Bank Ratings and Lending Supply: Evidence from Sovereign Downgrades*

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Abstract

We study the causal effect of bank rating downgrades on the supply of bank lending to the private sector. We exploit the asymmetric impact of sovereign downgrades on the ratings of banks at the sovereign bound versus banks below the bound as a result of credit rating agencies' sovereign ceiling policies. We find that banks at the sovereign bound reduce loan amounts and increase loan spreads more than otherwise similar banks below the bound following sovereign downgrades. Lending to foreign borrowers is also significantly affected, confirming a causal interpretation of the results.

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1. Introduction

We ask whether bank credit rating downgrades cause reductions in bank lending to the private sector. This question is generally hard to answer because changes in ratings are correlated with changes in macroeconomic and individual bank fundamentals, as well as changes in credit demand that are likely to impact the volume of credit extended by banks. We exploit exogenous variation in bank ratings that is due to rating agencies' sovereign ceiling policies to identify the effects of bank rating downgrades on bank lending supply. These policies imply that a bank's rating is bounded by the sovereign rating of its country of domicile.[1]

We quantify the effects of bank downgrades by comparing banks that have ratings equal to or above their sovereign prior to a downgrade (treatment group) with banks that have ratings below their sovereign (control group). While sovereign downgrades are likely to be accompanied by macroeconomic shocks that affect the entire financial sector, the ratings of the treatment group is affected *disproportionately more* than the ratings of the control group due to the sovereign ceiling. The asymmetric effect of sovereign downgrades on bank ratings is likely to be due to the constraint imposed by rating agencies and not to bank fundamentals, as there is no such asymmetry for banks just below the sovereign bound.

Bank downgrades can, in turn, impact the supply of lending through their effect on a bank's access to funding, in particular to wholesale funding and public bond markets. Institutional investors such as banks, insurance companies, and pension funds are subject to investment restrictions and Basel capital requirements that are based directly on ratings. Rating downgrades can also lead to increases in bond coupons and loan interest rates, and trigger debt covenant violations.

[1] While credit rating agencies have been gradually moving away from a policy of never rating a private issuer above the sovereign, sovereign ratings remain a significant determinant of corporate ratings (Borensztein, Cowan, and Valenzuela (2013)), and ratings that pierce the sovereign ceiling are still not common (Standard & Poor's (2012)).

The main empirical specification employs a difference-in-differences estimator that exploits the asymmetric impact on bank ratings and compares changes in the volume and prices of syndicated loans made by treated banks versus control banks around sovereign downgrades. We find that treated banks reduce lending supply significantly more than control banks following a sovereign downgrade. The total number of loans made by treated banks (as lead arranger or participant) declines by about 30% more than the loans by control banks. Such a relative decline is also seen for the number of loans and the dollar volume of loans when the bank acts as the lead arranger. Prior to the sovereign downgrade, loan activity grows at about the same rate for treated and control banks, and the relative decline for treated banks occurs at exactly the time of the sovereign downgrade, which mitigates concerns about pre-existing differential trends.

We also find that bank rating downgrades affect loan pricing. Treated banks increase interest rate spreads significantly more than control banks following a sovereign downgrade, with a differential effect on spreads between 17 and 45 basis points.

In the final part of our analysis we consider which components of bank's total funding are most affected by rating downgrades. Financial institutions worldwide have increasingly relied on wholesale funding to supplement retail deposits as a source of funds, making them more vulnerable to a sudden dry up in liquidity during financial crises (Brunnermeier (2009)). We find that long-term borrowing and interbank funding (the sources that should be most sensitive to the shock) are reduced by 3 to 5 percentage points (of total funding) more for treated than for control banks following a sovereign downgrade. We also show that credit default swap (CDS) spreads of treated banks increase by 44 to 65 basis points more than those of control banks, confirming that the shock to ratings affects the banks' cost of funding.

We face two major identification challenges in identifying the effect of ratings on bank lending. A first challenge is that deterioration in macroeconomic fundamentals can cause sovereign

downgrades, and simultaneously increase the cost of funding for banks. This implies that sovereign downgrades could reduce both the lending supply and the demand for loans on the part of borrowers. Supply might decline because of bank-specific liquidity shocks, but demand could fall contemporaneously because firms suffer a shock to their investment opportunities. Moreover, firms more affected by sovereign downgrades could borrow more from banks that are disproportionately more affected by the downgrade.

Our identification strategy directly addresses this possibility, as the treatment group contains more highly rated banks that should, *a priori*, be less sensitive to macroeconomic shocks than control banks. To further reduce such concerns, we employ several strategies. First, we run our tests using a sample that includes only foreign borrowers (i.e., borrowers domiciled in countries other than the country of the lender). For this sample, changes in demand for credit and changes in country-level factors caused by sovereign downgrades are likely to play a smaller role. We find similar effects when we focus on the sample of foreign borrowers. Second, we control for changes in macroeconomic conditions, and a large set of lender, borrower, and loan characteristics. Third, we estimate models with lender-by-borrower fixed effects. Under a lender-by-borrower fixed effects approach, the identification relies only on changes in lending within borrowers that take out loans from the same bank before and after the sovereign downgrade. This alleviates concerns about sample selection, such as bank-firm sorting (i.e., "good" firms borrow from "good" banks, or vice versa) and potential unobserved differences between firms that seek bank loans and firms that do not after a sovereign downgrade. Finally, we employ the Abadie and Imbens (2011) non-parametric matching estimator of the average effect of the treatment on the treated (ATT) to account for potential non-linear effects not captured by the controls in the main specification.

A second challenge is that we have to distinguish the direct effect of bank ratings from sovereign-to-bank and bank-to-sovereign transmission of risk. On the one hand, sovereign distress

can trigger fragility in the banking sector by eroding the value of its direct holdings of government debt and explicit and implicit government guarantees (Gennaioli, Martin, and Rossi (2014a)). On the other hand, a distressed financial sector can force governments to bail out banks. The costs of these bailouts can result in a further deterioration of the sovereign's creditworthiness, which feeds back to the financial sector (Acharya, Drechsler, and Schnabl (2013)).

We perform a series of tests to ensure that these alternative channels are not driving the results. As before, the fact that the treatment group contains banks of better quality and, at least *ex ante*, those less likely to rely on government support, helps with the identification of the effect of bank ratings. In order to directly address the loop between sovereign and bank credit risk, we re-run the tests using samples that exclude government-owned banks, "too big to fail" banks, banks that rely heavily on government support (using the "rating uplift"), or banks with large holdings of government bonds. All these samples produce similar result to our baseline specification. Furthermore, we conduct a placebo test in which we examine changes in loans for treated and control banks around banking crises that are not accompanied by sovereign downgrades. We find no difference between treated and control banks in these placebo periods, which supports the interpretation of a causal effect of bank ratings.

We contribute to three strands of the literature. First, this work is related to the literature on credit ratings. Research shows that ratings affect a firm's cost of capital (Kisgen and Strahan (2010)) and corporate decisions such as capital structure (Kisgen (2006, 2007, 2009)), and investment (Sufi (2009), Tang (2009), Lemmon and Roberts (2010), Chernenko and Sunderam (2012), Almeida, Cunha, Ferreira, and Restrepo (2013)). To the best of our knowledge, we are the first to identify the causal effect of changes in banks' ratings on bank lending supply.

Second, this paper is related to empirical work on the bank lending channel, in particular whether shocks to the financial position of a bank affect lending supply and real economic activity.

The literature first used time-series correlation between changes in liquidity and changes in loans or output to show that liquidity shocks have real effects (e.g., Bernanke and Blinder (1989)). Concerns about confounding macro effects have led to the use of cross-sectional variation in liquidity supply across banks (e.g., Kashyap, Lamont and Stein (1994), Jayaratne and Strahan (1996), Kashyap and Stein (2000)) or natural experiments (e.g., Ashcraft (2005), Khwaja and Mian (2008), Paravisini (2008)). In particular, the 2007-2009 global financial crisis has been used as an experimental ground to study the effects of bank distress on credit supply (e.g., Ivashina and Scharfstein (2010), Santos (2011), Iyer, Lopes, Peydro, and Schoar (2013)) and firm valuation and real outcomes (Carvalho, Ferreira, and Matos (2013), Chodorow-Reich (2014)).

Finally, this work is related to the literature on the transmission of sovereign credit risk to the private sector. Bedendo and Colla (2013) and Borensztein, Cowan, and Valenzuela (2013) study the effects of sovereign credit risk on corporate credit risk, and Arteta and Hale (2008) study the effects on foreign borrowing. Recent work studies the effects of the European sovereign debt crisis on local and cross-border bank lending (e.g., Popov and Van Horen (2013), Becker and Ivashina (2014)) and firm real outcomes (Acharya, Eisert, Eufinger, and Hirsch (2014)).

Our findings suggest that public debt management has important effects on bank lending supply by affecting banks' ratings through rating agencies' sovereign ceiling policies. Governments should be aware of the adverse effects that deteriorating sovereign credit risk has on private credit markets.

2. Methodology and Data

2.1. Quasi-Natural Experiment: Sovereign Ceiling and Downgrade

Credit rating agencies play an important role in providing information about the ability and the willingness of issuers, including governments and private issuers, to meet their financial obligations. The three major agencies – Standard & Poor's (S&P), Moody's, and Fitch – usually do not grant

private issuers a rating higher than that of the sovereign bonds of the country where the issuer is domiciled, a policy usually referred to as sovereign ceiling. Although the sovereign ceiling policy has been gradually relaxed by the rating agencies starting in 1997 and some private issuers may receive ratings higher than the sovereign, the sovereign rating is still an important determinant of private ratings (Borensztein, Cowan, and Valenzuela (2013)). The fact that governments often act as emergency liquidity providers (backstops) to domestic banks in distress by providing bailouts provides an economic rationale for the sovereign ceiling policy (e.g., Gorton and Huang (2004), Duchin and Sosyura (2012), Philippon and Schnabl (2013)).

We focus on foreign currency long-term issuer ratings, in which agencies use a sovereign's rating as a strong upper bound on the ratings of issuers located within each country.[2] We prefer S&P's rating history over other agencies' history because S&P tends to be more active in making rating revisions, and tends to lead other agencies in re-rating (Kaminsky and Schmukler (2002)). Rating announcements by S&P also seem to convey a greater own-country stock market impact and not to be fully anticipated by the market (Reisen and von Maltzan (1999)).

Because of the sovereign ceiling policy, there are different predictions for the effect of a sovereign downgrade on banks that have pre-downgrade ratings equal to (or above) the sovereign rating (treated banks) and those that have rating below the sovereign rating (control banks). A sovereign downgrade should have a greater effect on treated banks' ratings, potentially a one-for-one effect, than on control banks, as the sovereign ceiling is non-binding for the latter. For example, if a country with an AAA rating is downgraded to AA+, banks with ratings of AAA are much more likely to be downgraded than otherwise similar banks with ratings below AAA before the sovereign downgrade. Our identification strategy uses this asymmetry in the relation between bank ratings and sovereign ratings to isolate the effect of sovereign downgrades on bank lending. This asymmetry

[2] Rating agencies follow a policy that banks cannot have a rating more than one notch above the sovereign rating.

helps to distinguish the effects of bank ratings from confounding common macro effects, as macro shocks associated with sovereign downgrades should affect all banks equally. If there were any differential macro effects, better-quality banks (the treatment group) should be *less* affected than poorer-quality banks (the control group), controlling for differences in borrower characteristics.[3]

2.2. Data

The loan market data come from the Thomson Reuters Dealscan database. Dealscan collects loan-level information on syndicated loans, including the identity of the lead arranger and participant banks and the borrower, as well as a variety of loan contract terms (amount, all-in drawn spread, maturity, purpose, and type). The sample covers all loans initiated from January 1, 1989 through December 31, 2012. We aggregate the loan-level data by lender and quarter for the main tests. The outcome variables in these tests include the *Total Number of Loans* made by a bank (as participant or lead arranger) in each quarter, as well as the *Number of Loans as Lead* (only taking into account loans in which the bank acted as lead arranger), and the total amount of loans in which the bank acted as lead arranger (*Amount of Loans as Lead*).[4] The outcome variables are measured two quarters after the sovereign downgrade to allow for the fact that banks are already committed to loans closed before the downgrade (we obtain similar estimates when we measure the effect in the quarter immediately after the sovereign downgrade). We also run tests using growth rates of the loan variables, defined as the percentage change from the quarter before to two quarters after the sovereign downgrade.

We match the lenders in Dealscan (lead arranger and participant banks) to Bloomberg using country, ticker, and name. We obtain the lender rating and its sovereign rating using S&P long-term

[3] We focus on rating downgrades only because the sovereign ceiling policy does not have asymmetric implications in the case of sovereign upgrades. In fact, the decision to upgrade individual banks is much more likely to be related to banks' own fundamentals, which would weaken the rationale for our empirical approach.

[4] The Dealscan database rarely reports the actual loan shares of an individual lead arranger bank in a loan, so we instead use pro-rata shares. If a bank is a sole lead arranger, it gets a 100% share of the loan, and if there are M lead arrangers, each gets 1/M share of the loan.

foreign currency issuer ratings. Sovereign and bank ratings are mapped into 22 numerical categories, where 22 is the highest rating (AAA), 21 the second highest (AA+), and one the lowest (default).

We obtain bank funding variables from Bankscope, which we then use to investigate the mechanism underlying the reduction in bank lending following sovereign downgrades. The funding variables include *Retail Deposits*, *Non-Deposits Short-Term Funding*, *Interbank Funding*, and *Long-Term Funding*. We use bank characteristics also from Bankscope as control variables in the tests: *Size*, *Profitability*, *Capital*, *Liquidity*, and *Deposits*. Table A.1 in the Appendix provides variable definitions.

Time-varying macroeconomic controls in the regressions include annual GDP growth, inflation, and private credit-to-GDP taken from the World Bank/World Development Indicators database. Public debt-to-GDP and indicators for crises (currency, inflation, sovereign debt external and internal, and banking) are taken from the Reinhart and Rogoff (2009) database. OECD recession indicators for each country are drawn from the Federal Reserve Economic Data (FRED) database. Bank bondholdings proxies for domestic banks' holdings of government debt using financial institutions' net claims on the government relative to their total assets, following Kumhof and Tanner (2008) and Gennaioli, Martin, and Rossi (2014a), taken from the International Monetary Fund/International Financial Statistics database.

In the loan-level tests, the outcome variables are the log of the *Loan Amount* in millions of U.S. dollars and the *Loan Spread* over the LIBOR rate. Syndicated loan deals include multiple facilities that differ in price and maturity. We perform tests at the facility level; that is, we treat the facilities in each deal as different loans. In the case of facilities with multiple participants and lead arrangers, we consider each facility multiple times to capture differences across the participants and lead arrangers.

We also construct a lender-borrower-quarter panel that allows us to control for borrower heterogeneity. The outcome variables (*Total Number of Loans Dummy*, *Number of Loans as Lead Dummy*) are indicators that take a value of one if there is at least one loan (as a lead arranger or participant) in

the lender-borrower pair (*i*, *j*).

Both the loan-level and the lender-borrower-quarter level tests include an extensive set of loan and borrower control variables, as well as lender controls. We obtain loan controls from Dealscan and borrower controls from the WRDS-Factset Fundamentals Annual Fiscal (North America and International) database.[5]

2.3. Summary Statistics

Table 1 provides summary statistics for the lender-quarter panel. This panel has 16,329 observations (412 lenders), of which 3,311 are treated and 13,018 are control. Panel A provides the mean, median, standard deviation, minimum and maximum for all observations in the sample. Panel B provides the means of treated and control observations, as well as differences in means after accounting for country-by-quarter fixed-effects (i.e., within country and quarter).

Panel A of Table 1 shows that banks have, on average, a rating of 16.6 and a median rating of 17, which corresponds to a rating of A. The highest rated banks have a rating of AAA, and the lowest-rated banks are in default. In about 20% of the lender-quarter observations the bank is at the sovereign bound in the quarter prior to the sovereign downgrade (17% of these are equal to the sovereign rating). The sample includes a sovereign downgrade in about 2% of the observations.

The outcome variables (*Total Number of Loans*, *Number of Loans as Lead*, and *Amount of Loans as Lead*) consider separately all loans and only loans made to foreign borrowers. Banks in the sample make about 51 loans on average per quarter, with a median of 10. The distribution is highly skewed, with a maximum of 1,122 loans. These banks make about 35 loans as lead arrangers, with a median

[5] We match the borrowers in Dealscan to Factset to obtain borrower characteristics. We use the Dealscan-Compustat linking table to obtain identifiers (ISIN, SEDOL, CUSIP) from Compustat. We use these identifiers to match borrowers to the corresponding entity in Factset. For borrowers without a match, we search for a match between Dealscan and Factset using ticker, country, and name. We thank Michael Roberts for providing the Dealscan-Compustat match, used in Chava and Roberts (2008).

of 5 loans. Loans in which a bank acts as lead arranger total about $2.5 billion per quarter on average, with a median of $100 million. Banks participate in a significant number of loans outside their own country. On average, banks make 27 loans to foreign borrowers in a quarter (19 as lead arrangers), although the median is just 2 (1 as lead arrangers). The growth rate of the total number of loans is, on average, 17%, and it is slightly lower (12%) for the loans in which the bank acts as lead arranger.

Given that we rely on syndicated loans, it is not surprising that banks in the sample are large, with average total assets of over $206 billion and a median of $62 billion. The return on assets of all the banks is on average 1%. The average common equity ratio (*Capital*) is 8% of assets, in line with regulatory requirements. Cash and marketable securities (*Liquidity*) represent about 19% of assets and deposits and short-term funding (*Deposits*) about 66%, on average.

The final two rows of Panel A in Table 1 show summary statistics for the loan-level outcome variables (*Loan Amount* and *Loan Spread*). The average dollar amount of loans is $509 million (with a median of $156 million), and the average loan spread is 180 basis points.

Panel B shows that treated banks have a rating that is about 3.5 notches above that of the control group in the same country and quarter. The growth in the number and amount of loans is similar across the two groups. Treated banks are significantly smaller, more profitable, and better capitalized than control banks, which make them less sensitive to macroeconomic shocks and thus less likely to require government support.[6] The treated banks are, however, more likely to be state-owned, too big to fail, and have a higher rating uplift than the control banks. We perform tests excluding state-owned, too big to fail, and high rating uplift banks, as well as additional tests designed to address concerns that deteriorating sovereign credit quality might affect treated banks

[6] We also find that treated and control banks have, on average, indistinguishable equity betas equal to about one, which confirms that treated banks are not more sensitive to macroeconomic shocks than control banks.

through channels other than ratings.

Table 2 lists the countries and the timing of sovereign downgrades in our sample, as well as the number of treated banks in each country and year. The countries that appear most prominently are Argentina, Egypt, Greece, Italy, Japan, and Spain. The treated observations are distributed evenly over the late 1990s, then peak in 2001 and 2002, and then rise again between 2008 and 2012 at the time of the global financial and European sovereign debt crises. In 394 lender-quarter observations there is a sovereign downgrade; 110 of these are banks that have ratings at the sovereign bound (89 have ratings exactly equal to the sovereign rating). These treated observations include 53 unique banks. Table IA.1 of the Internet Appendix lists all treated banks (i.e., those at the sovereign bound when a country is downgraded), as well as the average rating of treated banks in the quarters prior and after the sovereign downgrade.

Panel A of Figure 1 shows the frequency distribution of the difference between the sovereign rating and the rating of each bank. A difference of zero means that the bank is exactly at the sovereign bound; a positive difference means that the bank is above the sovereign bound; and a negative difference means that a bank is below the sovereign bound. The figure shows a significant mass of banks (17%) exactly at the sovereign bound. All the bank-year pairs to the left (those banks with rating below the sovereign, which are in the control group) make up 79.7% of all observations. Our empirical strategy relies on the fact that there is almost no mass to the right of zero in this figure – that is, there are very few cases of banks with a rating above the sovereign – which creates the asymmetric effect of a sovereign downgrade on the ratings of banks at the bound relative to those below the bound.

Panel B of Figure 1 provides additional detail on the distribution of bank ratings relative to the sovereign. The top panel shows bank-country rating pairs where each observation in the figure is proportional to the frequency of each pair in the data. The 45-degree line corresponds to banks

exactly at the sovereign bound. As in Panel A, there is a significant fraction of banks exactly at the bound, and it is also clear that there are very few banks with a rating above the sovereign.

Figure 2 shows the effect of sovereign downgrades in the ratings and loan activity of banks as a function of their distance to the sovereign rating. The effects are shown as deviations from the average response. Panel A shows that the probability of a bank will obtain a rating downgrade at the time of a sovereign downgrade is discontinuous exactly at the sovereign bound. The ratings of banks just below the sovereign bound behave like the ratings of the average bank in the country following a sovereign downgrade. Panel B shows that the growth rate of the total number of loans is also discontinuous at the sovereign bound relative to all other banks in the country. These discontinuities in ratings and loan activity at the sovereign bound following a sovereign downgrade validate our empirical strategy. Additionally, the absence of differential effects between higher quality banks rated just below the sovereign bound and lower quality banks shows that our effects do not simply capture highly rated banks, but banks that are at the bound.

3. Results

3.1. Bank Ratings and Sovereign Downgrades

The first test compares the effect of sovereign downgrades on the rating of banks at the sovereign bound (the treated banks) in the quarter prior to a sovereign downgrade (the treatment) and the rating of banks below the bound (the control banks). We measure the impact on ratings in the treatment and control groups in the quarter of the sovereign downgrade.

We run ordinary least squares (OLS) regressions using the lender-quarter panel. Standard errors are clustered at the country level to correct for within-country residual correlation. We estimate a difference-in-differences regression of lender rating (converted to a numerical scale) where the explanatory variable of interest is the interaction of the *Sovereign Downgrade* dummy with a dummy for

treated banks (*Lender Rating* ≥ *Sovereign Rating*):

$$Lender\ Rating_{it} = \beta_1\left(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\right) + \beta_2(Sov.Downgrade_{i,t}) \quad (1)$$
$$+ \beta_3\left(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\right) \times (Sov.Downgrade_{i,t}) + \beta_4 X_{i,t-1}$$
$$+ \eta_t + \eta_i + \varepsilon_{it}$$

where $X_{i,t-1}$ is a vector of lender controls (*Size*, *Profitability*, *Capital*, *Liquidity*, and *Deposits*) and time-varying lender country controls, η_t are quarter fixed effects, and η_i are either country or lender fixed effects, which take into account overall time trends in the data as well as differences between lenders. The coefficient β_3 measures the extent to which treated banks suffer more with a sovereign downgrade than control banks.

Table 3 presents the estimates of regression equation (1). Column (1) includes country and quarter fixed effects. Column (2) also includes lender controls and time-varying macroeconomic country controls. We find that, on average, a sovereign downgrade causes treated banks to suffer a 1.4- to 1.5-notch larger rating reduction than control banks. The treated bank indicator (*Lender Rating* ≥ *Sovereign Rating*) is associated with a rating that is approximately three notches higher than that of other banks in the same country, and the *Sovereign Downgrade* dummy is associated with bank ratings that are about 0.5 to 0.9 notches lower. The effects are all highly statistically significant. In columns (3) and (4), we include lender fixed effects. This reduces the differential effect between treated and control banks slightly to about 1.0 to 1.2 notches, but the effect remains significant in both specifications.[7]

Table IA.2 in the Internet Appendix shows that statistical significance is unchanged when we use a two-way clustering by country and quarter. Table IA.3 shows a logit model for the probability that

[7] Banks with ratings above the sovereign may be systematically different from banks exactly at the bound. In untabulated results, we exclude banks above the bound even though including these banks works against finding a drop in ratings and lending for the treatment group. Not surprisingly, the effect is even stronger when we do this.

a bank is downgraded after the sovereign downgrade. Treated banks are nearly 4 times more likely to be downgraded than control banks when a sovereign downgrade hits the country where the bank is domiciled; the probability of a downgrade is 91% for treated banks and only 24% for control banks using the estimates in column (1).

Figure 3 compares the effect of sovereign downgrades on treated and control bank ratings from four years before the sovereign downgrade up to four years after. The estimates come from the regression in column (2) of Table 3, replacing the interaction term with dummies for whether a lender-quarter is in the treated group *t* years after or in the treated group *t* years before a given quarter. Treated banks have higher ratings three to four years before the downgrade, but then there are no significant changes in the two years prior to the sovereign downgrade. The treated banks then suffer a significantly greater downgrade at the time of the sovereign downgrade, a difference that persists for up to two years afterward. The effect is reversed about three years after the sovereign downgrade, suggesting that this is a temporary shock that lasts approximately two years.

3.2. Bank Ratings and Lending Supply: Lender-Quarter Tests

To examine the impact of sovereign downgrades on bank lending, we estimate a difference-in-differences regression of the number and amount of loans:

$$Lending_{it} = \beta_1\left(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\right) + \beta_2(Sov.Downgrade_{i,t}) + \beta_3\left(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\right) \times (Sov.Downgrade_{i,t}) + \beta_4 X_{i,t-1} + \eta_t + \eta_i + \varepsilon_{it} \quad (2)$$

where *Lending* is the log of one plus *Total Number of Loans*, *Number of Loans as Lead*, or *Amount of Loans as Lead*. All other variables are as in equation (1).[8] The coefficient β_3 measures the extent to

[8] The addition of one in the log of the lending variables accounts for the fact that some banks do not make any loan in a given quarter. The number of observations that take a value of zero is 3,031 (19% of the sample) in the *Total Number of*

which treated banks reduce lending more than control banks following a sovereign downgrade. Standard errors are clustered at the country-level to correct for within-country residual correlation.

Columns (1)-(6) of Table 4 show the results. Treated banks show a large and statistically significant reduction in total number of loans, number of loans as lead arranger, and total dollar amount of loans as lead arranger following a sovereign downgrade. In column (1) the interaction term (*Lender Rating* ≥ *Sovereign Rating* × *Sovereign Downgrade*) coefficient is -0.31, significant at the 1% level, which indicates that banks in the treatment group make about 30% fewer loans after the sovereign downgrade relative to the control group. The estimated differential reduction in lending activity is about 26% in column (2) when we include bank controls as well as time-varying country macro controls.

We see a similar reduction for the *Number of Loans as Lead* variable. The reduction in the amount lent suffers a more drastic reduction than the number of loans. In fact, treated banks cut the amount lent by 81% to 83% relative to control banks (the point estimates in the regressions that use the log of *Amount of Loans as Lead* as the dependent variable are approximately -1.6 to -1.8). Coefficients of the control variables have the expected sign. Larger banks make, on average, more loans and lend larger amounts, as do more profitable banks and banks that are better capitalized.

Columns (7)-(12) provide similar results, but using growth rates as the dependent variables (*Growth Total Number of Loans*, *Growth Number of Loans as Lead, Growth Amount of Loans as Lead*) and include quarter and country fixed effects. We find a strong and highly statistically significant effect of the sovereign downgrade on the growth of all three measures of lending for the banks above the bound relative to those below the bound. A sovereign downgrade reduces growth rates by 30 to 40 percentage points more for treated banks than for control banks. This compares to an average

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Loans and 4,424 (27% of the sample) in the *Number of Loans as Lead*. We obtain qualitatively similar estimates if we run the tests excluding lender-quarters with zero lending.

growth rate of 17%, which means that treated banks suffer an economically significant reduction in the number of loans relative to control banks. The estimate also reflects that many banks simply leave the syndicated loan market altogether (implying a growth rate of -100%).[9]

Table IA.4 in the Internet Appendix presents similar estimates when we include lender fixed effects in the regressions using growth rates as the outcome variable. Table IA.5 of the Internet Appendix shows that the statistical significance of the estimates are similar when we use a two-way clustering of standard errors by country and year. Table IA.6 of the Internet Appendix shows that the economic magnitudes are confirmed when we run an instrumental variables model for the effect of bank ratings on banks' lending behavior. We use the interaction of the sovereign downgrade and the dummy for whether a bank is at the sovereign bound as the instrument for bank rating. We find magnitudes for the causal effect of a one notch downgrade that are in line with those in Table 4.[10]

3.2.1. Loans to Foreign Borrowers

Table 5 shows the estimates of equation (2) when we restrict the sample to loans made to foreign borrowers. The estimates are similar in magnitude and statistical significance when we consider this subset of loans. On average, treated banks reduce the number of loans made by about 20%. As before, the impact on the amount of loans is more severe, and point estimates suggest a reduction of about 90% compared to the control group. Similarly, columns (4)-(6) show economically and statistically significant effects on the growth rate of loans.

The analysis including only loans made to foreign borrowers provides an important robustness test for our main results. In particular, one central issue in our analysis is whether we can isolate the

[9] If a bank does not make any loan after the sovereign downgrade, the growth rate is -100%. The number of observations that take a value of -100% is 1,175 in *Growth Total Number of Loans* and 1,503 in *Growth Number of Loans as Lead*. We obtain qualitatively similar estimates if we run the tests excluding lender-quarters with growth rates of -100%.
[10] This is expected, as the estimate from the 2SLS model is, in this case, equivalent to a Wald estimator that divides the coefficients of interest in Table 4 by the effect of the sovereign downgrade on the ratings of banks at the sovereign bound in Table 3 (about one notch).

credit supply effect induced by a change in ratings from potential simultaneous changes in the demand for credit on the part of borrowers from these banks. The effect of a sovereign downgrade on bank lending to foreign borrowers is very unlikely to be explained by a reduction in the demand for credit, and confirms instead that we are measuring a shock to the supply of loans.

Another demand-related concern is that borrowers might worry about the bank's ability to advance funds on open lines of credit (Ivashina and Scharfstein (2010)). Credit-line facilities allow firms to borrow up to a certain amount at a pre-set interest rate (usually a spread over the LIBOR). Thus, borrowers could have become reluctant to get lines of credit from the affected banks following a downgrade. In Table IA.7 in the Internet Appendix we re-run the regressions in Table 4 using the sample of term loans only (i.e., we exclude lines of credit) and obtain similar estimates.

3.2.2. Parallel Trends

One concern about inferences from the treatment-effects framework is whether the treatment and control groups follow parallel trends prior to the treatment. Figure 4 addresses this concern by graphing the equivalent of column (2) in Table 4 and column (1) in Table 5 where the dependent variable is the *Total Number of Loans*, but including yearly leads and lags of the interaction term. The specification is otherwise identical to that used in those tables. Panel A of Figure 4 shows that, in the four years prior to the sovereign downgrade, treated and control banks were making about the same number of loans per quarter (there is a small and statistically insignificant relative drop between years -4 and -2). We then see a significantly lower number of loans in the year of the downgrade and in the subsequent year, and then the difference reverts to close to nothing by the second year after the downgrade. Similarly, Panel B of Figure 4 shows no differences between treated and control banks in the number of loans made to foreign borrowers, with a sharp difference emerging in the year of the downgrade and persisting for the two subsequent years.

3.2.3. Matching Estimator

In order to address the possibility that the groups being compared in our benchmark specification may have different characteristics (see Roberts and Whited (2012)), we implement a non-parametric strategy that combines the sovereign ceiling experiment with a matching estimator. The idea of this estimator is to first isolate treated observations (in our application, banks with ratings at the sovereign bound) and then, from the population of non-treated observations (banks with ratings below the bound), find observations that best match the treated ones on covariates.

We use the Abadie and Imbens (2011) estimator, which minimizes the (Mahalanobis) distance between a vector of observed covariates across treated and non-treated banks to find control banks (we select four matched control observations for each treated observation). The estimator allows control banks to serve as matches more than once, which reduces the estimation bias but can increase the variance. The estimator produces exact matches on categorical variables, but naturally the matches on continuous variables will not be exact (although they should be close). The procedure recognizes this difficulty and applies a bias-correction component to the estimates of interest. In our application, the categorical variables are quarter and country. The non-categorical variables are banks' *Size*, *Profitability*, *Capital*, *Liquidity*, and *Deposits*.

We estimate the average effect of the treatment on the treated (ATT) by performing difference-in-differences estimations. That is, rather than compare the outcome variables of the treatment and control groups, we compare the changes in the outcome variables (*Growth Total Number of Loans*, *Growth Number of Loans as Lead*, and *Growth Amount of Loans as Lead*) between the groups around the sovereign downgrade (from the quarter prior to two quarters after the downgrade).

Panel A of Table 6 compares the mean and median of the covariates between the 46 treated lender-quarters and the 184 control lender-quarters in the quarter prior to the sovereign

downgrade.[11] The Pearson chi-square statistic tests for differences in the medians between the treatment and control groups. After the matching procedure, there are still some statistically significant differences in the median values of the covariates across treatment and control groups. Median *Profitability*, *Capital*, and *Liquidity* are higher for banks in the treatment versus the control group. These differences, however, are economically small and they are unlikely to explain our findings, since banks with higher profitability, capital, and liquid assets should be less affected rather than more affected by a sovereign downgrade. Panel A also compares the entire distributions of the various matching covariates (pre-treatment) across the two groups of firms using the Kolmogorov-Smirnov test of distributional differences. Similarly to the median tests, there are some statistically significant differences in the pre-treatment covariates between treated and control groups.

Panel B of Table 6 shows that treated banks reduce loan activity significantly more than control banks following a sovereign downgrade. We present both the difference-in-difference estimate and the ATT estimate with bias correction. The ATT for the *Growth Total Number of Loans* variable is -27 percentage points, which is statistically and economically significant, and is in line with the estimates in Table 4. The ATT is even greater, at more than 50 percentage points, when the outcome variables are the growth rates in the number of loans and the amount of loans as lead arranger. Table 6 shows similar estimates when we consider the sample of loans made to foreign borrowers.

3.3. Bank Ratings and Lending Supply: Effects within Borrower-Lender Relationship

3.3.1. Loan-Level Tests

In this section we explore how sovereign downgrades affect lending within lender-borrower relationships. We use loan-level data and include lender-borrower fixed effects in all regressions. This controls for the endogenous matching of lenders and borrowers in the syndicated loan market,

[11] The number of treated observations is restricted to cases for which we can calculate the growth rate, i.e., there is at least one loan in the quarter prior to the downgrade.

i.e., it accounts for the possibility that lenders and borrowers of similar unobserved quality may be more likely to interact in this market. Using a lender-borrower fixed effects approach, the effect of sovereign downgrades on lending is identified only by changes in lending by borrowers that take out loans from the same lender both before and after the sovereign downgrade. The outcome variables are *Loan Amount* and *Loan Spread*. Some studies (e.g., Khwaja and Mian (2008)) find no effects on loan pricing due to disruptions to bank liquidity, and they argue that the margin of adjustment for banks is more likely to be the number of loans. We revisit this issue by testing whether shocks to bank ratings also impact the pricing of loans made by affected banks.

The regression equation for a loan facility of lender *i* (participant or lead arranger) and borrower *j* in year *t* is as follows:

$$\begin{aligned} Loan\ Amount(Spread)_{ijt} = {} & \beta_1\big(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\big) \\ & + \beta_2(Sov.Downgrade_{i,t}) + \beta_3\big(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\big) \\ & \times (Sov.Downgrade_{i,t}) + \beta_4 X_{i,t-1} + \beta_5 X_{j,t-1} + \eta_t + \eta_{ij} + \varepsilon_{ijt} \end{aligned} \quad (3)$$

where $X_{i,t-1}$ is a vector of lender controls and time-varying (lender) country controls, $X_{j,t-1}$ is a vector of borrower controls, η_t are year fixed effects, and η_{ij} are lender-borrower pair fixed effects. Standard errors are clustered at the (lender) country-level to correct for within-country residual correlation. The coefficient β_3 measures the extent to which sovereign downgrades lead treated banks reduce loan amounts and increase spreads more than control banks. We measure the impact on loans in the treatment and control groups using a six-month window before the loan date, i.e., if there was a sovereign downgrade in the two quarter period prior to the loan date.

Panel A of Table 7 shows the estimates of equation (3) for the log of *Loan Amount* and *Loan Spread* in the sample of all borrowers. The results show that loans made by treated banks are between 13% and 24% smaller than loans made by control banks following a sovereign downgrade.

These results are consistent with the reduction in the total amount loaned by treated banks in Table 4. Column (3) includes loan-level controls such as *Secured*, *Senior*, *Purpose*, *Term Loan*, *Dividend Restriction*, *Prior Participant*, and *Prior Lead*. The effect in column (3) is similar to that in column (2).

Panel A of Table 7 also shows a strong effect of a sovereign downgrade on loan spreads in the sample of all borrowers. The effect is about 45 basis points with no lender controls, dropping to 17 to 20 basis points when the regressions include lender, borrower, and loan controls. All these estimates are statistically significant at the 5% level. The impact on loan spreads represents between 10% and 25% of the average loan spread in the sample.

When we restrict the sample to foreign borrowers (Panel B of Table 7), we find an interesting asymmetry between the results for loan amounts and for loan spreads. The differential effect on the loan amount of treated banks versus control banks in the sample of foreign borrowers is of similar size as in the sample of all borrowers, i.e., a drop of 11% to 19%. We find no differential effects, however, on the pricing of loans made by treated banks relative to control banks in the sample of foreign borrowers. The point estimates are economically low, at between zero and 3 basis points, and they are statistically insignificant. This suggests that banks are more likely to act as price takers, or at least have less influence on the pricing of loans, when they deal with foreign borrowers.

Table IA.8 in the Internet Appendix shows that the results in Table 7 are almost unchanged if we exclude borrowers in the financial and public sectors (SIC codes 6000-6999 and 9000-9999).

3.3.2. Lender-Borrower-Quarter Tests

In order to further investigate the effects of rating downgrades within borrower-lender relationships, we assess how the probability of observing a loan for a given lender-borrower pair changes after the sovereign downgrade.

We run logit regression models where the dependent variable is a dummy variable that takes a value of one if there is at least one loan in a lender-borrower pair in which the lender is a participant

(*Total Number of Loans Dummy*) or lead arranger (*Number of Loans as Lead Dummy*). All regressions include quarter and lender-borrower fixed effects. For each borrower-lender pair, the sample period is between the first quarter and the last quarter plus five years (the typical maturity of a syndicated loan) in which lender *i* made a loan to borrower *j*. In a quarter with no loans in a lender-borrower pair we assume that the variables take a value of zero. Because there are many observations with a zero, we restrict the sample to pairs with at least one loan as lead arranger over the sample period.

Table 8 shows the results. Panel A shows the results for the sample of all borrowers and Panel B for the sample of foreign borrowers. We find a statistically significant negative effect in the probability of observing a loan in a quarter for a lender-borrower pair for treated banks versus control banks. The effect is similar when we define the dependent variable using the total number of loans or the number of loans as lead arrangers. The reduction in marginal probability is approximately 0.9-1.1 percentage points, for an unconditional probability of observing a loan in a given quarter for a lender-borrower pair of about 7%.[12] We obtain similar estimates in columns (2) and (4) when we include lender and borrower controls as well as time-varying (lender) country macro controls. The magnitude of the effect is similar in the sample of foreign borrowers.

We conclude that sovereign downgrades have significant adverse effects on bank lending both on the intensive and extensive margins. The intensive margin effects are a reduced amount of lending and increased interest rate spreads to firms borrowing at the time of sovereign downgrades. The extensive margin effects are a reduced probability of obtaining a new loan.

3.4. Effect on Bank Funding

The mechanism underlying the credit supply shock we identify is that bank ratings affect the bank's access to funding. Ratings directly affect whether some institutional investors such as banks

[12] We are not able to compute marginal effects in the logit models due to the large number of fixed effects, so the marginal effects are obtained using a linear probability model with the same controls.

and insurance companies are allowed to invest in a bank's debt securities, as well as Basel capital requirements for holding such securities on their balance sheets.

We examine whether sovereign downgrades differentially affect the funding sources of the treated banks versus control banks. We expect treated banks to be particularly affected in more "sensitive" funding categories, namely, wholesale funding, interbank loans, and public debt markets following a sovereign downgrade, while retail deposits should not be affected as much. We also expect treated banks to face a larger increase in the cost of funding than control banks.

We run OLS specifications using a lender-quarter panel and estimate a difference-in-differences regression of bank funding sources:

$$Funding_{it} = \beta_1\left(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\right) + \beta_2(Sov.Downgrade)_{i,t} + \beta_3\left(Lender\ Rating_{i,t-1} \geq Sov.Rating_{i,t-1}\right) \times (Sov.Downgrade)_{i,t} + \beta_4 X_{i,t-1} + \eta_t + \eta_i + \varepsilon_{it} \quad (4)$$

where *Funding* is *Retail Deposits*, *Non-Deposit Short-Term Funding*, *Interbank Funding*, and *Long-Term Funding* (all variables are scaled by lagged total funding), and other variables are defined as in equation (1). The coefficient β_3 measures the extent to which treated banks funding sources are more affected following a sovereign downgrade than control banks. We measure the impact on funding in treatment and control groups two quarters after the sovereign downgrade, with the exception of *Long-Term Funding*, which we measure four quarters after the downgrade to account for the fact that banks access public debt markets less frequently than short-term funding markets.

Table 9 shows the results. The interaction term (*Lender Rating* ≥ *Sovereign Rating* × *Sovereign Downgrade*) coefficient is statistically insignificant in column (1), which indicates no differential effect on retail deposits of treated versus control banks. There is also no evidence of a differential effect on non-deposit short-term lending in column (3). Column (5), however, shows that treated banks face a decline in interbank funding of about 5 percentage points, which is statistically significant at

the 1% level. Additionally, column (7) shows that the interaction term coefficient is -0.03, significant at the 5% level, which indicates that banks in the treatment group face a reduction of 3 percentage points in long-term funding as a result of the sovereign downgrade compared to the control group. The estimated differential effects on funding sources are similar in columns (2), (4), (6), and (8) when we include bank controls, as well as time-varying country macro controls. We conclude that sovereign downgrades adversely affect the access of treated banks to wholesale funding and public debt markets, and therefore their ability to make new loans as compared to control banks.

We also estimate regression equation (4) using the change in credit default swap (CDS) spreads around sovereign downgrades (from the quarter before to one quarter after) as the dependent variable. We use five-year senior *CDS Spreads*. We measure the impact on CDS spreads in treatment and control groups one quarter after the sovereign downgrade. Table 10 shows the estimates. The interaction term (*Lender Rating* ≥ *Sovereign Rating* × *Sovereign Downgrade*) coefficient indicates a positive and significant differential effect of 44 to 65 basis points on the CDS spreads of treated banks versus controls bank. Results are similar when we include lender fixed effects in columns (3) and (4). Taken together, our findings on the effects on different sources of funding and CDS spreads suggest an asymmetric effect of sovereign downgrades on the cost of funding of treated banks versus control banks, which is consistent with an impaired ability to make new loans.

3.5. Alternative Channels

Our experiment is designed to identify the causal effect of bank ratings on bank lending, but there are channels (e.g., sovereign-to-bank and bank-to-sovereign transmission of risk) other than ratings that could lead to an effect of sovereign downgrades on bank lending. The first alternative is reverse causality, i.e. the possibility that deteriorating bank credit quality can lead to sovereign downgrades. While this channel is likely to be important, (e.g., Acharya, Drechsler, and Schnabl

(2013)), this is not the channel that our setting is designed to pick up, as we show that *higher*-quality banks are more affected than *lower*-quality banks by the sovereign downgrade. The second alternative is that the value of government support to banks could have deteriorated due to the sovereign downgrade. This could directly impact bank lending supply without an effect of banks ratings per se. We implement several additional tests that are designed to address these concerns.

First, we perform a placebo test that aims to address the issue of whether the results are driven by banking crises and the impact of deteriorating bank credit quality on sovereigns. We replicate the experiment that we run for sovereign downgrades but we use banking crises as the treatment rather than sovereign downgrades. In this placebo, we create a *Banking Crisis* indicator that is equal to one if a country suffers a banking crisis that is not accompanied by a sovereign rating downgrade in the last four quarters (the timing of banking crises is taken from the Reinhart and Rogoff (2009) database). This test asks whether higher quality banks (those at the sovereign bound) reduce credit by more than control banks when there is a banking crisis without a sovereign downgrade.

Table 11 shows the results of this placebo test. The negative treatment-control difference in bank lending outcomes does not appear in banking periods without sovereign downgrades, as shown by the coefficients on the interaction term (*Lender Rating* ≥ *Sovereign Rating* × *Banking Crisis*). If anything, we observe that treated banks are *less* affected in banking crises than control banks (see columns (1) and (2) of Panel A). This falsification test helps to rule out alternative explanations for the results such as a bank-to-sovereign effect.

Second, we perform tests that focus on a sample of banks that are *not* "too big to fail," as these are the ones that are most likely to benefit from the government backstop. These banks are also much more likely to "drag" the country to a sovereign downgrade if they become distressed. We define banks as "too big to fail" if they are above the 75th percentile of the distribution of the ratio of bank total liabilities to GDP. The threshold is 9.7%, which closely matches the 10% threshold

used in Demirgüç-Kunt and Huizinga (2010). We re-run the lender-quarter level tests but excluding from the sample the banks that are "too big to fail." Panel A of Table 12 shows that the results (using growth rates as the outcome variables) are similar to (or even slightly stronger than) those in Table 4, indicating that banks with higher systemic risk do not explain our results. Table IA.9 in the Internet Appendix shows results using the levels of the dependent variables instead of growth rates.

Third, we check whether the results are driven by state-owned banks. The rationale is that these banks may benefit more from government guarantees, and may be more reflective of the credit quality of the sovereign. We should note, however, that it is not *ex ante* clear that these banks should reduce lending more than others, as it is possible that governments force these banks to *increase* lending to make up for the reduction in credit supply from the rest of the financial system. Still, we re-run our tests excluding banks that are state-owned. There are 44 state-owned banks in our sample, which corresponds to about 11% of the total number of banks. Panel B of Table 12 shows that our results are largely unaffected when we drop state-owned banks from the sample. In Table IA.10 of the Internet Appendix we show that the matching estimator results in Table 6 are largely unchanged when we add a dummy for state-owned banks as covariate.

Fourth, we use a direct measure of the value of explicit and implicit government guarantees to banks based on credit ratings data. Moody's provides ratings for banks with and without the effect of government support. We interpret the difference between the two ratings (*Rating Uplift*) as a measure of the value of government support for each individual bank; a higher number indicates a higher value of government support, in line with the interpretation in Acharya, Drechsler, and Schnabl (2013). Panel C of Table 12 show that the effect is essentially unchanged when we drop banks with above-median rating uplift, supporting the interpretation of a direct effect of ratings on lending supply, rather than the effect of a change in the value of government support.

Finally, we show that banks' holdings of government debt do not explain our results. Acharya,

Drechsler, and Schnabl (2013) and Gennaioli, Martin, and Rossi (2014a) show that sovereign distress can trigger fragility in the banking sector due to holdings of government debt. The mean of the ratio of government bondholdings to assets is 6% (among positive holdings), which is in line with figures in Gennaioli, Martin, and Rossi (2014b). In order to rule out that this mechanism is driving the effect we uncover, Panel D of Table 12 reports estimates excluding banks with above-median levels of government bondholdings. The results are quantitatively and qualitatively similar to the main finding in Table 4 of reduced bank lending following a sovereign downgrade.[13]

The total holdings of government securities from Bankscope do not break down securities by nationality, in particular the holdings of own-government securities. To better control for holdings of government bonds, we collect bank-level data on holdings of different sovereign government bonds released as part of the European Banking Authority (EBA) European Union-wide stress test exercises in December 2010. In Table IA.12 of the Internet Appendix we re-run the tests using a sample of 54 European Union banks in 2008-2012 and including the gross direct long exposures to own country (bonds and loans), divided by total assets, as a control variable (*Exposure to Own Country*). We find that the interaction (*Lender Rating* ≥ *Sovereign Rating* × *Banking Crisis*) coefficient is negative, but it is imprecisely estimated because of the smaller sample (about 800 observations).

A final potential concern is that almost 50% of the treated observations in our sample are from the 2011-2012 period, which includes the European sovereign debt crisis. Naturally, the effects on bank lending are more pronounced in this period. Nevertheless, Table IA.13 in the Internet Appendix shows qualitatively similar results if we exclude the 2011-2012 period from the sample, although the coefficients are imprecisely estimated.

[13] Table IA.11 in the Internet Appendix shows that the results are not affected when we re-run the tests in Table 4 including the four measures above as controls (size of the bank liabilities to GDP, share of the bank owned by the government, rating uplift, and government bond holdings), as well as the interaction of these three variables with the sovereign downgrade dummy, rather than running tests in subsamples.

4. Conclusion

Our study of the impact of bank ratings on the supply of bank credit takes advantage of the asymmetric impact on bank ratings created by sovereign downgrades because of sovereign ceiling policies followed by the rating agencies. We show that banks with ratings at the sovereign bound reduce their lending volume and increase interest rate spreads significantly more than otherwise similar banks with ratings below the sovereign bound following a sovereign downgrade. We show that this reduction in lending supply can be attributed both to an impaired ability to access wholesale funding and public debt markets and to an increase in the cost of funding.

An important feature of our empirical strategy is that treated banks are of better credit quality than control banks, which rules out several alternative explanations such as confounding economy-wide shocks, which should affect all banks equally. The effect of bank rating downgrades can be attributed to the bank lending channel, and not to the firm borrowing channel, and such downgrades are unrelated to variation in bank-specific characteristics. Results relying exclusively on loans to foreign borrowers, loans made within lender-borrower relationships, and on a placebo test using banking crises confirm our interpretation of a causal effect of bank ratings. We also rule out the possibility that the loop between sovereign and bank credit risk could be driving the effect of sovereign downgrades.

Our findings show that public debt management affects credit markets through sovereign ceilings, and not only through fundamentals such as interest rates. When the sovereign has a rating that is not at the high end of the scale, ratings for even healthy banks from that country will suffer with deteriorating sovereign credit quality. Following a sovereign downgrade, rating agencies often downgrade banks at the sovereign bound even if these banks do not actually receive a greater shock to their credit quality than banks below the bound. Future work should examine the real effects for firms with lending relationships with banks affected by the sovereign ceiling rule.

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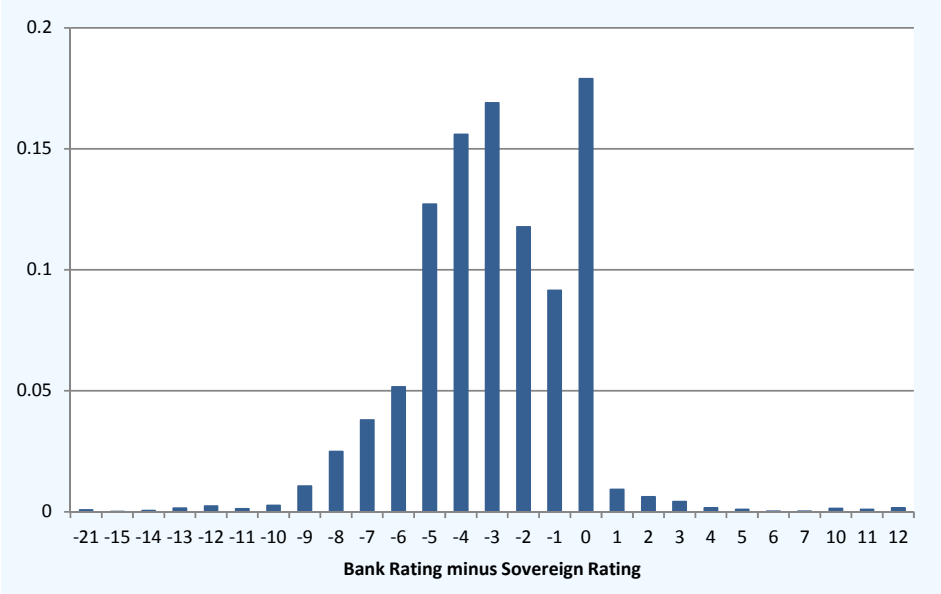
Figure 1 – Sovereign Ceiling Rule

Panel A shows the relative frequency of the difference between the sovereign rating and the rating of each individual bank. Ratings are converted to a numerical categories, where 22 is the highest rating (AAA) and one the lowest (default). A difference of zero means that the bank is exactly at the sovereign bound, a positive difference means that the bank is above the sovereign bound, and a negative difference means that the bank is below the sovereign bound. Panel B shows the relation between the sovereign rating and the rating of each individual bank. Ratings are converted to a numerical categories, where 22 is the highest rating (AAA) and one the lowest (default). The 45 degree line corresponds to bank-year observations in which the bank is at the sovereign bound. The area of each observation is proportional to its frequency.

Panel A – Distribution of Difference between Sovereign and Bank Ratings



Panel B – Distribution of Sovereign-Bank Rating Pairs

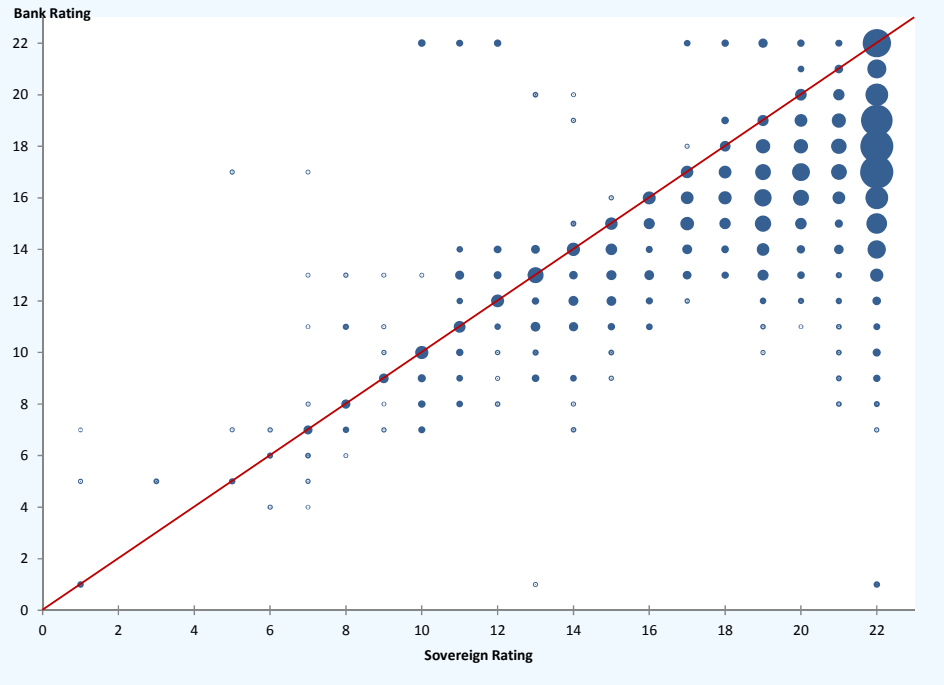
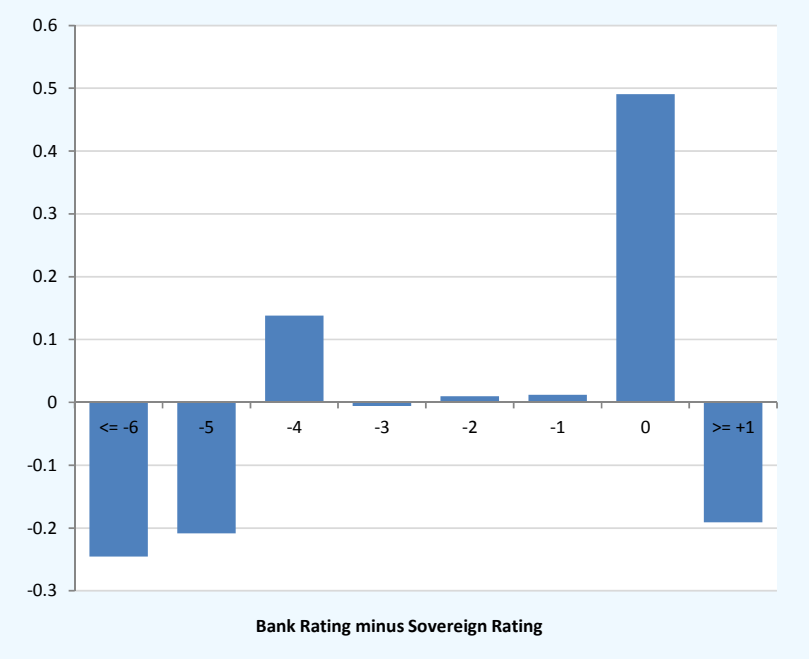


Figure 2 – Effects of Sovereign Downgrades by Distance from the Bound

Panel A shows the probability of a bank being downgraded in the quarter of the sovereign downgrade. Panel B shows the growth in the total number of loans measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade. Observations are grouped according to the pre-downgrade difference between the sovereign rating and the bank rating. A difference of zero means that the bank is exactly at the sovereign bound, a positive difference means that the bank is above the sovereign bound, and a negative difference means that the bank is below the sovereign bound. The effects are shown as deviations from the average response.

Panel A – Probability of Bank Rating Downgrade (deviations from average)



Panel B – Growth in the Total Number of Loans (deviations from average)

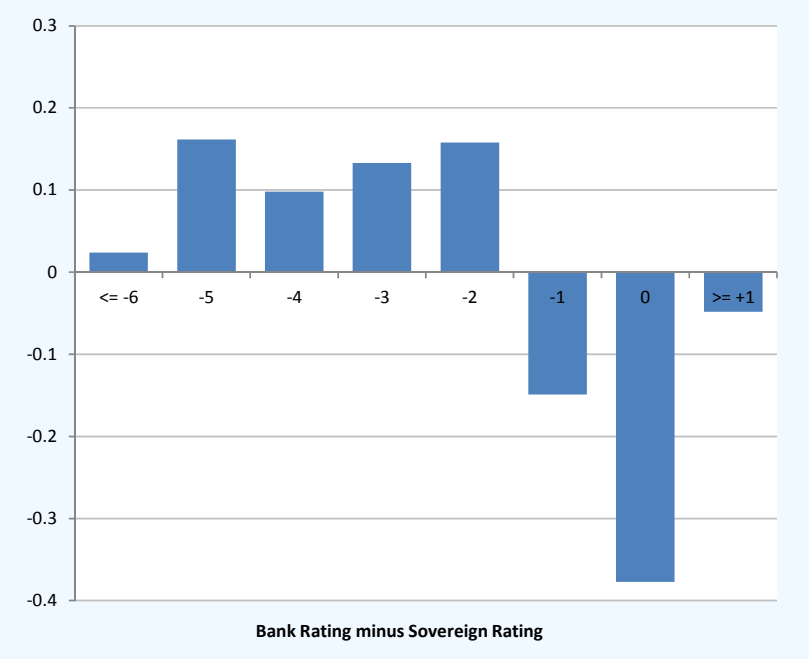


Figure 3 – Bank Rating and Sovereign Downgrade

This figure shows point estimates and 95% confidence intervals for the effect on the rating of banks that have pre-downgrade rating at the sovereign bound (treated banks) relative to banks below the bound (control banks) around the sovereign downgrade. Control variables are the same as in column (1) of Table 3. Standard errors are clustered at the lender country-level.

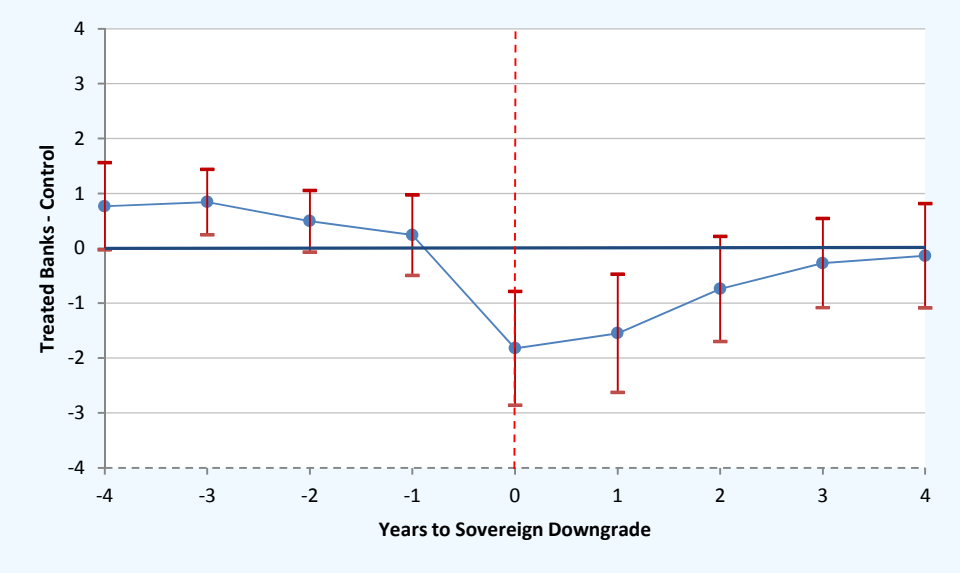
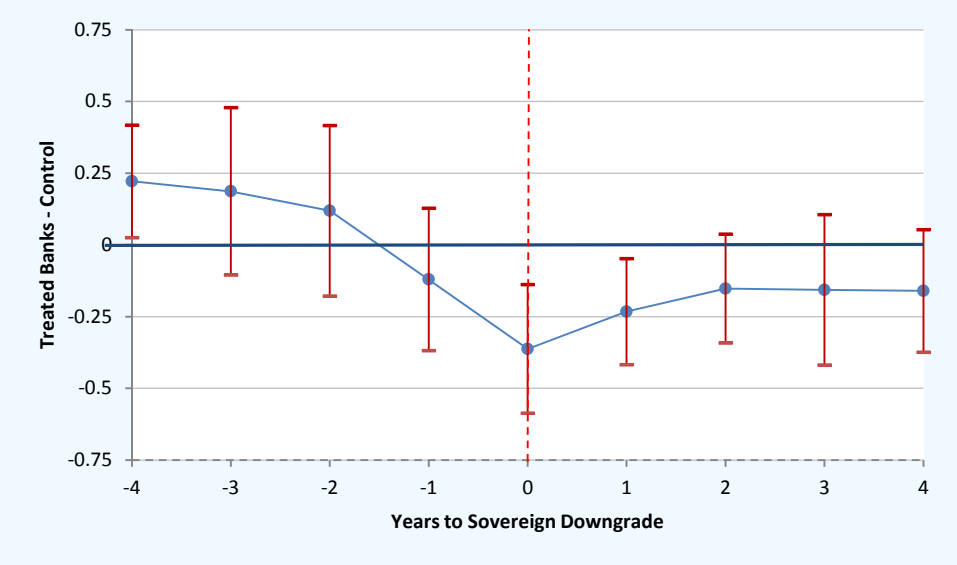


Figure 4 – Bank Lending and Sovereign Downgrade

This figure shows point estimates and 95% intervals for the effect on the total number of loans made by bank that have pre-downgrade rating at the sovereign bound (treated banks) relative to banks below the bound (control banks) around the sovereign downgrade. Control variables are the same as in column (2) of Table 4. Standard errors are clustered at the lender country level.

Panel A – All Loans



Panel B – Loans to Foreign Borrowers

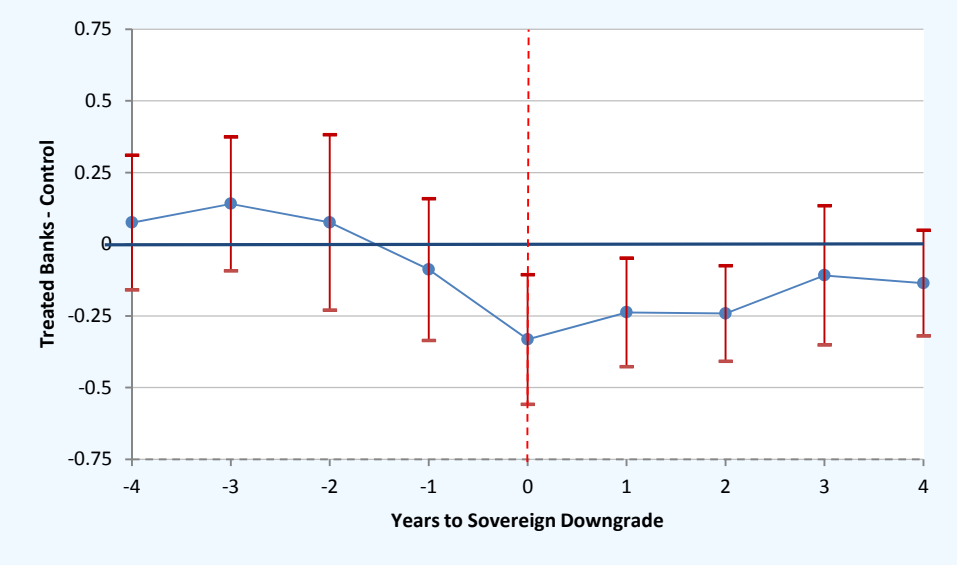


Table 1 – Summary Statistics

Panel A shows the mean, median, standard deviation, minimum, maximum and number of observations of variables at the lender-quarter level, except the last two rows (*Loan Amount* and *Loan Spread*), which are at the loan level. Panel B shows means and differences in means between treated banks, defined as banks that have pre-downgrade rating at the sovereign bound, and control banks. The difference in mean and t-statistic are estimated with country by quarter fixed effects. Variable definitions are provided in Table A.1 in the Appendix.

Panel A – Full Sample

	Mean	Median	Standard Deviation	Minimum	Maximum	Observations
Panel A.1 - Lender-Quarter Level Variables						
Lender Rating	16.6	17.0	3.0	1.0	22.0	16,329
Sovereign Downgrade (dummy)	0.02	0.00	0.15	0.00	1.00	16,329
Total Number of Loans	51.1	10.0	105.8	0.0	1,122	16,329
Number of Loans as Lead	34.8	5.0	81.4	0.0	961.0	16,329
Amount of Loans as Lead ($M)	2,460	100	8,150	0	174,000	16,329
Total Number of Loans - Foreign	27.2	2.0	64.3	0.0	597.0	16,329
Number of Loans as Lead - Foreign	19.2	1.0	46.9	0.0	442.0	16,329
Amount of Loans as Lead - Foreign ($M)	1,320	16	4,260	0	56,700	16,329
Growth Total Number of Loans	0.17	0.00	0.91	-1.00	2.67	12,769
Growth Number of Loans as Lead	0.12	-0.01	0.93	-1.00	2.60	11,441
Growth Amount of Loans as Lead	0.50	-0.06	1.81	-1.00	6.35	11,439
Size ($B)	206.1	61.9	385.3	0.1	3,065	16,329
Profitability	0.01	0.01	0.01	-0.05	0.05	16,314
Capital	0.08	0.07	0.07	0.01	0.57	16,329
Liquidity	0.19	0.15	0.15	0.01	0.82	16,327
Deposits	0.66	0.72	0.21	0.06	0.95	16,323
Too Big Too Fail (dummy)	0.43	0.00	0.50	0.00	1.00	15,573
State-Owned (dummy)	0.12	0.00	0.33	0.00	1.00	16,329
Rating Uplift	2.00	1.00	2.52	0.00	19.00	9,436
Government Bondholdings	0.01	0.00	0.04	0.00	0.38	16,329
Retail Deposits	0.62	0.66	0.27	0.01	1.21	15,009
Non-Deposit Short-Term Funding	0.24	0.20	0.18	0.00	0.94	14,777
Long-Term Funding	0.20	0.12	0.22	0.00	0.96	15,965
Interbank Funding	0.15	0.11	0.15	0.00	0.98	12,972
CDS Spread (basis points)	138.8	84.0	214.4	1.2	3,350.0	3,899
Panel A.2 - Loan-Level Variables						
Loan Amount ($M)	509	156	1,230	0	50,000	930,581
Loan Spread (basis points)	180.3	150.0	134.8	15.0	687.5	656,527

Panel B –Treated and Control Samples

	Mean		Difference		Number	Number
	Treated	Control	(Country-Qrt. FE)	t-statistic	of Treated	of Control
Lender Rating	16.8	16.6	3.5	76.7	3,311	13,018
Sovereign Downgrade (dummy)	0.03	0.02	--	--	3,311	13,018
Total Number of Loans	17.9	59.5	-33.2	-13.5	3,311	13,018
Number of Loans as Lead	13.2	40.3	-22.4	-12.3	3,311	13,018
Amount of Loans as Lead ($M)	714	2,908	-1,942	-13.6	3,311	13,018
Total Number of Loans - Foreign	12.1	31.1	-27.0	-14.3	3,311	13,018
Number of Loans as Lead - Foreign	8.7	21.9	-19.0	-13.8	3,311	13,018
Amount of Loans as Lead - Foreign ($M)	475	1,531	-1,468	-13.3	3,311	13,018
Growth Total Number of Loans	0.10	0.18	0.00	0.2	2,206	10,563
Growth Number of Loans as Lead	0.07	0.13	0.00	0.0	2,013	9,428
Growth Amount of Loans as Lead	0.51	0.50	0.10	1.5	2,013	9,426
Size ($B)	130.8	225.3	-85.9	-8.4	3,311	13,018
Profitability	0.01	0.01	0.00	4.3	3,309	13,005
Capital	0.11	0.07	0.06	20.9	3,311	13,018
Liquidity	0.20	0.18	0.00	-0.2	3,310	13,017
Deposits	0.54	0.69	-0.24	-35.7	3,308	13,015
Too Big Too Fail (dummy)	0.54	0.40	0.07	4.9	3,204	12,369
State-Owned (dummy)	0.33	0.07	0.27	25.0	3,311	13,018
Rating Uplift	1.93	2.01	0.86	7.8	1,572	7,864
Government Bondholdings	0.01	0.01	0.00	-4.9	3,311	13,018
Retail Deposits	0.55	0.63	-0.15	-18.6	2,692	12,317
Non-Deposit Short-Term Funding	0.23	0.24	-0.02	-2.8	2,682	12,095
Long-Term Funding	0.31	0.17	0.23	28.5	3,203	12,762
Interbank Funding	0.15	0.16	-0.02	-3.8	2,672	10,300
CDS Spread	209.3	128.4	-40.9	-5.9	501	3,398

Table 2 – Sample of Treated Banks

This table shows the countries and years with a sovereign downgrade and at least one treated bank, defined as banks that have pre-downgrade rating at the sovereign bound. The number of treated banks in each event is shown in parentheses.

Country	Downgrade Year	Number of Treated
Argentina	2000 (2), 2001 (8), 2012 (1)	11
Australia	1989 (1)	1
Brazil	1999 (1), 2002 (3)	4
China	1999 (2)	2
Egypt	2002 (2), 2011 (6), 2012 (7)	15
France	2012 (2)	2
Greece	2010 (1), 2011 (5), 2012 (4)	10
Hungary	2008 (1), 2009 (1), 2011 (1), 2012 (1)	4
Indonesia	1998 (1), 2000 (1), 2001 (2), 2002 (2)	6
India	1998 (1)	1
Italy	2006 (1), 2011 (4), 2012 (5)	10
Japan	2001 (3), 2002 (3), 2011 (1)	7
Korea, Republic of	1997 (2)	2
Lebanon	2000 (1), 2001 (1), 2002 (1), 2008 (1)	4
Malaysia	1997 (1), 1998 (1)	2
Panama	2001 (2)	2
Philippines	2003 (1), 2005 (1)	2
Portugal	2009 (1), 2010 (1), 2011 (3)	5
Russian Federation	2008 (2)	2
South Africa	2012 (2)	2
Spain	2011 (2), 2012 (5)	7
Thailand	1998 (1)	1
Turkey	2001 (5)	5
United States	2011 (1)	1
Venezuela	1999 (1), 2002 (1)	2
Total		110

Table 3 – Bank Rating Downgrade and Sovereign Downgrade

This table shows OLS regression estimates of the effect of a sovereign downgrade on the rating of banks that have pre-downgrade rating at the sovereign bound. The dependent variable is the credit rating of the bank converted to a numeric scale one quarter after the sovereign downgrade. Observations are at the lender-quarter level. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Lender Rating >= Sovereign Rating	2.99***	2.66***	0.79**	0.80**
	(0.32)	(0.32)	(0.35)	(0.33)
Sovereign Downgrade	-0.91***	-0.53**	-0.89***	-0.62***
	(0.33)	(0.26)	(0.24)	(0.22)
Lender Rating >= Sov. Rating x Sov. Downgrade	-1.49**	-1.36***	-1.15**	-0.94***
	(0.59)	(0.42)	(0.46)	(0.36)
Size		0.47***		0.87***
		(0.10)		(0.19)
Profitability		26.11**		28.36***
		(12.11)		(6.74)
Capital		4.33***		3.30
		(1.53)		(2.38)
Liquidity		0.44		-0.56
		(0.89)		(0.64)
Deposits		-0.55		0.98**
		(0.62)		(0.47)
Country Macro Controls		Y		Y
Country FE	Y	Y		
Quarter FE	Y	Y	Y	Y
Lender FE			Y	Y
Number of Observations	20,850	16,329	20,850	16,329
R-Squared	0.64	0.72	0.11	0.30

Table 4 – Bank Lending and Sovereign Downgrade

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have pre-downgrade rating at the sovereign bound relative to banks below the bound. The dependent variables are measured two quarters after the sovereign downgrade (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade). Observations are at the lender-quarter level. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)		Number of Loans as Lead (log)		Amount of Loans as Lead (log)		Growth Total Number of Loans		Growth Number of Loans as Lead		Growth Amount of Loans as Lead	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lender Rating >= Sovereign Rating	-0.06	-0.17**	-0.14	-0.17**	-0.43	-0.79	-0.02	0.02	-0.02	-0.02	0.00	0.00
	(0.09)	(0.08)	(0.09)	(0.08)	(0.46)	(0.49)	(0.03)	(0.04)	(0.04)	(0.04)	(0.06)	(0.08)
Sovereign Downgrade	-0.07	0.01	-0.13	-0.06	-1.18*	-0.57	-0.08	-0.04	-0.17**	-0.10	-0.36**	-0.22
	(0.11)	(0.09)	(0.11)	(0.08)	(0.71)	(0.59)	(0.06)	(0.06)	(0.07)	(0.07)	(0.16)	(0.16)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.31***	-0.26*	-0.21**	-0.23**	-1.62**	-1.76*	-0.41***	-0.35***	-0.33***	-0.30**	-0.43**	-0.36
	(0.12)	(0.14)	(0.09)	(0.10)	(0.77)	(0.97)	(0.12)	(0.11)	(0.11)	(0.12)	(0.22)	(0.23)
Size		0.35***		0.33***		1.39*		0.01		0.06***		0.01
		(0.11)		(0.12)		(0.74)		(0.01)		(0.01)		(0.01)
Profitability		1.13		0.66		5.70		-2.44		-0.23		-3.12
		(2.43)		(2.20)		(11.53)		(1.82)		(2.19)		(3.82)
Capital		1.99***		2.15***		11.85***		0.38**		0.53***		1.24***
		(0.69)		(0.82)		(4.06)		(0.19)		(0.20)		(0.43)
Liquidity		0.20		0.24		2.58		-0.03		0.13*		0.24*
		(0.28)		(0.27)		(1.61)		(0.08)		(0.07)		(0.13)
Deposits		0.41		0.35		2.41**		0.17**		0.01		0.00
		(0.27)		(0.26)		(1.10)		(0.08)		(0.06)		(0.13)
Country Macro Controls		Y		Y		Y		Y		Y		Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y						
Country FE							Y	Y	Y	Y	Y	Y
Number of Observations	19,877	15,502	19,877	15,502	19,877	15,502	15,472	12,769	13,568	11,441	13,564	11,439
R-Squared	0.29	0.19	0.26	0.21	0.08	0.06	0.10	0.11	0.11	0.12	0.06	0.06

Table 5 – Bank Lending to Foreign Borrowers and Sovereign Downgrade

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have pre-downgrade rating at the sovereign bound relative to banks below the bound. The dependent variables are measured two quarters after the sovereign downgrade (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade). Observations are at the lender-quarter level. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. The sample includes only loans in which the lender and borrower are from different countries. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.07	-0.06	-0.35	0.04	0.02	0.07
	(0.07)	(0.06)	(0.42)	(0.05)	(0.05)	(0.07)
Sovereign Downgrade	-0.05	-0.07	-0.97	-0.07	-0.19**	-0.19
	(0.06)	(0.07)	(0.64)	(0.07)	(0.09)	(0.13)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.20*	-0.19*	-2.44***	-0.32***	-0.36***	-0.55***
	(0.12)	(0.11)	(0.80)	(0.10)	(0.13)	(0.19)
Size	0.34***	0.30***	1.66***	0.06***	0.09***	0.07***
	(0.09)	(0.08)	(0.60)	(0.01)	(0.02)	(0.03)
Profitability	3.02	3.21*	10.56	3.06*	5.31**	6.85*
	(1.85)	(1.69)	(9.44)	(1.77)	(2.13)	(3.64)
Capital	1.55**	1.26*	11.01**	0.16	0.29	0.74
	(0.74)	(0.65)	(4.75)	(0.49)	(0.37)	(0.55)
Liquidity	0.22	0.28	3.08*	0.28***	0.24*	0.34*
	(0.23)	(0.21)	(1.58)	(0.09)	(0.13)	(0.20)
Deposits	0.43*	0.26	1.70	-0.03	-0.09	-0.19*
	(0.24)	(0.22)	(1.25)	(0.07)	(0.10)	(0.11)
Country Macro Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y			
Country FE				Y	Y	Y
Number of Observations	15,502	15,502	15,502	9,580	8,594	8,593
R-Squared	0.17	0.20	0.07	0.17	0.18	0.09

Table 6 – Matched Sample

Panel A shows summary statistics of treated banks, defined as banks that have pre-downgrade rating at the sovereign bound, and matched control banks. Panel B shows difference-in-differences estimates of the average treatment effect on the treated banks (ATT) using the Abadie-Imbens nearest-neighbor estimator. The dependent variables are the growth rate of the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger between the quarter prior to and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. Lenders are matched exactly on country and quarter, and other pre-treatment covariates include banks' size, profitability, capital, liquidity, and deposits. Variable definitions are provided in Table A.1 in the Appendix. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A – Summary Statistics

	Mean		Median			Kolmogorov-
	Treated	Control	Treated	Control	Pearson χ^2 p-value	Smirnov p-value
Size	11.46	11.53	11.18	11.55	0.46	0.01
	(0.11)	(0.09)				
Profitability	0.70	0.30	0.66	0.37	0.00	0.00
	(0.09)	(0.04)				
Capital	0.10	0.06	0.08	0.06	0.00	0.00
	(0.01)	(0.00)				
Liquidity	0.16	0.12	0.15	0.10	0.00	0.00
	(0.01)	(0.01)				
Deposits	0.62	0.69	0.62	0.64	0.14	0.00
	(0.02)	(0.01)				

Panel B – Difference-in-Differences Estimates

	Treated	Control	Difference-in Difference	ATT	Number of Treated
All Loans					
Total Number of Loans	-0.41***	-0.08	-0.32***	-0.27**	46
	(0.05)	(0.07)	(0.08)	(0.13)	
Number of Loans As Lead	-0.45***	-0.24***	-0.21***	-0.51***	42
	(0.05)	(0.06)	(0.07)	(0.13)	
Amount of Loans As Lead	-0.26**	0.05	-0.32**	-0.56***	42
	(0.10)	(0.11)	(0.14)	(0.21)	
Loans to Foreign Borrowers					
Total Number of Loans	-0.38***	0.04	-0.42***	-0.52***	34
	(0.06)	(0.09)	(0.11)	(0.18)	
Number of Loans As Lead	-0.55***	-0.19**	-0.37***	-0.32*	32
	(0.05)	(0.08)	(0.10)	(0.17)	
Amount of Loans As Lead	-0.45***	0.08	-0.53***	-0.38	32
	(0.08)	(0.13)	(0.16)	(0.26)	

Table 7 – Loan Amount and Spread

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of the loan amount and interest rate spread of banks that have pre-downgrade rating at the sovereign bound. The effect is measured in the six-month period after the sovereign downgrade. Observations are at the loan level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Borrower controls include borrowers' size, Tobin's Q, leverage, tangibility, foreign sales, an indicator whether the borrower has a credit rating, and credit rating converted to a numeric scale. Loan controls include indicators for secured loan, senior loan, loan purpose (general purpose, debt repayment, working capital, takeover and other), term loan, dividend restrictions, and prior participant or lead arranger (whether the lender was a lead arranger or participant for the same borrower in the prior loan). Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Panel A includes all loans, and Panel B includes only loans in which the lender and borrower are from different countries. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A – All Loans

	Loan Amount (log)			Loan Spread		
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	0.09**	0.05	0.05	-2.38	-1.45	-1.80
	(0.04)	(0.04)	(0.04)	(4.58)	(3.99)	(3.32)
Sovereign Downgrade	0.04	0.06**	0.05**	-2.98	-4.60	-4.46
	(0.03)	(0.03)	(0.03)	(5.26)	(3.18)	(3.24)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.24***	-0.15**	-0.13*	45.39***	20.06**	17.36**
	(0.06)	(0.07)	(0.07)	(12.65)	(8.59)	(8.60)
Lender Controls		Y	Y		Y	Y
Borrower Controls		Y	Y		Y	Y
Loan Controls			Y			Y
Country Macro Controls		Y	Y		Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Lender x Borrower FE	Y	Y	Y	Y	Y	Y
Number of Observations	930,581	368,412	368,412	657,254	279,259	279,259
R-Squared	0.88	0.88	0.88	0.84	0.85	0.86

Panel B – Loans to Foreign Borrowers

	Loan Amount (log)			Loan Spread		
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	0.08***	0.07**	0.07**	-4.42	-3.30	-3.49
	(0.03)	(0.03)	(0.03)	(4.05)	(4.14)	(3.64)
Sovereign Downgrade	0.05	0.01	0.02	-0.03	-1.63	-1.14
	(0.03)	(0.02)	(0.02)	(2.59)	(4.51)	(4.19)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.19***	-0.12*	-0.11*	2.18	-0.80	-2.84
	(0.07)	(0.07)	(0.06)	(7.04)	(7.41)	(7.35)
Lender Controls		Y	Y		Y	Y
Borrower Controls		Y	Y		Y	Y
Loan Controls			Y			Y
Country Macro Controls		Y	Y		Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Lender x Borrower FE	Y	Y	Y	Y	Y	Y
Number of Observations	480,361	199,119	199,119	332,041	149,303	149,303
R-Squared	0.83	0.83	0.84	0.85	0.86	0.88

Table 8 – Lender-Borrower Relationships

This table shows logit regression estimates of the effect of a sovereign downgrade on the probability of observing a loan for banks that have pre-downgrade rating at the sovereign bound. The dependent variables are indicators that take the value of one if there is at least a loan as participant or lead arranger in a lender-borrower pair in each quarter. Observations are at the lender-borrower-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Borrower controls include borrowers' size, Tobin's Q, leverage, tangibility, foreign sales, an indicator whether the borrower has a credit rating, credit rating converted to a numeric scale, and prior participant or lead arranger (whether the lender was a lead arranger or participant for the same borrower in a prior loan). Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Panel A includes all loans, and Panel B includes only loans in which the lender and borrower are from different countries. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A – All Loans

	Total Number of Loans Dummy		Number of Loans as Lead Dummy	
	(1)	(2)	(3)	(4)
Lender Rating >= Sovereign Rating	0.03	-0.01	0.04*	-0.01
	(0.02)	(0.03)	(0.02)	(0.03)
Sovereign Downgrade	0.01	-0.05*	0.02	-0.05
	(0.02)	(0.03)	(0.02)	(0.03)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.24***	-0.23**	-0.25***	-0.28**
	(0.07)	(0.10)	(0.07)	(0.11)
Lender Controls		Y		Y
Borrower Controls		Y		Y
Country Macro Controls		Y		Y
Quarter FE	Y	Y	Y	Y
Lender x Borrower FE	Y	Y	Y	Y
Number of Observations	2,530,825	1,308,022	2,440,768	1,249,050
R-Squared	0.03	0.04	0.03	0.04

Panel B – Loans to Foreign Borrowers

	Total Number of Loans Dummy		Number of Loans as Lead Dummy	
	(1)	(2)	(3)	(4)
Lender Rating >= Sovereign Rating	-0.01	0.03	0.01	0.05
	(0.02)	(0.03)	(0.03)	(0.04)
Sovereign Downgrade	-0.07**	-0.08*	-0.05	-0.06
	(0.03)	(0.04)	(0.04)	(0.05)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.31***	-0.21*	-0.33***	-0.25*
	(0.09)	(0.12)	(0.10)	(0.13)
Lender Controls		Y		Y
Borrower Controls		Y		Y
Country Macro Controls		Y		Y
Quarter FE	Y	Y	Y	Y
Lender x Borrower FE	Y	Y	Y	Y
Number of Observations	1,301,937	703,414	1,249,009	669,496
R-Squared	0.04	0.05	0.04	0.05

Table 9 – Bank Funding and Sovereign Downgrade

This table shows OLS regression estimates of the effect of a sovereign downgrade on retail deposits, non-deposit short-term funding, interbank funding, and long-term funding of banks that have pre-downgrade rating at the sovereign bound. The dependent variables are measured as a percentage of lagged total funding and two quarters after the sovereign downgrade, with the exception of long-term funding that is measured four quarters after the downgrade. Observations are at the lender-quarter level. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Retail Deposits		Non-Deposit Short-Term Funding		Interbank Funding		Long-Term Funding	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender Rating >= Sovereign Rating	-0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sovereign Downgrade	-0.03***	0.00	0.01	0.00	0.02	0.01**	0.02***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Lender Rating >= Sov. Rating x Sov. Downgrade	0.00	-0.01	0.00	0.00	-0.05***	-0.04**	-0.03**	-0.03*
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Size		-0.08***		0.04***		0.03**		0.01
		(0.01)		(0.01)		(0.01)		(0.01)
Profitability		0.12		0.56		0.92***		-0.29
		(0.28)		(0.36)		(0.31)		(0.22)
Capital		0.30**		0.27		0.52*		-0.21**
		(0.15)		(0.20)		(0.29)		(0.10)
Liquidity		-0.09**		0.15**		0.09*		-0.07**
		(0.04)		(0.06)		(0.05)		(0.03)
Deposits		0.26***		0.31***		0.27***		-0.48***
		(0.03)		(0.06)		(0.08)		(0.05)
Country Macro Controls		Y		Y		Y		Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y	Y
Number of Observations	12,118	11,766	11,943	11,600	12,727	12,350	12,032	11,572
R-Squared	0.13	0.32	0.03	0.14	0.09	0.18	0.11	0.35

Table 10 – Credit Default Swap Spreads and Sovereign Downgrade

This table shows OLS regression estimates of the effect of a sovereign downgrade on credit default swap (CDS) spreads of banks that have pre-downgrade rating at the sovereign bound. The dependent variables are measured as the change between the quarter prior to and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Lender Rating >= Sovereign Rating	-2.93	1.29	1.33	14.21
	(15.28)	(13.13)	(37.36)	(33.88)
Sovereign Downgrade	71.25**	60.54***	73.99***	63.43***
	(28.41)	(23.05)	(28.18)	(22.46)
Lender Rating >= Sov. Rating x Sov. Downgrade	45.02**	65.31**	44.22**	55.15**
	(18.29)	(28.95)	(19.99)	(27.57)
Size		-0.16		13.88**
		(1.41)		(6.67)
Profitability		-305.73		-416.70
		(1150.02)		(1284.15)
Capital		22.40		254.30
		(74.50)		(207.36)
Liquidity		-37.70*		-30.80
		(20.78)		(38.99)
Deposits		-7.42		27.56
		(13.28)		(55.83)
Country Macro Controls		Y		Y
Country FE	Y	Y		
Quarter FE	Y	Y	Y	Y
Lender FE			Y	Y
Number of Observations	3,660	3,576	3,660	3,576
R-Squared	0.31	0.32	0.28	0.29

Table 11 – Placebo Test – Banking Crises without Sovereign Downgrade

This table shows OLS regression estimates of the effect of banking crisis without a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have a pre-downgrade rating at the sovereign bound relative to banks below the bound. The dependent variables are measured two quarters after banking crises (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the crisis). The treatment is defined as a banking crisis without a sovereign downgrade during the last four quarters. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.21**	-0.20**	-0.93*	0.03	-0.01	-0.01
	(0.09)	(0.08)	(0.48)	(0.03)	(0.04)	(0.08)
Sovereign Downgrade	-0.17	-0.06	0.71	0.33*	0.41***	0.37
	(0.16)	(0.13)	(0.79)	(0.17)	(0.11)	(0.24)
Lender Rating >= Sov. Rating x Sov. Downgrade	0.35***	0.28***	1.08	-0.08	-0.10	0.11
	(0.11)	(0.09)	(0.94)	(0.07)	(0.06)	(0.11)
Lender Controls	Y	Y	Y	Y	Y	Y
Country Macro Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y			
Country FE				Y	Y	Y
Number of Observations	15,502	15,502	15,502	12,769	11,441	11,439
R-Squared	0.20	0.21	0.06	0.11	0.12	0.07

Table 12 – Government Support and Bondholdings

This table shows OLS regression estimates of the effect of a sovereign downgrade on the growth rate of the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger of banks that have pre-downgrade rating at the sovereign bound. The dependent variables are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Regressions also include quarter and country fixed effects. Panel A excludes banks that are above the "too big to fail" threshold, defined as a ratio of bank liabilities to GDP above the 75th percentile of the distribution. Panel B excludes state-owned banks. Panel C excludes banks with rating uplift above the median. The rating uplift is the difference between the Moody's Long-Term Issuer Rating and the Bank Financial Strength Rating. Panel D excludes banks with high government bondholdings, defined as a ratio of holdings of government securities divided by total assets above the median. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A - Excluding Too Big to Fail Banks			*Panel B - Excluding State-Owned Banks*		
Lender Rating >= Sovereign Rating	0.03	-0.07	0.10	0.01	-0.05	-0.06
	(0.07)	(0.08)	(0.12)	(0.03)	(0.04)	(0.08)
Sovereign Downgrade	-0.04	0.01	-0.12	-0.04	-0.11	-0.18
	(0.10)	(0.08)	(0.16)	(0.07)	(0.09)	(0.18)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.56***	-0.46**	-0.29	-0.30***	-0.26**	-0.25
	(0.20)	(0.22)	(0.56)	(0.10)	(0.11)	(0.23)
Number of Observations	6,555	5,456	5,455	11,427	10,194	10,192
R-Squared	0.08	0.08	0.05	0.11	0.12	0.07
	Panel C - Excluding High Rating Uplift Banks			*Panel D - Excluding Banks with High Government Bondholdings*		
Lender Rating >= Sovereign Rating	0.04	-0.05	-0.26	0.01	-0.03	0.04
	(0.06)	(0.07)	(0.18)	(0.04)	(0.05)	(0.09)
Sovereign Downgrade	0.31*	0.17	0.20	-0.05	-0.11	-0.17
	(0.16)	(0.13)	(0.37)	(0.07)	(0.07)	(0.16)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.70***	-0.50**	-0.49	-0.39***	-0.33**	-0.57**
	(0.20)	(0.25)	(0.54)	(0.14)	(0.15)	(0.25)
Number of Observations	4,273	3,810	3,809	10,180	9,029	9,028
R-Squared	0.14	0.14	0.07	0.10	0.12	0.06

Appendix

Table A.1 – Variable Definitions

Variable	Description
Panel A – Lender Variables	
Lender Rating	S&P long-term foreign currency issuer ratings of the lender mapped into 22 numerical categories (Bloomberg).
Sovereign Rating	S&P long-term foreign currency issuer ratings of the country where lender is domiciled mapped into 22 numerical categories (Bloomberg).
Sovereign Downgrade	Dummy variable that takes a value of one if the sovereign rating is downgraded in a quarter, and zero otherwise.
Total Number of Loans	Total number of loans made by a bank as participant or lead arranger (Dealscan).
Number of Loans as Lead	Number of loans only taking into account loans in which the bank acted as lead arranger (Dealscan).
Amount of Loans as Lead	Total amount of loans in millions of U.S. dollars in which the bank acted as lead arranger (Dealscan).
Size	Log of total assets in billions of U.S. dollars (Bankscope item 2025).
Profitability	Operating income divided by total assets (Bankscope items 4024/2025).
Capital	Ratio of common equity to total assets (Bankscope items 2055/2025).
Liquidity	Ratio of cash and marketable securities to total assets (Bankscope items 2075/2025).
Deposits	Ratio of deposits and short-term funding to total assets (Bankscope items 2030/2025).
Too Big To Fail	Dummy variable that takes a value of one if the ratio of bank total liabilities (Bankscope item 11750) to GDP is above the 75th percentile, and zero otherwise.
State-Owned	Dummy variable that takes a value of one if the government owns (directly and indirectly) more than 50% of the equity (Bankscope).
Rating Uplift	Difference between the Long-Term Issuer Rating and the Bank Financial Strength Rating mapped into 22 numerical categories; the Moody's (2007) conversion table is used to transform the Bank Financial Strength Rating into long-term issuer equivalent rating.
Government Bondholdings	Holdings of government securities, including Treasury bills, bonds, and other government securities divided by total assets (Bankscope items 29272/2025).
Retail Deposits	Ratio of total customer deposits to lagged total funding (Bankscope items 2031/11650).
Non-Deposit Short-Term Funding	Ratio of total funding minus the sum of retail deposits and long-term funding to lagged total funding (Bankscope items (11650–2023–11620)/11650).
Long-Term Funding	Ratio of long-term funding to lagged total funding (Bankscope items 11620/11650).
Interbank Funding	Ratio of deposits from banks to lagged total funding (Bankscope items 2185/11650).
CDS Spread	Senior credit default swap spread of lender in basis points with five year tenor (Bloomberg).
Panel B – Loan Variables	
Loan Amount	Loan amount in millions of U.S. dollars (Dealscan item Facility Amount).
Loan Spread	Loan spread over the LIBOR rate (Dealscan item All-in Spread Drawn).

Secured	Dummy variable that takes a value of one if the loan is secured by collateral, and zero otherwise (Dealscan item Secured).
Senior	Dummy variable that takes a value of one if the loan is senior, and zero otherwise (Dealscan item Seniority).
Purpose	Dummy variables for the purpose of the loan include general purpose, debt repayment, working capital, and takeover (Dealscan item Primary Purpose).
Term Loan	Dummy variable that takes a value of one if the loan is a term loan and zero if it is a credit line (Dealscan item Specific Tranche Type).
Dividend Restriction	Dummy variable that takes a value of one if the loan has restrictions on paying dividends, and zero otherwise (Dealscan item Covenants: General-Material Restriction).
Prior Participant	Dummy variables that take a value of one if the bank served as a participant for the borrower's previous loan.
Prior Lead	Dummy variables that take a value of one if the bank served as a lead arranger for the borrower's previous loan.
Panel C – Borrower Variables	
Size	Log of total assets (Factset item FF_ASSETS).
Tobin's Q	Ratio of total assets plus market capitalization minus common equity to total assets (Factset items (FF_ASSETS+FF_MKT_VAL–FF_COM_EQ)/FF_ASSETS).
Leverage	Ratio of total debt to total assets (Factset items FF_DEBT/FF_ASSETS).
Tangibility	Ratio of net property, plant, and equipment to total assets (Factset items FF_PPE_NET/FF_ASSETS).
Foreign Sales	Ratio of foreign sales to total sales (Factset item FF_FOR_SALES_PCT).
Rating	S&P long-term foreign currency issuer ratings of the borrower mapped into 22 numerical categories (Bloomberg).
Unrated	Dummy variable that takes a value of one if a borrower does not have a credit rating, and zero otherwise.

Internet Appendix to "Bank Ratings and Lending Supply: Evidence from Sovereign Downgrades"

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Table IA.1 – List of Treated Banks

This table shows the list of treated banks, defined as banks that have pre-downgrade rating at the sovereign bound when a country is downgraded, country of domicile, and average bank rating in the quarter before and after the sovereign downgrade.

Bank Name	Country	Number of Observations	Average Rating Before Sov. Downgrade	Average Rating After Sov. Downgrade
Banco de Galicia	Argentina	5	9.0	3.6
Banco de Galicia y Buenos Aires	Argentina	6	8.8	5.8
State Bank of New South Wales	Australia	1	21.0	21.0
Banco do Brasil	Brazil	1	10.0	9.0
Uniao de Bancos Brasileiros SA	Brazil	2	10.0	9.0
Votorantim Participacoes SA	Brazil	1	10.0	9.0
China Development Bank [CDB]	China	1	15.0	14.0
Export-Import Bank of China [China Eximbank]	China	1	15.0	14.0
African Export-Import Bank [Afreximbank]	Egypt	4	13.0	12.3
Banque Misr SAE	Egypt	1	8.0	13.0
Commercial International Bank (Egypt) SAE	Egypt	5	10.6	11.4
National Bank of Egypt SAE [NBE]	Egypt	5	10.6	11.4
Agence Francaise de Development [AFD]	France	1	22.0	21.0
Caisse des Depots et Consignations	France	1	22.0	21.0
Alpha Bank AE	Greece	2	5.0	5.0
Black Sea Trade & Development Bank [BSTDB]	Greece	2	17.0	17.0
National Bank of Greece SA	Greece	4	9.3	6.8
Piraeus Bank SA	Greece	2	5.0	5.0
OTP Bank Rt [National Savings & Commercial Bank]	Hungary	4	13.5	12.3
Bank of Baroda	India	1	12.0	11.0
Bank Indonesia	Indonesia	4	6.0	4.8
Bank Internasional Indonesia	Indonesia	1	12.0	4.0
PT Bank Mandiri Persero	Indonesia	1	7.0	7.0
Cassa Depositi e Prestiti SpA [CDP]	Italy	2	17.5	15.0
Cassa di Risparmio di Parma e Piacenza	Italy	2	17.5	15.0
Intesa Sanpaolo SpA [ISP]	Italy	2	17.5	15.0
Mediobanca SpA	Italy	3	18.0	16.3
UniCredit	Italy	1	17.0	15.0
Development Bank of Japan Inc	Japan	1	20.0	19.0
Japan Bank for International Cooperation	Japan	2	20.5	19.0
Toyota Financial Services Corp	Japan	4	21.5	21.3
Export-Import Bank of Korea	Korea (South)	1	19.0	12.0
Korea Development Bank	Korea (South)	1	19.0	12.0
Banque Audi SAL	Lebanon	4	8.5	7.8
Malayan Banking Bhd	Malaysia	2	17.0	14.5
Banco General SA	Panama	1	13.0	13.0
Bladex [Banco Latinoamericano de Exportaciones SA]	Panama	1	14.0	13.0
Asian Development Bank	Philippines	2	22.0	22.0
Banco BPI SA	Portugal	1	16.0	13.0
Banco Espirito Santo SA [BES]	Portugal	1	16.0	13.0
Caixa Geral de Depositos SA [CGD]	Portugal	3	17.7	15.7
Vnesheconombank [VEB]	Russia	1	15.0	14.0
VTB Bank JSC	Russia	1	15.0	14.0
FirstRand Bank Ltd [FRB]	South Africa	1	15.0	19.0
Standard Bank Group Ltd	South Africa	1	15.0	18.0
Banco Bilbao Vizcaya Argentaria SA [BBVA]	Spain	3	17.3	15.0
Banco Santander SA	Spain	4	18.3	16.3
Bangkok Bank Public Co Ltd	Thailand	1	14.0	12.0
Dogus Holding AS	Turkey	2	8.5	7.0
TC Ziraat Bankasi AS	Turkey	1	9.0	6.0
Turkiye Is Bankasi AS [Isbank]	Turkey	2	8.5	7.0
Inter-American Development Bank	USA	1	22.0	22.0
Banco Mercantil CA	Venezuela	2	11.0	13.5
Total		110	14.2	12.9

Table IA.2 – Bank Rating Downgrade and Sovereign Downgrade – Clustering by Country and Quarter

This table shows OLS regression estimates of the effect of a sovereign downgrade on the rating of banks that have pre-downgrade rating at the sovereign bound. The dependent variable is the credit rating of the bank converted to a numeric scale one quarter after the downgrade. Observations are at the lender-quarter level. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the quarter and lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Lender Rating >= Sovereign Rating	2.99***	2.66***	0.79**	0.80**
	(0.32)	(0.32)	(0.35)	(0.33)
Sovereign Downgrade	-0.91**	-0.53*	-0.89***	-0.62**
	(0.35)	(0.30)	(0.27)	(0.25)
Lender Rating >= Sov. Rating x Sov. Downgrade	-1.49***	-1.36***	-1.15***	-0.94***
	(0.57)	(0.45)	(0.42)	(0.35)
Size		0.47***		0.87***
		(0.10)		(0.19)
Profitability		26.11**		28.36***
		(11.96)		(6.89)
Capital		4.33***		3.30
		(1.53)		(2.37)
Liquidity		0.44		-0.56
		(0.88)		(0.63)
Deposits		-0.55		0.98**
		(0.62)		(0.47)
Country Macro Controls		Y		Y
Country FE	Y	Y		
Quarter FE	Y	Y	Y	Y
Lender FE			Y	Y
Number of Observations	20,850	16,329	20,850	16,329
R-Squared	0.64	0.72	0.86	0.89

Table IA.3 – Bank Rating Downgrade and Sovereign Downgrade – Logit Model

This table shows logit regression estimates of the effect of a sovereign downgrade on the probability of a rating downgrade for banks that have pre-downgrade rating at the sovereign bound. The dependent variable is an indicator that takes the value of one if the bank suffers a downgrade. Observations are at the lender-borrower-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Lender Rating >= Sovereign Rating	-0.56***	-0.79***	0.23	0.60**
	(0.21)	(0.28)	(0.21)	(0.25)
Sovereign Downgrade	2.84***	2.10***	2.45***	1.94***
	(0.34)	(0.35)	(0.15)	(0.18)
Lender Rating >= Sov. Rating x Sov. Downgrade	4.01***	5.68***	2.93***	3.78***
	(0.78)	(1.17)	(0.37)	(0.55)
Size		0.20***		0.44***
		(0.05)		(0.15)
Profitability		-35.17***		-28.93***
		(8.78)		(5.86)
Capital		-1.16		1.07
		(1.93)		(3.26)
Liquidity		-0.55		-0.41
		(0.40)		(0.79)
Deposits		-0.60		1.06
		(0.42)		(0.76)
Country Macro Controls		Y		Y
Country FE	Y	Y		
Quarter FE	Y	Y	Y	Y
Lender FE			Y	Y
Number of Observations	17,372	12,962	15,219	11,545
R-Squared	0.25	0.37	0.14	0.29

Table IA.4 – Growth of Bank Lending with Lender Fixed Effects

This table shows OLS regression estimates of the effect of a sovereign downgrade on the growth rate of the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger of banks that have pre-downgrade rating at the sovereign bound. The dependent variables are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Growth Total Number of Loans		Growth Number of Loans as Lead		Growth Amount of Loans as Lead	
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.01	-0.03	-0.02	-0.05	-0.07	-0.10
	(0.05)	(0.04)	(0.04)	(0.04)	(0.11)	(0.11)
Sovereign Downgrade	-0.07	-0.04	-0.16**	-0.11	-0.37**	-0.25
	(0.07)	(0.07)	(0.07)	(0.07)	(0.16)	(0.16)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.44***	-0.35***	-0.39***	-0.34***	-0.44**	-0.36*
	(0.10)	(0.10)	(0.10)	(0.12)	(0.22)	(0.21)
Size		-0.02		0.03		0.02
		(0.03)		(0.05)		(0.10)
Profitability		-3.17		-1.31		-5.02
		(2.23)		(2.66)		(4.26)
Capital		0.55		0.89		1.81
		(0.35)		(0.56)		(1.14)
Liquidity		0.13		0.06		0.43
		(0.12)		(0.17)		(0.30)
Deposits		0.24***		0.21**		0.39*
		(0.07)		(0.09)		(0.22)
Country Macro Controls		Y		Y		Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y
Number of Observations	15,472	12,769	13,568	11,441	13,564	11,439
R-Squared	0.10	0.10	0.10	0.11	0.05	0.05

Table IA.5 – Clustering by Country and Quarter

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have pre-downgrade rating at the sovereign bound relative to banks below the bound. The dependent variables are measured two quarters after the sovereign downgrade (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade). Observations are at the lender-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the quarter and lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.17**	-0.17**	-0.79	0.01	-0.03	0.02
	(0.09)	(0.08)	(0.48)	(0.04)	(0.04)	(0.08)
Sovereign Downgrade	0.01	-0.06	-0.57	-0.03	-0.06	-0.13
	(0.07)	(0.06)	(0.58)	(0.08)	(0.08)	(0.18)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.26*	-0.23**	-1.76	-0.38***	-0.32***	-0.40
	(0.15)	(0.11)	(1.17)	(0.14)	(0.12)	(0.26)
Lender Controls	Y	Y	Y	Y	Y	Y
Country Macro Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y			
Country FE				Y	Y	Y
Number of Observations	15,502	15,502	15,502	12,769	11,441	11,439
R-Squared	0.84	0.84	0.56	0.10	0.11	0.06

Table IA.6 – Two-Stage Least Squares

This table shows two-stage least squares estimates of the effect of bank ratings on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have pre-downgrade rating at the sovereign bound relative to banks below the bound. The first stage dependent variable is the lender rating (converted to a numerical scale) and the instrument is the interaction between the sovereign downgrade dummy and the dummy for banks that have a pre-downgrade rating at the sovereign bound. The second stage dependent variables are measured two quarters after the sovereign downgrade (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade). Observations are at the lender-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.37**	-0.34***	-2.16**	-0.48**	-0.47**	-0.53
	(0.15)	(0.13)	(1.03)	(0.22)	(0.21)	(0.37)
Sovereign Downgrade	0.17	0.08	0.48	0.06	0.00	-0.11
	(0.17)	(0.13)	(1.03)	(0.10)	(0.09)	(0.19)
Lender Rating	0.27*	0.23*	1.79*	0.19**	0.18**	0.22*
	(0.16)	(0.13)	(1.08)	(0.08)	(0.08)	(0.13)
Lender Controls	Y	Y	Y	Y	Y	Y
Country Macro Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y			
Country FE				Y	Y	Y
Number of Observations	15,502	15,502	15,502	12,769	11,441	11,439
R-Squared	0.83	0.83	0.55	0.00	0.05	0.04

Table IA.7 – Sample of Term Loans

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have pre-downgrade rating at the sovereign bound relative to banks below the bound. The dependent variables are measured two quarters after the sovereign downgrade (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade). Observations are at the lender-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. The sample is restricted to term loans. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.10	-0.08	-0.44	-0.02	-0.04	-0.09
	(0.08)	(0.08)	(0.54)	(0.04)	(0.05)	(0.07)
Sovereign Downgrade	0.01	-0.04	-0.52	-0.03	-0.04	0.03
	(0.08)	(0.07)	(0.60)	(0.07)	(0.08)	(0.20)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.26**	-0.19**	-2.08***	-0.37***	-0.39***	-0.65***
	(0.12)	(0.09)	(0.77)	(0.09)	(0.09)	(0.19)
Lender Controls	Y	Y	Y	Y	Y	Y
Country Macro Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y			
Country FE				Y	Y	Y
Number of Observations	15,502	15,502	15,502	11,565	9,926	9,995
R-Squared	0.23	0.23	0.08	0.09	0.11	0.05

Table IA.8 – Loan Amount and Spread – Excluding Financials and Public Administration

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of the loan amount and interest rate spread of banks that have pre-downgrade rating at the sovereign bound. The effect is measured in the six-month period after the sovereign downgrade. Observations are at the loan level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Borrower controls include borrowers' size, Tobin's Q, leverage, tangibility, foreign sales, an indicator whether it has a credit rating, and credit rating converted to a numeric scale. Loan controls include indicators for secured loan, senior loan, loan purpose (general purpose, debt repayment, working capital, takeover and other), term loan, dividend restrictions, and prior participant or lead arranger (whether the lender was a lead arranger or participant for the same borrower in the prior loan). Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. The sample excludes loans taken by borrowers from the financial (SIC 6000-6999) and public sectors (SIC 9000-9999). Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Loan Amount (log)			Loan Spread		
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	0.08**	0.04	0.05	-0.40	-0.85	-1.15
	(0.04)	(0.04)	(0.04)	(5.44)	(4.42)	(3.67)
Sovereign Downgrade	0.03	0.05	0.04	-3.11	-6.84**	-6.48**
	(0.03)	(0.03)	(0.03)	(5.22)	(3.10)	(3.12)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.26***	-0.18**	-0.15**	46.72***	24.10**	21.70**
	(0.07)	(0.07)	(0.07)	(13.31)	(10.06)	(10.36)
Lender Controls		Y	Y		Y	Y
Borrower Controls		Y	Y		Y	Y
Loan Controls			Y			Y
Country Macro Controls		Y	Y		Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Lender x Borrower FE	Y	Y	Y	Y	Y	Y
Number of Observations	747,752	311,341	311,341	544,051	243,160	243,160
R-Squared	0.89	0.89	0.89	0.83	0.84	0.86

Table IA.9 – Government Support and Bondholdings

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger of banks that have pre-downgrade rating at the sovereign bound. The dependent variables are measured two quarters after the sovereign downgrade. Observations are at the lender-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Regressions also include quarter and lender fixed effects. Panel A excludes banks that are above the "too big to fail" threshold, defined as a ratio of bank liabilities to GDP above the 75th percentile of the distribution. Panel B excludes state-owned banks. Panel C excludes banks with rating uplift above the median. The rating uplift is the difference between the Moody's Long-Term Issuer Rating and the Bank Financial Strength Rating. Panel D excludes banks with high government bondholdings, defined as a ratio of holdings of government securities divided by total assets above the median. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A - Excluding Too Big to Fail Banks			*Panel B - Excluding State-Owned Banks*		
Lender Rating >= Sovereign Rating	-0.24**	-0.23**	-1.96***	-0.18**	-0.18**	-0.91*
	(0.09)	(0.11)	(0.72)	(0.09)	(0.08)	(0.52)
Sovereign Downgrade	0.15**	0.03	0.19	0.05	-0.02	-0.59
	(0.06)	(0.06)	(0.71)	(0.09)	(0.07)	(0.62)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.35*	-0.29**	-2.39	-0.31**	-0.27***	-2.34**
	(0.20)	(0.15)	(1.64)	(0.15)	(0.10)	(0.99)
Number of Observations	8,439	8,439	8,439	13,728	13,728	13,728
R-Squared	0.16	0.14	0.05	0.21	0.22	0.06
	Panel C - Excluding High Rating Uplift Banks			*Panel D - Excluding Banks with High Government Bondholdings*		
Lender Rating >= Sovereign Rating	-0.04	-0.09	0.00	-0.14*	-0.12	-0.94*
	(0.12)	(0.12)	(0.84)	(0.08)	(0.08)	(0.57)
Sovereign Downgrade	0.17	0.11	-0.07	0.02	-0.04	-0.21
	(0.15)	(0.13)	(1.09)	(0.09)	(0.09)	(0.66)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.44*	-0.40*	-1.36	-0.21	-0.19*	-1.79*
	(0.26)	(0.24)	(2.10)	(0.15)	(0.10)	(1.05)
Number of Observations	4,980	4,980	4,980	12,501	12,501	12,501
R-Squared	0.19	0.19	0.05	0.20	0.21	0.06

Table IA.10 – Matched Sample Including State Ownership as Covariate

Panel A shows summary statistics of treated lenders (banks that have a pre-downgrade rating at the sovereign bound) and control lenders in the matched sample. Panel B shows difference-in-differences estimates of the average treatment effect on the treated banks (ATT) using the Abadie-Imbens nearest-neighbor estimator. The dependent variables are the growth rate of the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger between the quarter prior to and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. Lenders are matched exactly on country, quarter and dummy variable for state-owned banks, and other pre-treatment covariates include banks' size, profitability, capital, liquidity, and deposits. Variable definitions are provided in Table A.1 in the Appendix. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A – Summary Statistics

	Mean		Median			Kolmogorov-
	Treated	Control	Treated	Control	Pearson χ^2 p-value	Smirnov p-value
Size	11.46	11.29	11.18	11.47	0.60	0.07
	(0.11)	(0.10)				
Profitability	0.70	0.26	0.66	0.30	0.00	0.00
	(0.09)	(0.05)				
Capital	0.10	0.07	0.08	0.07	0.00	0.00
	(0.01)	(0.00)				
Liquidity	0.16	0.13	0.15	0.10	0.00	0.00
	(0.01)	(0.01)				
Deposits	0.62	0.70	0.62	0.67	0.01	0.00
	(0.02)	(0.01)				

Panel B – Difference-in-Differences Estimates

	Treated	Control	Difference-in Difference	ATT	Number of Treated
All Loans					
Total Number of Loans	-0.41***	-0.01	-0.40***	-0.52***	46
	(0.05)	(0.08)	(0.09)	(0.14)	
Number of Loans As Lead	-0.45***	-0.18***	-0.27***	-0.60***	42
	(0.05)	(0.07)	(0.08)	(0.13)	
Amount of Loans As Lead	-0.26**	0.05	-0.32**	-0.94***	42
	(0.10)	(0.11)	(0.14)	(0.22)	
Loans to Foreign Borrowers					
Total Number of Loans	-0.38***	0.03	-0.41***	-0.34**	34
	(0.06)	(0.09)	(0.11)	(0.17)	
Number of Loans As Lead	-0.55***	-0.13	-0.42***	-0.33**	32
	(0.05)	(0.09)	(0.10)	(0.16)	
Amount of Loans As Lead	-0.45***	0.01	-0.46***	-0.31	32
	(0.08)	(0.13)	(0.15)	(0.23)	

Table IA.11 – Government Support and Bondholdings Controls

This table shows OLS regression estimates of the effect of a sovereign downgrade on the growth rate of the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger of banks that have pre-downgrade rating at the sovereign bound. The dependent variables are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. Regressions also include quarter and country fixed effects. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lender Rating >= Sovereign Rating	0.03	-0.01	0.04	0.05	0.02	0.02	0.03	-0.02	-0.01	0.03	-0.02	0.01
	(0.04)	(0.05)	(0.08)	(0.03)	(0.04)	(0.10)	(0.03)	(0.04)	(0.07)	(0.04)	(0.04)	(0.08)
Sovereign Downgrade	-0.01	-0.03	-0.11	0.27**	0.17	0.37	-0.02	-0.10	-0.16	-0.06	-0.12	-0.21
	(0.06)	(0.07)	(0.17)	(0.11)	(0.11)	(0.32)	(0.07)	(0.08)	(0.17)	(0.07)	(0.07)	(0.18)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.30***	-0.25**	-0.28	-0.48***	-0.38***	-0.72***	-0.32***	-0.30**	-0.25	-0.34***	-0.30**	-0.35
	(0.12)	(0.13)	(0.23)	(0.10)	(0.13)	(0.27)	(0.12)	(0.12)	(0.21)	(0.11)	(0.12)	(0.22)
Bank Liabilities to GDP	0.04*	0.00	-0.04									
	(0.02)	(0.03)	(0.04)									
Bank Liabilities to GDP x Sovereign Downgrade	-0.23	-0.35***	-0.62***									
	(0.16)	(0.09)	(0.24)									
Rating Uplift				-0.01	0.00	-0.01						
				(0.01)	(0.01)	(0.01)						
Rating Uplift x Sovereign Downgrade				-0.09***	-0.09***	-0.15***						
				(0.03)	(0.02)	(0.04)						
Government Ownership							-4.12	1.39	7.52			
							(4.74)	(5.95)	(11.53)			
Government Ownership x Sovereign Downgrade							-17.97	-0.62	-71.11**			
							(22.87)	(23.20)	(27.71)			
Government Bondholdings										0.42	0.34	0.33
										(0.33)	(0.40)	(0.71)
Government Bondholdings x Sovereign Downgrade										0.65	0.78	-0.92
										(0.91)	(0.70)	(0.91)
Number of Observations	12,133	10,821	10,819	7,740	7,057	7,055	12,769	11,441	11,439	12,769	11,441	11,439
R-Squared	0.11	0.12	0.06	0.13	0.14	0.07	0.11	0.12	0.07	0.11	0.12	0.07

Table IA.12 – Government Bondholding Controls from the European Union-Wide Stress Tests

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have pre-downgrade rating at the sovereign bound relative to banks below the bound. The dependent variables are measured two quarters after the sovereign downgrade (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade). Observations are at the lender-quarter level. Lender controls include the banks' size, profitability, capital, liquidity, deposits, and exposure to own government bondholdings (defined as financial institutions' holdings of own-country government debt relative to their total assets). Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. The sample includes loans made by 54 banks in 2008-2012 included in the European Banking Authority (EBA) European Union-wide stress test exercise in December 2010. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.15	-0.29	-1.70*	0.07	0.06	0.27**
	(0.17)	(0.19)	(0.93)	(0.12)	(0.10)	(0.12)
Sovereign Downgrade	0.07	0.02	-0.88	-0.01	-0.02	0.02
	(0.08)	(0.08)	(0.80)	(0.18)	(0.15)	(0.25)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.09	0.00	-1.08	-0.27***	-0.21**	-0.41**
	(0.17)	(0.18)	(1.65)	(0.10)	(0.11)	(0.19)
Exposure to Own Country	-1.90	-4.20	-14.26	-0.39	-0.39	-3.18**
	(3.94)	(3.55)	(14.67)	(0.74)	(0.57)	(1.33)
Exposure to Own Country x Sovereign Downgrade	0.77	1.13	14.82**	0.44	1.08	1.41
	(1.22)	(1.00)	(6.25)	(1.32)	(0.91)	(1.75)
Lender Controls	Y	Y	Y	Y	Y	Y
Country Macro Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y			
Country FE				Y	Y	Y
Number of Observations	848	848	848	779	761	760
R-Squared	0.18	0.18	0.05	0.25	0.20	0.15

Table IA.13 – Sample Excluding 2011-2012

This table shows OLS regression estimates of the effect of a sovereign downgrade on the log of one plus the total number of loans, number of loans as lead arranger, and amount of loans as lead arranger (as well as the growth rate of these variables) of banks that have pre-downgrade rating at the sovereign bound relative to banks below the bound. The dependent variables are measured two quarters after the sovereign downgrade (the growth rates are measured as the percentage change between the quarter prior to and two quarters after the sovereign downgrade). Observations are at the lender-quarter level and include only loans made before 2011. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, growth rate of GDP, inflation, ratio of private credit to GDP, banks' holdings of government debt, and indicator variables for whether the country is experiencing a currency crisis, an inflation crisis, a sovereign domestic debt crisis, a sovereign external debt crisis, a banking crisis, or a recession. The sample excludes loans initiated in 2011-2012. Variable definitions are provided in Table A.1 in the Appendix. Standard errors are clustered at the lender country level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Total Number of Loans (log)	Number of Loans as Lead (log)	Amount of Loans as Lead (log)	Growth Total Number of Loans	Growth Number of Loans as Lead	Growth Amount of Loans as Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Lender Rating >= Sovereign Rating	-0.17**	-0.16**	-0.68	0.02	0.00	0.02
	(0.09)	(0.08)	(0.49)	(0.04)	(0.05)	(0.08)
Sovereign Downgrade	-0.07	-0.16*	-0.82	-0.18**	-0.22*	-0.57**
	(0.10)	(0.10)	(0.83)	(0.09)	(0.11)	(0.23)
Lender Rating >= Sov. Rating x Sov. Downgrade	-0.18	-0.19	-1.83	-0.26*	-0.21	0.02
	(0.17)	(0.15)	(1.50)	(0.14)	(0.18)	(0.35)
Lender Controls	Y	Y	Y	Y	Y	Y
Country Macro Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y			
Country FE				Y	Y	Y
Number of Observations	13,926	13,926	13,926	11,449	10,237	10,235
R-Squared	0.20	0.22	0.06	0.12	0.13	0.06