis of available current information, highly questionable or improbable), and Loss (for loans that are considered uncollectible and of so little value that their continuance as bankable assets is not warranted and, as such, should be promptly charged off). [SNC]