

# Bank Ratings and Lending Supply: Evidence from Sovereign Downgrades

**Manuel Adelino**

Duke University

**Miguel A. Ferreira**

Nova School of Business and Economics, CEPR, and ECGI

We study the causal effect of bank credit rating downgrades on the supply of bank lending. The identification strategy exploits the asymmetric impact of sovereign downgrades on the ratings of banks at the sovereign bound relative to banks that are not at the bound as a result of rating agencies' sovereign ceiling policies. This asymmetric effect leads to greater reductions in ratings-sensitive funding and lending of banks at the bound relative to other banks. Results for foreign borrowers and within lender-borrower relationships confirm that credit demand does not explain our findings. (*JEL* E51, G21, G24, G28, H63)

Received February 10, 2015; accepted December 31, 2015 by Editor Philip Strahan.

When banks face large shocks to liquidity supply, their ability to provide capital to firms can be impaired even when the firms' fundamentals are unchanged. We ask whether downgrades to bank credit ratings reduce lending to the private sector through the direct effect of downgrades on banks' access to external funding. 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 affect the volume of credit extended by banks. We exploit exogenous variation in bank ratings that is due to credit rating agencies' sovereign ceiling policies to identify the effects of bank rating downgrades on their lending supply. These policies

---

We thank Phil Strahan (the editor), an anonymous referee, Diana Bonfim, Nicola Cetorelli, Sergey Chernenko, Paolo Colla, Isil Erel, Francesco Franco, Richard Herring, Samuel Lopes, Alberto Martin, João Santos, Paola Sapienza, Joel Shapiro, Adi Sunderam, and James Vickery, participants at the American Finance Association meeting, NBER Summer Institute Workshop on the Economics of Credit Rating Agencies, New York Fed/NYU Stern Conference on Financial Intermediation, and Wharton Conference on Liquidity and Financial Crises, and seminar participants at the Stockholm School of Economics for helpful comments. This work was supported by the Banque de France and the European Research Council. Supplementary data can be found on *The Review of Financial Studies* web site. Send correspondence to Miguel Ferreira, Nova School of Business and Economics, Campus de Campolide, 1099-032 Lisboa, Portugal; telephone: +351 213801631. E-mail: miguel.ferreira@novasbe.pt.

© The Author 2016. Published by Oxford University Press on behalf of The Society for Financial Studies. All rights reserved. For Permissions, please e-mail: journals.permissions@oup.com.

doi:10.1093/rfs/hhw004

Advance Access publication January 27, 2016

imply that a bank's rating is bounded by the sovereign rating of its country of domicile.<sup>1</sup>

We quantify the effects of bank downgrades by comparing banks that have ratings equal to their sovereign before a downgrade (treatment group) with banks that have ratings different from 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 are affected disproportionately more than the ratings of the control group following a sovereign downgrade due to the sovereign ceiling. The asymmetric effect of sovereign downgrades on bank ratings is likely to be caused by the constraint imposed by rating agencies and not to bank fundamentals, because there is no such asymmetry for banks that are near the sovereign rating.

Bank downgrades can, in turn, affect the supply of lending through their effect on a bank's access to funding, in particular to wholesale funding and public bond markets. Ratings directly affect whether some institutional investors, such as banks, insurance companies, and pension funds, can invest in a bank's debt securities, as well as Basel capital requirements for holding such securities on their balance sheets. Ratings are used in interbank markets to determine the eligibility of counterparties to participate in a transaction and to set exposure limits. Rating downgrades can lead to increases in bond coupons and loan interest rates, and trigger debt covenant violations. Downgraded banks can thus face impaired access to markets, higher collateral requirements, and higher funding costs due to rating triggers.

Anecdotal evidence in the financial press supports the notion that rating downgrades are a first-order concern in a bank's access to funding. A *Financial Times* article (Watkins 2012) reports that downgrades have "an immediate impact on the ability of money market funds to provide short-term financing to banks, because some clients stipulate that counterparties must have a minimum credit rating. . . . Banks and insurers also buy bank paper. For these investors, as a bank descends down the rating order they face higher capital charges." A *Reuters* article (Durand 2011) reports that "bond investors have warned that the downward trend in banks' senior credit rating will reduce access to wholesale markets and force them to deleverage. . . . in the case of longer-term funds, most will set an exposure limit they have in a bank and some of the limitations will be dictated by credit ratings." A *Bloomberg* article (Vaughan 2012) reports that rating cuts "could erode profits, trigger margin calls and leave some firms unable to borrow . . . without access to funding from private sources, banks have had to sell assets and reduce lending."

We first establish that ratings downgrades lead to declines in access to ratings-sensitive sources of funding, such as wholesale funding. Financial institutions

<sup>1</sup> Although credit rating agencies have been gradually moving 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 remain uncommon (Standard & Poor's 2012).

worldwide increasingly rely on wholesale funding to supplement retail deposits as a funding source, 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 ratings) are reduced three percentage points (of total funding) more for treated than for control banks following a sovereign downgrade. In contrast, there are no differential effects on retail deposits. We also show that credit default swap (CDS) spreads of treated banks increase by about 15% (or 20 bps at the mean of the data) more than those of control banks, confirming that the shock to ratings affects the banks' funding costs.

We then examine the effect of ratings downgrades on bank lending. The main empirical specification employs a difference-in-differences estimator that compares changes in the number of syndicated loans made by treated banks versus control banks around sovereign downgrades. The specifications also include time-varying bank- and country-level control variables, as well as country-by-quarter fixed effects to capture macroeconomic conditions and any source of unobserved country-level heterogeneity that affect banks in a given period.

We find that treated banks reduce lending supply significantly more than control banks following a sovereign downgrade. The number of loans made by treated banks (as lead arranger or participant) declines by about 25% more than the loans made by control banks in the same country and quarter. The effect on dollar volume of loans is generally larger in magnitude, which is a result of the combined effect of smaller and fewer loans granted. Before 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 the time of the sovereign downgrade, mitigating concerns about preexisting differential trends. We also find that downgrades affect loan pricing. Treated banks increase interest rate spreads more than control banks following a sovereign downgrade, with a differential effect on spreads between 5 and 40 basis points, but the effect on loan prices is economically and statistically less pronounced than the effect on quantities.

We face two major identification challenges in estimating 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 addresses this possibility: 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 lender country). 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 (or stronger) effects on bank lending when we focus on this sample of foreign borrowers, and this holds even when we control for borrower country recessions and fixed effects.

Second, we control for a large set of lender, borrower, and loan characteristics, including 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., “bad” firms borrow from “bad” banks, or vice versa), and potential unobserved differences between firms that seek loans and firms that do not after a sovereign downgrade. We also employ the Abadie and Imbens (2011) nonparametric matching estimator of the average effect of the treatment on the treated (ATT) to account for potential nonlinear effects not captured by the controls in the main specification.

Finally, we conduct several placebo tests that ask whether treated banks reduce lending more during recessions or banking crises that are not accompanied by a shock to the sovereign rating, as well as during the two-year period before a sovereign downgrade. These tests address the concern that unobserved differences between treated and control banks trigger sharp contrasts in the posttreatment period because of changes in the environment other than ratings. We find no difference between treated and control banks in these placebo periods, and this supports the interpretation of a causal effect of bank ratings.

A second challenge is 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, and this feeds back to the financial sector (Acharya et al. 2015).

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, on average, contains banks of better quality than those in the control group and, at least ex ante, those less likely to rely on government support, helps with identifying the effect of bank ratings. To address the loop between sovereign and bank credit risk, we estimate the effect of rating downgrades, excluding government-owned banks, “too big to fail” banks, banks that rely heavily on government support (using the “rating uplift”), and banks with large holdings of government bonds. All these tests produce results similar to our baseline specification. We also show

that sovereign downgrades are not more likely to be preceded by downgrades of treated banks relative to control banks.

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 et al. Forthcoming). To the best of our knowledge, we are the first to identify the effect of changes in banks' ratings on bank funding and lending.

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 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; Black and Strahan 2002) 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 setting in which to study the effects of bank distress on credit supply (e.g., Ivashina and Scharfstein 2010; Cornett et al. 2011; Santos 2011; Iyer et al. 2013) and firm valuation and real outcomes (Chodorow-Reich 2014; Carvalho, Ferreira, and Matos Forthcoming).

Finally, this work is related to the literature on the transmission of sovereign credit risk to the private sector. Borensztein, Cowan, and Valenzuela (2013), Augustin et al. (2014), and Bedendo and Colla (2015) 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 effect of banks' holdings of domestic sovereign debt on bank lending and firm real outcomes during the European sovereign debt crisis (Becker and Ivashina 2014; De Marco 2014; Acharya et al. 2015; Popov and Van Horen 2015).

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

## **1. Methodology and Data**

### **1.1 Quasi-natural experiment: Sovereign downgrade and ceiling**

Credit rating agencies play an important role in providing information about the ability and the willingness of issuers, both governmental and private, 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 in which the issuer

is domiciled, a policy usually termed sovereign ceiling. Although starting in 1997 the ratings agencies have gradually relaxed the sovereign ceiling policy and some private issuers may receive ratings higher than the sovereign, the sovereign rating remains an important determinant of private ratings (Borensztein, Cowan, and Valenzuela 2013). S&P (2012) reports that only 113 private issuer ratings worldwide exceed their sovereign rating, on a foreign-currency basis, and only three are commercial (parent) banks. 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; Bebczuk and Goldstein 2011; 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. We prefer S&P's ratings history over other agencies' history because S&P tends both to be more active in making ratings revisions and to lead other agencies in rerating (Kaminsky and Schmukler 2002). Ratings announcements by S&P also seem to convey a greater own-country stock market impact and seem not to be fully anticipated by the market (Reisen and von Maltzan 1999).

In general, rating agencies grant an issuer a rating above the sovereign only if the issuer can demonstrate strong resilience and low default dependence relative to the sovereign, as well as insulation from the domestic economic and financial disruptions typically associated with sovereign distress. Interestingly, S&P recently updated its methodology to address some limitations of the previous approach. S&P (2013) methodology applies a sovereign foreign currency default stress scenario (stress test) with respect to the bank's country of domicile. Banks that pass the stress test can be rated up to two or four notches above the sovereign foreign currency rating, depending on whether S&P views their sensitivity to country risk as high or moderate, respectively. S&P expects that some banks as a result will receive upgrades, which suggests that S&P granted conservative ratings to some banks due to the sovereign ceiling before the recent revision of the methodology.

Because of the sovereign ceiling policy, there are different predictions for the effect of a sovereign downgrade on banks that have predowngrade ratings equal to the sovereign ratings (treated banks) and those that have ratings different (below or above) from the sovereign ratings (control banks). A sovereign downgrade should have a greater ratings effect on treated banks, potentially a one-for-one effect, than on control banks, because the sovereign ceiling is nonbinding 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 downgrades on bank funding

and lending. This asymmetry helps to distinguish the effects of bank ratings from confounding common macro effects, since 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.

## 1.2 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 main outcome variable is the *Number of loans* made by a bank (as lead arranger or participant) in each quarter. The lead arranger banks of each loan facility usually hold the largest share of the syndicated loans (Kroszner and Strahan 2001; Sufi 2007). The lead arranger is frequently the administrative agent, with a fiduciary duty to other syndicate members to provide timely information about the default of the borrower. For these reasons, we calculate the *Number of loans as lead* in each quarter, taking into account only loans in which the bank acted as lead arranger.

We 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. 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 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 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 1 the lowest (default).

We obtain bank funding variables from Bankscope. The funding variables include *Retail deposits*, *Nondeposits short-term funding*, *Interbank funding*, and *Long-term funding*. We also use bank characteristics from Bankscope as control variables in the tests: *Size*, *Profitability*, *Capital*, *Liquidity*, and *Deposits*. Table A1 in the Appendix provides variable definitions.

The regressions include several time-varying macroeconomic controls: GDP growth, inflation, and private credit-to-GDP are 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 Reinhart and Rogoff's (2009) database. The

Organisation for Economic Co-operation and Development (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), are taken from the International Financial Statistics database.

In the loan-level tests, the outcome variables are the logarithm of *Loan amount* in millions of U.S. dollars and *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. The loan-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.<sup>2</sup>

### 1.3 Summary statistics

Table 1 provides summary statistics for the lender-quarter panel. This panel has 20,850 observations (479 lenders), of which 3,639 are treated and 17,211 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 the differences in the 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 16.8 and a median rating of 17, which corresponds to a rating of A. In about 17% of the lender-quarter observations, the bank is at the sovereign bound in the quarter before the sovereign downgrade. The sample includes a sovereign downgrade in about 2% of the observations.

The outcome variables (*Number of loans*, *Number of loans as lead*) separately consider all loans and loans made only to foreign borrowers. Banks in the sample make about forty-five loans on average per quarter, with a median of eight. The distribution is highly skewed, with a maximum of 1,122 loans. These banks make about thirty loans as lead arrangers, with a median of three loans. Banks participate in a significant number of loans outside their own country. On average, banks make twenty-three loans to foreign borrowers in a quarter (sixteen as lead arrangers), and the median is one.

<sup>2</sup> 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 country, ticker, and name. We thank Michael Roberts for providing the DealScan-Compustat match (used in Chava and Roberts 2008).

**Table 1**  
**Summary statistics**

**Panel A: Full sample**

	Mean	Median	SD	Minimum	Maximum	Number of observations
<b>Panel A1: Lender-quarter variables</b>						
Lender rating	16.78	17.00	3.13	1.00	22.00	20,850
Sovereign rating	19.59	22.00	3.88	0.00	22.00	20,850
Sovereign downgrade	0.02	0.00	0.14	0.00	1.00	20,850
Retail deposits	0.60	0.65	0.26	0.01	1.00	15,427
Nondeposit short-term funding	0.21	0.17	0.16	0.00	0.94	15,427
Interbank funding	0.15	0.11	0.15	0.00	0.95	13,308
Long-term funding	0.19	0.12	0.22	0.00	0.92	16,498
CDS spread (basis points)	139.47	84.67	215.74	1.20	3,350.00	4,002
Number of loans	44.92	8.00	99.76	0.00	1,122.00	20,850
Number of loans as lead	30.32	3.00	76.86	0.00	961.00	20,850
Number of loans, foreign	23.22	1.00	58.95	0.00	597.00	20,850
Number of loans as lead, foreign	16.30	1.00	42.98	0.00	442.00	20,850
Growth in the number of loans	0.22	0.00	1.08	-1.00	4.00	15,472
Growth in the number of loans as lead	0.17	-0.01	1.09	-1.00	4.00	13,568
Size (\$ billion)	202	61	381	0	3,065	16,919
Profitability	0.01	0.01	0.01	-0.05	0.05	16,794
Capital	0.08	0.07	0.07	0.01	0.57	16,919
Liquidity	0.19	0.16	0.15	0.01	0.82	16,910
Deposits	0.66	0.72	0.21	0.06	0.95	16,814
Too big to fail	0.43	0.00	0.49	0.00	1.00	16,125
State owned	0.10	0.00	0.31	0.00	1.00	20,850
Rating uplift	1.99	1.00	2.51	0.00	19.00	10,235
Government bondholdings	0.01	0.00	0.04	0.00	0.38	20,850
Exposure to own country, EBA	0.11	0.07	0.13	0.00	1.21	2,926
Beta	1.01	1.03	0.43	-1.07	4.38	11,530
<b>Panel A2: Loan variables</b>						
Loan Amount (\$ million)	509	156	1,230	0	50,000	930,581
Loan spread (basis points)	180.32	150.00	134.82	15.00	687.50	656,527

(continued)

Given that we rely on syndicated loans, it is not surprising that banks in the sample are large, with average total assets of over \$202 billion and a median of \$61 billion. The return on assets (*Profitability*) is 1%, on average. 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 loan amount is \$509 million (with a median of \$156 million), and the average loan spread is 180 bps.

Panel B shows that treated banks have a rating that is about 2.9 notches above that of the control group in the same country and quarter. The growth in the number of loans is similar across the two groups within the same country and quarter (for both all loans and those in which the bank acts as the lead arranger). Treated banks are significantly smaller and better capitalized than control banks, making them less sensitive to macroeconomic shocks and less likely to require government support. The treated banks are, however, more

**Table 1**  
Continued

**Panel B: Treated and control samples**

	Mean		Difference (country-quarter FE)	<i>t</i> -statistic	Number of treated	Number of control
	Treated	Control				
Lender rating	17.06	16.72	2.93	68.55	3,639	17,211
Sovereign rating	17.04	20.13	—	—	3,639	17,211
Sovereign downgrade	0.02	0.02	—	—	3,639	17,211
Retail deposits	0.53	0.62	-0.14	-17.00	2,412	13,015
Nondeposit short-term funding	0.20	0.21	-0.01	-1.26	2,412	13,015
Interbank funding	0.13	0.15	-0.03	-5.68	2,321	10,987
Long-term funding	0.30	0.17	0.20	25.55	2,776	13,722
CDS spread (basis points)	194.54	131.23	-38.94	-5.46	521	3,481
Number of loans	17.55	50.71	-31.32	-15.93	3,639	17,211
Number of loans as lead	12.64	34.05	-21.21	-14.50	3,639	17,211
Number of loans, foreign	11.29	25.74	-25.32	-16.97	3,639	17,211
Number of loans as lead, foreign	8.05	18.05	-17.58	-16.15	3,639	17,211
Growth in the number of loans	0.18	0.22	0.00	0.00	2,355	13,117
Growth in the number of loans as lead	0.14	0.18	-0.02	-0.69	2,130	11,438
Size (\$ billion)	139	215	-92	-9.21	2,863	14,056
Profitability	0.01	0.01	0.00	6.14	2,855	13,939
Capital	0.10	0.08	0.05	17.85	2,863	14,056
Liquidity	0.21	0.18	0.00	0.40	2,860	14,050
Deposits	0.56	0.68	-0.21	-30.63	2,853	13,961
Too big to fail	0.51	0.41	0.05	3.62	2,783	13,342
State owned	0.32	0.06	0.27	27.74	3,639	17,211
Rating uplift	1.92	2.00	0.88	8.08	1,523	8,712
Government bondholdings	0.01	0.01	0.00	-1.71	3,639	17,211
Exposure to own country, EBA	0.12	0.11	-0.02	-2.77	291	2,635
Beta	0.98	1.01	-0.04	-2.16	1,330	10,200

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 the means and the differences in the means between treated banks, defined as banks that have a 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 A1 in the Appendix.

likely to be too big to fail, state-owned, and with a higher rating uplift than the control banks. We perform tests excluding too big to fail, state-owned, and high rating uplift banks, as well as other tests to address concerns that deteriorating sovereign credit quality might affect treated banks through channels other than ratings.<sup>3</sup>

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. Since country heterogeneity is an important concern, we estimate all regressions with country fixed effects. Further, the primary findings are robust to restricting the sample to OECD countries, which have more developed banking sectors. The treated observations are distributed evenly over the late 1990s, 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.

<sup>3</sup> 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 are control banks.

**Table 2**  
**The sample of treated banks**

Country	Downgrade year	Number of observations
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 (4), 2012 (5)	11
France	2012 (2)	2
Greece	2010 (1), 2011 (4)	5
Hungary	2008 (1), 2009 (1), 2011 (1), 2012 (1)	4
Indonesia	1998 (1), 2000 (1), 2001 (2), 2002 (1)	5
India	1998 (1)	1
Italy	2006 (1), 2011 (4), 2012 (5)	10
Japan	2001 (2), 2002 (2), 2011 (1)	5
Korea, Republic of	1997 (2)	2
Lebanon	2000 (1), 2001 (1), 2002 (1), 2008 (1)	4
Malaysia	1997 (1)	1
Portugal	2009 (1), 2010 (1), 2011 (3)	5
Russian Federation	2008 (2)	2
South Africa	2012 (2)	2
Spain	2011 (2), 2012 (3)	5
Thailand	1998 (1)	1
Turkey	2001 (5)	5
United States	2011 (1)	1
Total		89

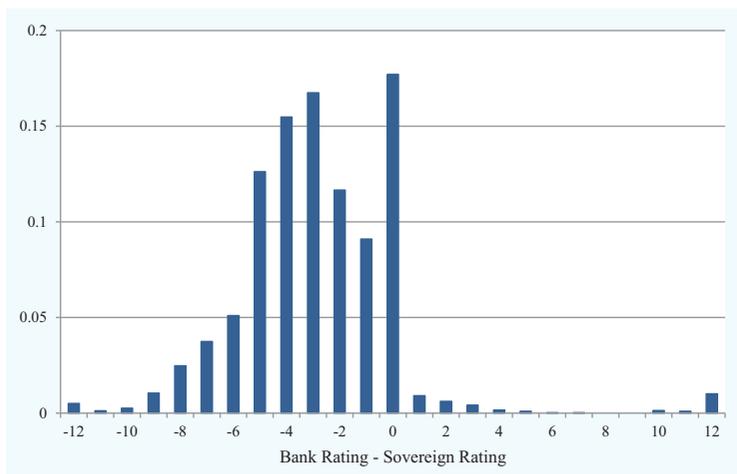
This table shows the countries and years with a sovereign downgrade and at least one treated bank, defined as banks that have a pre-downgrade rating at the sovereign bound. The number of treated banks in each event is shown in parentheses.

In 447 lender-quarter observations there is a sovereign downgrade; 89 of these are banks that have ratings at the sovereign bound. These treated observations include forty-six 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 before and after the sovereign downgrade.<sup>4</sup>

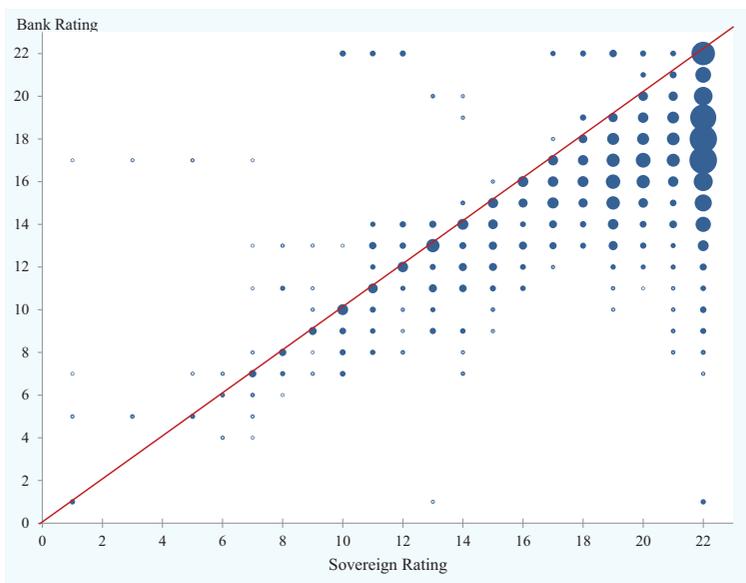
Panel A of Figure 1 shows the frequency distribution of the difference between the sovereign rating and the rating of each bank. A difference of zero means that the bank is exactly at the sovereign bound; a positive difference means that the bank is above the sovereign bound; and a negative difference 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 a rating below the sovereign) make up roughly 80% 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 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 the ratings of banks that are not at the bound. Panel B of Figure 1 provides additional detail on the distribution of bank ratings relative to the sovereign. The figure shows

<sup>4</sup> There have been many more sovereign downgrades during our sample period, but we rely only on those for which we can identify treated banks in the downgraded country.

Panel A: The distribution of differences between sovereign and bank ratings



Panel B: Distribution of sovereign-bank rating pairs



**Figure 1**  
**Sovereign ceiling rule**

Panel A shows the relative frequency of the difference between the rating of each individual bank and the sovereign rating. Ratings are converted to a numerical categories, where twenty-two 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. 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.

bank-country rating pairs for which each observation is proportional to the frequency of each pair in the data. The 45-degree line corresponds to banks at the sovereign bound. As in panel A, there is a significant fraction of banks 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 that a bank will obtain a ratings 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 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. In addition, the absence of significant differential effects between higher-quality banks rated just below the sovereign bound and lower-quality banks shows that our effects capture not simply high-quality banks but banks that are at the bound.

## 2. Results

### 2.1 Effect on bank ratings

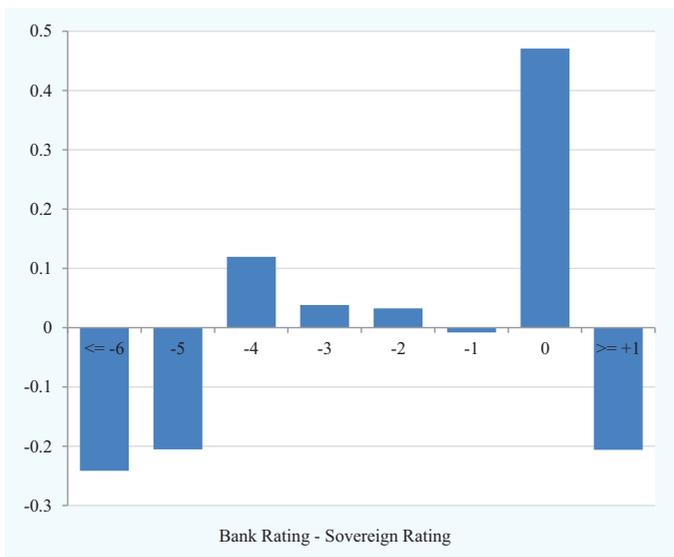
The first test compares the effect of sovereign downgrades on the ratings of banks at the sovereign bound (treated banks) in the quarter before a sovereign downgrade (treatment) and the ratings of banks that are not at the bound (control banks). We measure the impact on ratings in the treatment and control groups in the quarter of the sovereign downgrade.

We run ordinary least-squares (OLS) regressions using the lender-quarter panel. We estimate a difference-in-differences regression of lender ratings (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*):

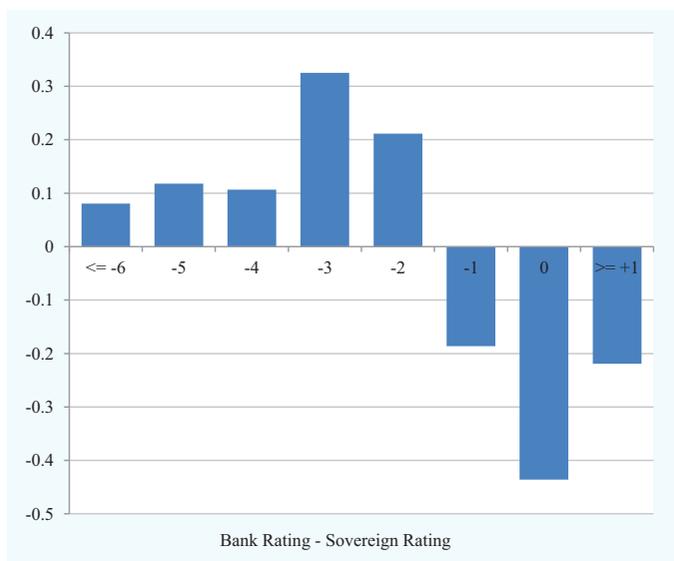
$$\begin{aligned} \text{Lender rating}_{it} = & \beta_1 (\text{Lender rating}_{i,t-1} = \text{Sov. rating}_{i,t-1}) \times (\text{Sov. downgrade}_{i,t}) \\ & + \beta_2 (\text{Lender rating}_{i,t-1} = \text{Sov. rating}_{i,t-1}) \\ & + \beta_3 (\text{Sov. downgrade}_{i,t}) + \beta_4 X_{i,t-1} + \eta_t + \eta_c + \eta_i + \varepsilon_{it}, \end{aligned} \quad (1)$$

where  $X_{i,t-1}$  is a vector of lender controls (*Size*, *Profitability*, *Capital*, *Liquidity*, and *Deposits*) and time-varying lender country controls,  $\eta_t$  is quarter fixed effects,  $\eta_c$  is lender country fixed effects, and  $\eta_i$  is lender fixed effects, which take into account overall time trends in the data, as well as time-invariant differences between countries and lenders. We also implement specifications in which we replace quarter and country fixed effects (i.e.,  $\eta_t$  and  $\eta_c$ ) with

Panel A: The probability of a bank rating downgrade



Panel B: The number of loans



**Figure 2**

**The effect of sovereign downgrades by distance from the sovereign rating**

Panel A shows the probability of a bank being downgraded in the quarter of the sovereign downgrade. Panel B shows the growth rate of the number of loans measured as the percentage change between the quarter before and two quarters after the sovereign downgrade. Observations are grouped according to the predowndgrade 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 effect is shown as deviation from the average response.

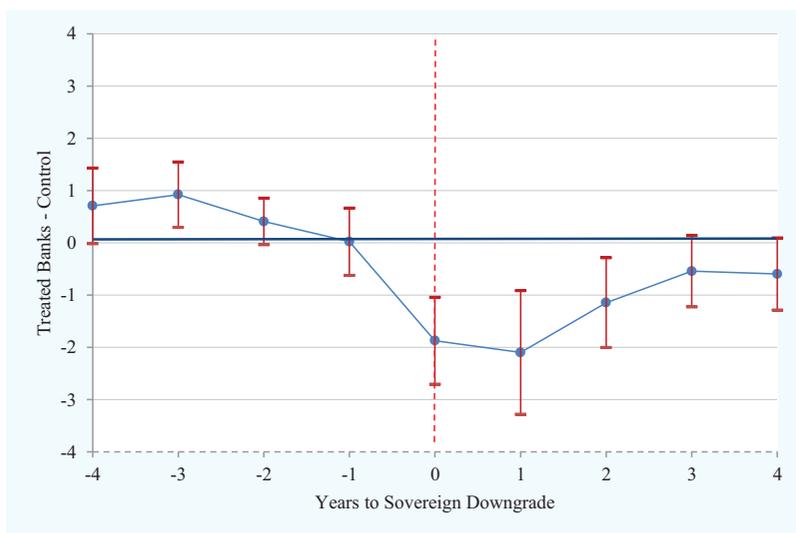
**Table 3**  
**Bank rating and sovereign downgrade**

	(1)	(2)	(3)	(4)
Lender rating = Sov. rating $\times$ Sov. downgrade	-1.16*** (0.43)	-1.40*** (0.45)	-0.70*** (0.26)	-0.53** (0.26)
Lender rating = Sovereign rating	0.78*** (0.08)	0.84*** (0.09)	0.94*** (0.06)	0.95*** (0.06)
Sovereign downgrade	-0.94*** (0.23)	-0.73*** (0.22)		
Size		0.88*** (0.05)		0.43*** (0.04)
Profitability		33.97*** (3.01)		15.28*** (2.18)
Capital		3.13*** (0.71)		0.72 (0.60)
Liquidity		-0.76*** (0.18)		0.11 (0.12)
Deposits		1.08*** (0.15)		0.54*** (0.14)
Country macro controls		y		
Quarter FE	y	y		
Country $\times$ Quarter FE			y	y
Lender FE	y	y	y	y
Number of observations	20,850	16,329	20,850	16,329
R-squared	0.86	0.89	0.91	0.93

This table shows OLS regression estimates of the effect of a sovereign downgrade on the rating of banks that have a predowngrade rating at the sovereign bound relative to other banks. 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. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

lender country-by-quarter fixed effects (i.e.,  $\eta_t \times \eta_c$ ), which absorb all shocks that are common to banks in the lender country in each quarter. The coefficient  $\beta_1$  measures the extent to which treated banks suffer more with a sovereign downgrade than control banks. Standard errors are clustered at the country level to correct for within-country residual correlation.

Table 3 presents the estimates of regression Equation (1). Column 1 includes lender and quarter fixed effects. Column 2 includes lender controls and time-varying macroeconomic country controls. We find that, on average, a sovereign downgrade causes treated banks to suffer a 1.2-to-1.4-notch greater rating reduction than control banks. The treated bank indicator (*Lender rating* = *Sovereign rating*) is associated with a rating that is approximately 0.8 notches higher than those of other banks in the same country, and the *Sovereign downgrade* dummy is associated with bank ratings that are about one notch lower. The effects are all highly statistically significant. In Columns 3 and 4, we include country-by-quarter fixed effects to control for time-varying country-specific unobserved shocks. In this specification, the effect of the downgrade on banks at the bound is identified using only variation relative to other banks in the same country and quarter. This reduces the differential effect between treated and control banks to about 0.5 to 0.7 notches, but the effect remains



**Figure 3**  
**Bank rating and sovereign downgrade**

This figure shows point estimates and 95% confidence intervals of the effect on the rating of banks that have a pre-downgrade rating at the sovereign bound (treated banks) relative to other banks (control banks) around the sovereign downgrade. Standard errors are clustered at the lender country level.

statistically significant, even though this is a demanding specification on the data, given the number of treated observations in our setting.

Table IA.2 shows a logit model for the probability that a bank is downgraded after the sovereign downgrade. Treated banks are more likely to be downgraded than control banks when a sovereign downgrade hits the country in which the bank is domiciled; the probability of a downgrade is 98% for treated banks and only 20% 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  $t$  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 before 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.

## 2.2 Effect on bank funding

The mechanism underlying the credit supply shock we identify is that bank ratings affect the bank’s access to funding. We examine whether sovereign

**Table 4**  
**Bank funding and sovereign downgrade**

	Retail deposits		Nondeposit short term funding		Interbank funding		Long-term funding		CDS spread (log)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lender rating = Sov. rating × Sov. downgrade	0.02 (0.02)	0.01 (0.02)	0.00 (0.02)	0.01 (0.02)	-0.03** (0.01)	-0.03** (0.01)	-0.03** (0.01)	-0.03* (0.02)	0.14* (0.08)	0.16** (0.08)
Lender rating = Sovereign rating	0.00 (0.01)	0.00 (0.01)	0.00 (0.02)	-0.01 (0.02)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	-0.06* (0.04)	-0.06 (0.04)
Lender controls		y		y		y		y		y
Country × Quarter FE	y	y	y	y	y	y	y	y	y	y
Lender FE	y	y	y	y	y	y	y	y	y	y
Number of observations	12,118	11,768	12,118	11,768	12,727	12,352	12,032	11,576	3,767	3,670
R-squared	0.93	0.95	0.79	0.80	0.79	0.80	0.88	0.90	0.94	0.94

This table shows OLS regression estimates of the effect of a sovereign downgrade on retail deposits, nondeposit short-term funding, interbank funding, long-term funding, and the logarithm of the credit default swap (CDS) spread of banks that have a pre-downgrade rating at the sovereign bound relative to other banks. The dependent variables in Columns 1–8 are measured as a percentage of lagged total funding and two quarters after the sovereign downgrade, with the exception of long-term funding, which is measured four quarters after the downgrade. The CDS spread in Columns 9 and 10 is measured one quarter 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 A1 in the Appendix. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

downgrades differentially affect the funding sources of the treated banks versus control banks. Following a sovereign downgrade we expect treated banks to be particularly affected in ratings-sensitive funding categories, namely, wholesale funding, interbank loans, and public debt markets, whereas retail deposits (and equity capital) should be less affected. 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:

$$\begin{aligned}
 \text{Funding}_{it} = & \beta_1 (\text{Lender rating}_{i,t-1} = \text{Sov. rating}_{i,t-1}) \times (\text{Sov. downgrade})_{i,t} \\
 & + \beta_2 (\text{Lender rating}_{i,t-1} = \text{Sov. rating}_{i,t-1}) \\
 & + \beta_3 (\text{Sov. downgrade})_{i,t} + \beta_4 X_{i,t-1} + \eta_t + \eta_c + \eta_i + \varepsilon_{it}, \quad (2)
 \end{aligned}$$

where *Funding* is *Retail deposits*, *Nondeposit Short-term funding*, *Interbank funding*, and *Long-term funding* (all variables are scaled by lagged total funding), and the other variables are defined as in Equation (1). The coefficient  $\beta_1$  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 do short-term funding markets.

Table 4 shows the results of specifications with lender and country-by-quarter fixed effects. The interaction term (*Lender rating = Sovereign rating*

$\times$  *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 nondeposit short-term lending in Column 3. Column 5, however, shows that treated banks face a decline in interbank funding of about three percentage points compared to control banks, which is statistically significant. In addition, 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 three 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 lender controls.

We also estimate regression Equation (2) using the logarithm of the credit default swap (CDS) spread as the dependent variable. We use five-year CDS spreads. Columns 9 and 10 of Table 4 show the estimates. The interaction term ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) coefficient indicates a positive and significant differential effect of 14%–16% on the CDS spreads of treated banks versus controls bank, which corresponds to 20 bps at the mean of the data.

Taken together, our findings show that sovereign downgrades adversely affect the access of treated banks to wholesale funding and public debt markets and their cost of funding relative to control banks, which is consistent with an impaired ability to make new loans.

### 2.3 Effect on lending supply

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

$$\begin{aligned} \Delta Lending_{it} = & \beta_1 (Lender\ rating_{i,t-1} = Sov.\ rating_{i,t-1}) \times (Sov.\ downgrade_{i,t}) \\ & + \beta_2 (Lender\ rating_{i,t-1} = Sov.\ rating_{i,t-1}) \\ & + \beta_3 (Sov.\ downgrade_{i,t}) + \beta_4 X_{i,t-1} + \eta_t + \eta_c + \varepsilon_{it}, \end{aligned} \quad (3)$$

where  $\Delta Lending$  is the growth rates of the loan variables (*Number of loans, Number of loans as lead*), defined as the percentage change from the quarter before to two quarters after the sovereign downgrade. All other variables are as in Equation (1). The coefficient  $\beta_1$  measures the extent to which treated banks reduce lending more than control banks following a sovereign downgrade. All regressions include quarter and country fixed effects to capture general macroeconomic conditions and country-level heterogeneity or, alternatively, country-by-quarter effects (i.e.,  $\eta_t \times \eta_c$ ) to capture time-varying country-specific shocks.

Table 5 shows the results. Treated banks show a large and statistically significant reduction in the number of loans following a sovereign downgrade.

**Table 5**  
**Bank lending and sovereign downgrade**

	Number of loans				Number of loans as lead			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender rating = Sov. rating × Sov. downgrade	−0.50*** (0.11)	−0.46*** (0.11)	−0.25** (0.10)	−0.23** (0.11)	−0.42*** (0.13)	−0.42*** (0.14)	−0.25* (0.15)	−0.25* (0.15)
Lender rating = Sovereign rating	0.01 (0.03)	0.04 (0.04)	0.05 (0.04)	0.08 (0.05)	−0.01 (0.04)	−0.01 (0.05)	−0.01 (0.05)	0.02 (0.07)
Sovereign downgrade	−0.09 (0.07)	−0.05 (0.07)			−0.18** (0.07)	−0.11 (0.07)		
Size		−0.01 (0.02)	−0.02 (0.01)	−0.02 (0.01)		0.05*** (0.01)	0.03*** (0.01)	0.03*** (0.01)
Profitability		−2.77 (2.07)	−0.21 (1.96)	0.84 (1.78)		0.11 (2.67)	1.49 (3.16)	3.10 (2.40)
Capital		0.36* (0.21)	−0.01 (0.28)	−0.34 (0.37)		0.46** (0.23)	0.24 (0.22)	−0.14 (0.40)
Liquidity		−0.06 (0.08)	−0.08 (0.08)	−0.07 (0.08)		0.11 (0.08)	0.09 (0.07)	0.11 (0.07)
Deposits		0.18* (0.11)	0.16 (0.12)	0.21 (0.15)		−0.01 (0.08)	−0.05 (0.07)	−0.01 (0.08)
Country macro controls		y				y		
Quarter FE	y	y			y	y		
Country FE	y	y			y	y		
Country × Quarter FE			y	y			y	y
Sample of countries	all	all	all	OECD	all	all	all	OECD
Number of observations	15,472	12,769	12,769	9,946	13,568	11,441	11,441	8,803
R-squared	0.09	0.10	0.28	0.27	0.09	0.10	0.21	0.18

This table shows OLS regression estimates of the effect of a sovereign downgrade on the growth rate of the number of loans and number of loans as lead arranger of banks that have a pre-downgrade rating at the sovereign bound relative to other banks. The dependent variables are measured as the percentage change between the quarter before 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 A1 in the Appendix. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

In Column 1 the interaction term (*Lender rating = Sovereign rating × Sovereign downgrade*) coefficient is  $-0.50$ , significant at the 1% level, which indicates that banks in the treatment group make about 50% fewer loans after the sovereign downgrade relative to the control group. The estimated differential reduction in lending activity is about 46% in Column 2 when we include lender controls and time-varying country macro controls. These estimates compare to an average growth rate of about 22%, which means that treated banks suffer an economically significant reduction in the number of loans relative to control banks. The estimates also reflect that many banks simply leave the syndicated loan market altogether (implying a growth rate of  $-100\%$ ).<sup>5</sup> Coefficients of the control variables have the expected sign. Larger banks make, on average, more loans, as do more profitable and better capitalized banks.

<sup>5</sup> The number of observations that take the value of  $-100\%$  is 1,591 in the growth rate of the *Number of loans*. We obtain qualitatively similar estimates if we run the tests excluding lender-quarters with growth rates of  $-100\%$ .

A potential important concern with our findings is that unobserved country heterogeneity may be driving the results. In the country fixed effect regressions in Columns 1 and 2, only the effects of within-country changes in bank lending and ratings are taken into account, so country-specific omitted variables cannot explain our findings. We also include time-varying country-level controls to take care of time-varying country conditions. To further address this concern, Column 3 presents estimates including country-by-quarter fixed effects, so the estimates are identified using only variation within country-quarter. This reduces the differential effect between treated and control banks to about 25%, but the effect remains statistically and economically significant. As we point out above, this is a demanding specification, especially given the relatively small number of treated observations. We also estimate the bank lending regressions using a sample restricted to banks domiciled in OECD countries, which have more developed banking systems. The estimated differential effects are similar when we restrict the sample to OECD countries in Column 4.<sup>6</sup>

In Columns 5–8 of Table 5 we take into account only loans in which the bank acted as lead arranger. The estimates are similar in magnitude and statistical significance when we consider the *Number of loans as lead* variable. On average, treated banks reduce the number of loans made by about 40%, and this estimate drops to about 25% when we include country-by-quarter fixed effects.

Next, we turn to the subsample of loans in which the lender and borrower are domiciled in different countries. The analysis of loans made to foreign borrowers provides an important robustness test for our main results. In particular, a central issue in our analysis is whether we can isolate the credit supply effect induced by a change in ratings from potential simultaneous changes in the demand for credit on the part of borrowers. The effect of a sovereign downgrade on bank lending to foreign borrowers is unlikely to be explained by a reduction in the demand for credit and is instead consistent with a shock to the lending supply.<sup>7</sup>

Table 6 shows the estimates of Equation (3) when we restrict the sample to loans made to foreign borrowers. Columns 1–4 use the growth in all loans to foreign borrowers as the dependent variable, and Columns 5–8 use only loans in which the bank acts as the lead arranger. The estimates are generally similar (or larger) in magnitude and statistical significance to those in Table 5. On average, treated banks reduce the number of loans made by 50%–60%, with small changes to the magnitude of the estimated effect

<sup>6</sup> We find similar effects on lending in the subsamples of developed and emerging markets, defined according to the Morgan Stanley Capital International (MSCI) indexes classification. Borensztein, Cowan, and Valenzuela (2013) show that the influence of the sovereign ceiling on private issuer ratings is particularly significant in emerging markets. This result does not, however, necessarily translate into larger effects on lending in emerging markets because ratings-based regulations and ratings triggers may be more important in developed markets (because they have more sophisticated banking systems than emerging markets).

<sup>7</sup> 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). Results (untabulated) are similar when we use the sample of term loans only (i.e., we exclude lines of credit).

**Table 6**  
**Bank lending to foreign borrowers and sovereign downgrade**

	Number of loans, foreign				Number of loans as lead, foreign			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender rating = Sov. rating × Sov. downgrade	-0.49*** (0.12)	-0.48*** (0.11)	-0.63*** (0.17)	-0.58*** (0.15)	-0.37** (0.15)	-0.43*** (0.15)	-0.52** (0.25)	-0.53** (0.26)
Lender rating = Sovereign rating	0.04 (0.04)	0.05 (0.05)	0.08 (0.06)	0.11* (0.07)	0.02 (0.05)	0.03 (0.06)	0.04 (0.07)	0.10 (0.08)
Sovereign downgrade	-0.19** (0.08)	-0.09 (0.08)			-0.34*** (0.10)	-0.24** (0.10)		
Lender controls		y	y	y		y	y	y
Country macro controls		y				y		
Quarter FE	y	y			y	y		
Country FE	y	y			y	y		
Country × Quarter FE			y	y			y	y
Sample of countries	all	all	all	OECD	all	all	all	OECD
Number of observations	11,248	9,580	9,580	7,279	9,891	8,594	8,594	6,465
R-squared	0.13	0.14	0.21	0.20	0.14	0.15	0.24	0.22

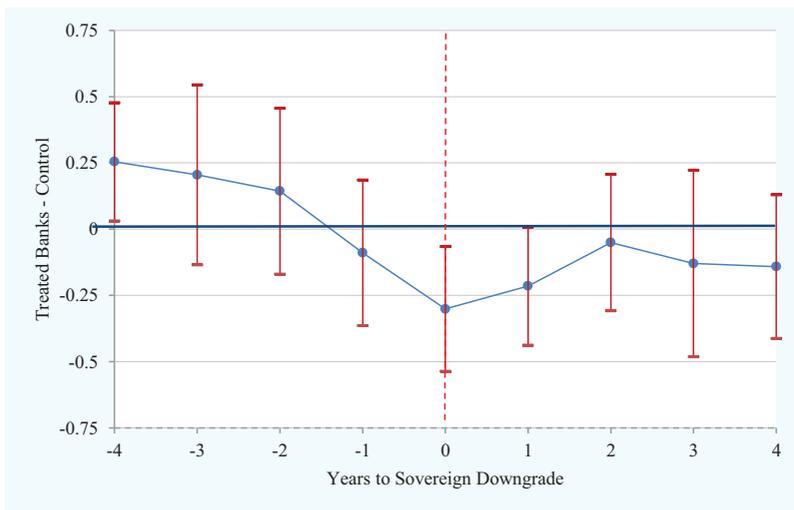
This table shows OLS regression estimates of the effect of a sovereign downgrade on the growth rate of the number of loans and number of loans as lead arranger of banks that have a pre-downgrade rating at the sovereign bound relative to other banks. The dependent variables are measured as the percentage change between the quarter before and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. The sample includes only loans in which the lender and borrower are from different countries. Lender controls include the banks' size, profitability, capital, liquidity, and deposits. Country macro controls (time varying) include the ratio of government debt to GDP, inflation, 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 A1 in the Appendix. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

even when we include country-by-quarter fixed effects. Even if some foreign borrowers depend on demand that originates in the lender's country, one would not expect a demand-based explanation to produce the same, or stronger, effects for these borrowers. The results are instead in line with a credit supply explanation.<sup>8</sup>

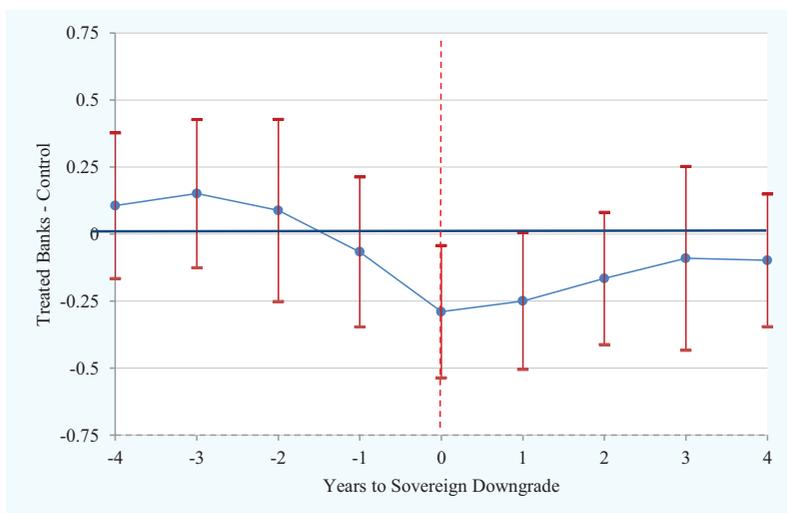
Figure 4 addresses the concern of whether treated and control banks follow parallel trends before the treatment by graphing the equivalent of Column 2 in Tables 5 and 6, where the dependent variable is the *Number of loans*, but including yearly leads and lags of the interaction term. The specification is otherwise identical to that used in those tables. Panel A of Figure 4 shows that, in the four years before the sovereign downgrade, the growth in the number of loans per quarter is similar for treated and control banks (there is a small and statistically insignificant drop between year -4 and year -2). A significantly lower number of loans are generated in the year of the downgrade and in the next year, and by the second year after the downgrade, the difference reverts to almost nothing. Similarly, panel B of Figure 4 shows no differences between

<sup>8</sup> We address the concern that foreign borrowers may have a significant operation in the lender's country. Although we lack detailed data on foreign sales by country, the percentage of foreign sales of foreign borrowers is similar among treated and control groups.

Panel A: All loans



Panel B: Loans to foreign borrowers



**Figure 4**  
**Bank lending and sovereign downgrade**

This figure shows point estimates and 95% intervals of the effect on the number of loans made by bank that have a pre-downgrade rating at the sovereign bound (treated banks) relative to other banks (control banks) around the sovereign downgrade. Panel A includes all loans, and panel B includes only loans in which the lender and borrower are from different countries. Standard errors are clustered at the lender country level.

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 next two years.

## 2.4 Borrower country controls

The results using loans to foreign borrowers in Table 6 address the concern that firms borrowing from affected banks are exposed to different shocks than firms borrowing from nonaffected banks, reducing their demand for loans more relative to firms that borrow from control banks at the time of sovereign downgrades. To further address this concern we implement two additional empirical strategies.

We reestimate the regressions in Table 6, but we exclude from the sample of foreign borrowers those in countries whose economies are in a recession. Panel A of Table 7 shows the estimates using the growth rate in the number of loans to this subset of foreign borrowers as dependent variable. The estimates are qualitatively similar to those in Table 6 and statistically significant.

Next, we consider a lender-by-borrower country-by-quarter panel that allows us to control for borrower country fixed effects. The regressions include borrower country fixed effects or borrower country-by-quarter fixed effects that control for unobserved borrower country heterogeneity. We restrict the sample to lender-borrower country pairs with at least one loan over the sample period. Panel B of Table 7 shows the estimates of these tests using the growth rate in the number of loans as dependent variable. We find that the interaction term ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) coefficient remains negative and significant.

## 2.5 Robustness

We perform several robustness checks of our primary finding on the effect of rating downgrades on lending supply. The results of these tests are reported in the Internet Appendix.

First, we directly relate bank lending to a bank downgrade (and not to a sovereign downgrade) by running an instrumental variables model for the effect of bank ratings on lending. We use the interaction of the sovereign downgrade (dummy) and the dummy for whether a bank is at the sovereign bound as the instrument for the change in lender rating (where the first stage is an OLS model) or for the lender downgrade dummy (where the first stage is a probit model). Table IA.3 in the Appendix shows that the magnitudes for the effect of a one-notch lender downgrade are in line with those in Table 5 for the sample of all loans and Table 6 for the sample of loans to foreign borrowers.<sup>9</sup>

Second, we also calculate the dollar volume of loans (*Amount of loans*) in each quarter. The DealScan database rarely reports the actual loan shares of an individual lead arranger bank in a loan, so we instead use the average share retained by lead arrangers and participants in deals with the same syndicate

<sup>9</sup> This is expected, as the estimate from the two-stage least-squares (2SLS) model is, in this case, equivalent to a Wald estimator that divides the coefficients of interest in Tables 5 and 6 by the effect of the sovereign downgrade on the ratings of banks at the sovereign bound in Table 3 (about one notch).

**Table 7**  
**Bank lending and sovereign downgrade: Borrower country controls**

**Panel A: Lender-quarter tests, excluding loans to countries in a recession**

	(1)	(2)	(3)	(4)
Lender rating = Sov. rating × Sov. downgrade	-0.30** (0.12)	-0.33*** (0.12)	-0.37** (0.15)	-0.32*** (0.11)
Lender rating = Sovereign rating	0.00 (0.05)	0.01 (0.06)	0.05 (0.07)	0.11 (0.07)
Sovereign downgrade	-0.25** (0.10)	-0.16 (0.13)		
Lender controls		y		y
Country macro controls		y		
Quarter FE	y	y		
Lender country FE	y	y		
Lender country × Quarter FE			y	y
Sample of countries	all	all	all	OECD
Number of observations	10,751	9,150	9,150	6,937
R-squared	0.28	0.31	0.39	0.42

**Panel B: Lender-borrower country-quarter tests**

	(1)	(2)	(3)	(4)	(5)
Lender rating = Sov. rating × Sov. downgrade	-0.23*** (0.06)	-0.17*** (0.06)	-0.21*** (0.06)	-0.16** (0.06)	-0.11* (0.06)
Lender rating = Sovereign rating	-0.06* (0.03)	-0.05 (0.03)	-0.04 (0.03)	-0.04 (0.03)	-0.04 (0.04)
Sovereign downgrade	-0.04 (0.04)	-0.04 (0.04)	-0.01 (0.04)		
Lender controls	y	y	y	y	y
Country macro controls	y	y	y	y	y
Quarter FE	y				
Borrower country FE	y		y		
Borrower country × Quarter FE		y		y	y
Lender country FE			y	y	
Lender country × Quarter FE					y
Number of observations	134,880	134,880	134,880	134,880	134,880
R-squared	0.08	0.22	0.08	0.22	0.23

This table shows OLS regression estimates of the effect of a sovereign downgrade on the growth rate of the number of loans of banks that have a pre-downgrade rating at the sovereign bound relative to other banks. The dependent variables are measured as the percentage change between the quarter before and two quarters after the sovereign downgrade. Panel A shows regression estimates at the lender-quarter level using the sample of loans in which the lender and borrower are from different countries, and excluding borrowers in countries whose economies are in a recession. Panel B shows regression estimates at the lender-borrower country-quarter level using the sample of lender-borrower country pairs with at least one loan over the sample period. 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 A1 in the Appendix. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

structure as weights to calculate the *Amount of loans* variable (e.g., Chodorow-Reich 2014).<sup>10</sup> Table IA.4 shows estimates of Equation (3) when we use the growth rate in *Amount of loans* as the dependent variable. Columns 1–3 show

<sup>10</sup> If a bank is a sole lead arranger, it gets a 100% share of the loan. If there is one lead arranger and one participant and, on average (in the sample of loans for which we have information on actual shares), the lead arranger retains 70% of the loan and the participant the rest, we use 0.7 and 0.3 as weights in all deals with this syndicate structure for which we do not have information on actual shares. The need to impute loan shares may add measurement error to the estimates based on the dollar volume of loans.

that the growth rate of the dollar volume of loans drops by 30%–50% for treated banks relative to those in the control group. These estimates, though similar in magnitude as those we obtain for the number of loans in Table 5, generally have lower precision, likely due to the measurement error associated with estimating banks' loan shares. Columns (4)–(6) show comparable results when we consider loans made to foreign borrowers.

Third, we consider next whether the effect of downgrades on lending supply is driven by banks with impaired access to markets due to ratings-based regulatory and contractual constraints faced by banks' investors. Capital requirements and other ratings-based regulations are typically written around broad rating categories, not individual ratings. We estimate the interaction term ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) coefficient separately for the sample of banks downgraded into a new broad rating category and the sample of banks downgraded within the same broad rating category. We rely on the Basel II rating categories to perform this test: AAA to AA–, A+ to A–, BBB+ to BBB–, BB+ to B–, and below B–. About one-third of the bank downgrades induced by the sovereign ceiling cross these rating categories.<sup>11</sup>

Table IA.5 shows that the effect on bank lending is more pronounced when the bank rating crosses a broad rating category than when the banks stays in the same broad rating category. The differences are statistically significant when we include country-by-quarter fixed effects. However, the effect on lending among downgrades without regulatory consequences remains significant in other specifications, suggesting that other channels may also play a role.

Fourth, we also estimate the effects of sovereign upgrades on bank lending. We do not expect sovereign upgrades to matter as much as downgrades as banks with ratings at the sovereign bound are not necessarily upgraded following a sovereign upgrade, unlike sovereign downgrades. In fact, the sovereign ceiling policies do not address sovereign upgrades, so the decision to upgrade an individual bank is more likely to be made on a case-by-case basis (and not immediately after the upgrade of the sovereign). Upgrades also happen in good times when financial constraints are less binding and a shock to bank liquidity might matter less.

We identify years of sovereign upgrades and then construct the treatment and control groups as we do for downgrades. Table IA.6 shows that ratings of banks at the sovereign bound do not increase disproportionately relative to other banks following a sovereign upgrade. This means that we do not have the equivalent of a “first stage” in the case of sovereign upgrades as we see no effects on ratings. Table IA.7 presents the results on bank lending. The estimates show that the differential effect on lending supply of treated banks

<sup>11</sup> We cannot perform a test that looks at downgrades across the investment-grade boundary (BBB– to BB+) because we have only three cases of treated banks whose ratings cross this boundary due to a sovereign downgrade.

versus control banks is economically and statistically insignificant following a sovereign upgrade. These results are reassuring, as they suggest that in the absence of the differential effect on ratings, we do not find effects on lending supply of banks at the bound relative to other banks. If the lending activity of the two groups of banks were affected by the value of government support (or other differences in the exposure of banks to the sovereign), we would expect to see similar changes in their lending activity even if the bank ratings were not affected.

Finally, we report the results of other robustness checks in the Internet Appendix. Table IA.8 shows results of the Abadie and Imbens (2011) nonparametric matching estimator of the average effect of the treatment on the treated (ATT), to address the possibility that the groups being compared in our benchmark specification may have different (pretreatment) characteristics (see Roberts and Whited 2012). We discuss the matching procedure (including the covariates) in detail in Section 1 of the Internet Appendix. The results are similar using this approach. Table IA.9 presents similar estimates when we include lender fixed effects in the growth rate regressions in Tables 5 and 6. Table IA.10 shows that the statistical significance of the estimates is similar when we use standard errors clustered by both country and quarter. Table IA.11 shows that results are robust when we estimate tobit regressions that take into account a  $-100\%$  growth rate for when a bank makes no loans after the sovereign downgrade. Table IA.12 presents estimates when we run lender fixed effects regressions in which the dependent variable is the logarithm of one plus the *Number of loans*. Table IA.13 shows that results are robust when we estimate negative binomial regressions in which the dependent variable is the *Number of loans*. Table IA.14 shows that the effects are largely unchanged when we exclude banks above the sovereign bound from the sample.

## 2.6 Effects within borrower-lender relationships

In this section we explore how sovereign downgrades affect bank 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 loan market; that is, 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 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*; that is, these tests consider the intensive margin of lending. 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 affect loan pricing.

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

$$\begin{aligned} \text{Amount}(\text{Spread})_{kijt} = & \beta_1 (\text{Lender rating}_{i,t-1} = \text{Sov. rating}_{i,t-1}) \times (\text{Sov. downgrade}_{i,t}) \\ & + \beta_2 (\text{Lender rating}_{i,t-1} = \text{Sov. rating}_{i,t-1}) + \beta_3 (\text{Sov. downgrade}_{i,t}) \\ & + \beta_4 X_{i,t-1} + \beta_5 X_{j,t-1} + \beta_6 X_{k,t} + \eta_t + \eta_c + \eta_{ij} + \varepsilon_{kijt}, \end{aligned} \quad (4)$$

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,  $X_{k,t}$  is a vector of loan controls;  $\eta_t$  are quarter fixed effects;  $\eta_c$  are lender country fixed effects, and  $\eta_{ij}$  are lender-borrower pair fixed effects. In some specifications, quarter and country fixed effects are replaced by country-by-quarter fixed effects. The coefficient  $\beta_1$  measures the extent to which sovereign downgrades lead treated banks to 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, that is, if there was a sovereign downgrade in the semester period before the loan date.

Panel A of Table 8 shows the estimates of Equation (4) for the logarithm 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 26% smaller than loans made by control banks following a sovereign downgrade. These results are consistent with the reduction in the amount loaned by treated banks.

Panel A of Table 8 also shows an effect of a sovereign downgrade on loan spreads in the sample of all borrowers. The effect is about 40 bps with no lender controls, dropping to about 30 bps when the regressions include lender, borrower, and loan controls. All these estimates are statistically significant at the 5% level. The effect on loan spreads represents about 20% of the average loan spread in the sample. However, the effect on loan spreads is no longer statistically significant when we include country-by-quarter fixed effects in Column 8. Table IA.15 in the Internet Appendix shows that the results in Table 8 are almost unchanged if we exclude borrowers in the financial and public sectors (SIC codes 6000–6999 and 9000–9999).

Panel B of Table 8 shows the results for loan amounts and loan spreads in the sample of foreign borrowers. 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: a drop of 16%–22%. 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. This suggests that banks are likely to act as price takers, or at least to have less influence on loan pricing, when they deal with foreign borrowers.

We also assess how the probability of observing a loan for a given lender-borrower pair changes after the sovereign downgrade (i.e., the extensive margin) by running logit regression models in which the dependent variable is a

**Table 8**  
**Loan amount, spread, and sovereign downgrade**

**Panel A: All loans**

	Loan amount (log)				Loan spread			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender rating = Sov. rating	-0.26***	-0.22***	-0.21***	-0.13***	39.55***	33.13***	30.38***	5.28
× Sov. downgrade	(0.04)	(0.05)	(0.04)	(0.04)	(10.46)	(12.57)	(11.43)	(18.48)
Lender rating = Sovereign rating	0.09***	0.04	0.04	0.05	-0.93	-0.85	-1.41	-11.58**
	(0.02)	(0.04)	(0.04)	(0.06)	(3.73)	(3.59)	(3.42)	(5.29)
Sovereign downgrade	0.02	0.03	0.03	-0.04	0.21	-7.01**	-6.42**	-6.88***
	(0.02)	(0.03)	(0.03)	(0.04)	(3.31)	(3.06)	(2.97)	(2.54)
Lender controls		y	y	y		y	y	y
Borrower controls		y	y	y		y	y	y
Loan controls			y	y			y	y
Country macro controls		y	y			y	y	
Quarter FE	y	y	y		y	y	y	
Country × Quarter FE				y				y
Lender × Borrower FE	y	y	y	y	y	y	y	y
Number of observations	930,581	368,412	368,412	368,412	657,254	279,259	279,259	279,259
R-squared	0.86	0.87	0.87	0.87	0.82	0.83	0.83	0.83

**Panel B: Loans to foreign borrowers**

Lender rating = Sov. rating	-0.22***	-0.18***	-0.17***	-0.16***	2.96	10.04	8.57	13.35
× Sov. downgrade	(0.04)	(0.04)	(0.05)	(0.05)	(10.09)	(10.81)	(9.38)	(13.78)
Lender rating = Sovereign rating	0.08***	0.07***	0.07***	0.07*	-4.46	-3.21	-3.66	-8.10*
	(0.02)	(0.03)	(0.03)	(0.04)	(3.17)	(3.19)	(3.03)	(4.22)
Sovereign downgrade	0.01	-0.02	-0.02	-0.07	0.45	-1.54	-1.32	-1.88
	(0.02)	(0.02)	(0.02)	(0.04)	(1.85)	(2.52)	(2.30)	(8.45)
Lender controls		y	y	y		y	y	y
Borrower controls		y	y	y		y	y	y
Loan controls			y	y			y	y
Country macro controls		y	y			y	y	
Quarter FE	y	y	y		y	y	y	
Country × Quarter FE				y				y
Lender × Borrower FE	y	y	y	y	y	y	y	y
Number of observations	480,361	199,119	199,119	199,119	332,041	149,488	149,488	149,488
R-squared	0.80	0.81	0.81	0.81	0.83	0.84	0.84	0.84

This table shows OLS regression estimates of the effect of a sovereign downgrade on the logarithm of the loan amount and interest rate spread of banks that have a pre-downgrade rating at the sovereign bound relative to other banks. The effect is measured in the six-month period after the sovereign downgrade. Observations are at the loan level. Panel A includes all loans, and panel B includes only loans in which the lender and borrower are from different countries. 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. Variable definitions are provided in Table A1 in the Appendix. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

dummy variable that takes a value of one if there is at least one loan in a lender-borrower pair in a given quarter (i.e., the panel is at the lender-borrower-quarter level). 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  $j$  (the sample includes only lender-borrower pairs with at least one loan over the sample period).

Table IA.16 in the Internet Appendix shows the results. 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 reduction in marginal probability is approximately one percentage point, for an unconditional probability of observing a loan in a given quarter for a lender-borrower pair of about 7%.

## 2.7 Alternative channels

Our experiment is designed to identify the causal effect of bank ratings on bank lending, but there are channels other than ratings that could lead to an effect of downgrades on bank lending. The first alternative is reverse causality, that is, the possibility that deteriorating bank credit quality can lead to sovereign downgrades, not the other way around (bank-to-sovereign channel). When banks are in distress, the sovereign is expected to activate the safety net, leading to a deterioration of the sovereign's financial position and a subsequent downgrade. While this channel is likely to be important (e.g., Strahan 2013; Acharya et al. 2015), 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 (government-to-bank channel). This could directly affect the bank lending supply without an effect of bank ratings per se. We implement several additional tests designed to address these concerns.

First, we perform a series of placebo tests that address 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 or recessions as the treatment instead of sovereign downgrades. In these placebos, 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 downgrade in the last four quarters (the timing of banking crises is taken from the Reinhart and Rogoff 2009 database). We also create a *Recession* indicator that is equal to one if a country suffers a recession that is not accompanied by a sovereign downgrade in the last four quarters (the source is the OECD). These tests ask whether higher-quality banks (those at the sovereign bound) reduce credit by more than control banks when there is a banking crisis or a recession, that is, whether treated banks generally respond differently during negative economic shocks due to some unobserved factor.

Table 9 shows that the negative treatment-control difference in bank lending does not appear in banking crisis or recession periods (*Placebo shock*) without sovereign downgrades, as shown by the insignificant coefficients on the interaction terms ( $Lender\ rating = Sovereign\ rating \times Placebo\ shock$ ). This does not mean that these mechanisms are not important during sovereign crises

**Table 9**  
**Bank lending and sovereign downgrade: Placebo tests**

Placebo shock:	Banking crises		Recessions		Presovereign downgrade	
	(1)	(2)	(3)	(4)	(5)	(6)
Lender rating = Sov. rating × Placebo shock	-0.11 (0.09)	-0.11 (0.09)	0.02 (0.07)	-0.09 (0.06)	-0.03 (0.09)	0.18 (0.15)
Lender rating = Sovereign rating	0.05 (0.04)	0.03 (0.04)	0.03 (0.05)	0.05 (0.04)	0.04 (0.04)	-0.04 (0.05)
Placebo shock	0.36* (0.20)		0.01 (0.04)		0.03 (0.03)	
Lender controls	y	y	y	y	y	y
Country macro controls	y		y		y	
Quarter FE	y		y		y	
Country FE	y		y		y	
Country × Quarter FE		y		y		y
Number of observations	12,769	12,769	12,769	12,769	12,769	12,769
R-squared	0.10	0.30	0.10	0.30	0.10	0.30

This table shows OLS regression estimates of the effect of placebo periods on the growth rate of the number of loans of banks that have a pre-downgrade rating at the sovereign bound relative to other banks. The dependent variables are measured as the percentage change between the quarter before and two quarters after the placebo shock. The treatment is defined as banking crises without a sovereign downgrade during the last four quarters in Columns 1 and 2, recessions without a sovereign downgrade during the last four quarters in Columns 3 and 4, and the two-year period before the actual sovereign downgrade (the cutoff is six months before the shock) in Columns 5 and 6. 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. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

(Gennaioli, Martin, and Rossi 2014a; Acharya et al. 2015); rather, it means that the loop between sovereign and bank credit risk does not account for the effects of ratings uncovered in this paper. As an additional placebo test, we shift the sovereign downgrades in our data to include the two years before the true date of each downgrade (up to six months before the true date). Columns 5 and 6 of Table 9 show that there is no evidence of preexisting differential trends in lending between treated and control banks for these placebo downgrade dates.

Second, we estimate the effect of rating downgrades excluding banks that have high systemic risk (i.e., banks that are too big to fail), as these 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 (2013). We rerun the lender-quarter level tests but include the interaction of the treated bank dummy ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) with a dummy for *Too big to fail* banks (the regression also includes the main effects for each variable and a full set of interaction terms). Columns 1 and 2 of Table 10 show that the interaction term ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) coefficient is negative and

**Table 10**  
**Bank lending and sovereign downgrade: Government support and bondholdings**

Government exposure:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Too big to fail	State-owned bank	Rating uplift	Government bondholdings	Exposure to own country, EBA					
Lender rating = Sov. rating × Sov. downgrade	-0.58*** (0.20)	-0.37* (0.22)	-0.42*** (0.12)	-0.34** (0.15)	-0.67*** (0.18)	-1.21*** (0.29)	-0.44*** (0.12)	-0.28** (0.12)	-0.62 (0.50)	-0.85* (0.51)
Lender rating = Sovereign rating	-0.03 (0.07)	-0.01 (0.07)	0.03 (0.03)	0.04 (0.04)	0.04 (0.07)	0.07 (0.06)	0.02 (0.04)	0.02 (0.05)	0.43 (0.29)	0.40 (0.41)
Sovereign downgrade	0.01 (0.09)				0.34** (0.14)		-0.06 (0.07)		0.02 (0.23)	
Gov. exposure × Lender rating = Sov. rating	0.12 (0.08)	0.12 (0.09)	0.07 (0.11)	0.03 (0.13)	0.01 (0.02)	0.01 (0.02)	1.87*** (0.77)	3.44** (1.53)	-4.81** (2.36)	-0.68 (2.53)
Gov. exposure × Sovereign downgrade	-0.17* (0.10)	-0.26*** (0.07)	-0.27 (0.24)	-0.31 (0.31)	-0.11*** (0.04)	-0.12** (0.06)	0.65 (1.09)	0.46 (0.82)	0.34 (1.61)	-2.08*** (0.78)
Gov. exposure	-0.03 (0.05)	-0.03 (0.07)	-0.03 (0.05)	-0.03 (0.06)	-0.01 (0.01)	-0.03** (0.01)	0.21 (0.32)	0.02 (0.30)	-0.66 (0.79)	-0.89 (0.82)
Lender rating = Sov. rating × Sov. downgrade × Gov. exposure	0.26 (0.23)	0.14 (0.31)	0.10 (0.29)	0.62 (0.44)	0.04 (0.05)	0.22*** (0.07)	-0.92 (1.31)	-2.49 (1.68)	4.06 (5.58)	1.58 (4.15)
Lender controls	y	y	y	y	y	y	y	y	y	y
Country macro controls	y	y	y	y	y	y	y	y	y	y
Quarter FE	y	y	y	y	y	y	y	y	y	y
Country FE	y	y	y	y	y	y	y	y	y	y
Country × Quarter FE	y	y	y	y	y	y	y	y	y	y
Number of observations	12,133	12,133	12,769	12,769	7,740	7,740	12,769	12,769	779	779
R-squared	0.09	0.30	0.10	0.30	0.12	0.36	0.10	0.30	0.23	0.41

This table shows OLS regression estimates of the effect of a sovereign downgrade on the growth rate of the number of loans of banks that have a pre-downgrade rating at the sovereign bound relative to other banks. The dependent variables are measured as the percentage change between the quarter before and two quarters after the sovereign downgrade. Observations are at the lender-quarter level. *Too big to fail* is a dummy variable that takes a value of one if the ratio of total liabilities to GDP is above the 75th percentile, and zero otherwise. *State-owned bank* is a dummy variable that takes a value of one if the government owns (directly and indirectly) more than 50% of the equity, and zero otherwise. *Rating uplift* is the difference between the Moody's Long-Term Issuer Rating and the Bank Financial Strength Rating. *Government bondholdings* is holdings of government securities divided by total assets. *Exposure to own country*, *EBA* is gross direct long exposures to domestic sovereign debt divided by total assets. 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 external debt crisis, a banking crisis, or a recession. Variable definitions are provided in Table A1 in the Appendix. Robust standard errors clustered by lender country are reported in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

significant, which indicates that treated banks with low systemic risk reduce lending more than control banks. Moreover, the triple interaction term ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade \times Too\ big\ to\ fail$ ) coefficient is insignificant, which indicates that banks with high systemic risk (too big to fail banks) are not more affected than banks with low systemic risk.

Third, to further address the reverse causality concern, we estimate a logit model for the probability of a sovereign downgrade if the lender is downgraded in the previous quarter (*Lender downgrade*). If banks at the bound are causing sovereign downgrades, we would expect to find a positive differential effect for this group of banks. Table IA.17 shows the estimates of the logit model. We find no evidence that sovereign downgrades are more likely to be temporally preceded by downgrades of treated banks relative to control banks. The interaction term ( $Lender\ rating = Sovereign\ rating \times Lender\ downgrade$ ) coefficient is actually negative and statistically insignificant.

Fourth, 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 note, however, that it is not *ex ante* clear that these banks should reduce lending more than others, because governments may force these banks to increase lending to make up for the reduction in credit supply from the rest of the financial system. Still, we rerun our tests including an interaction term of the treatment dummy with a dummy for *State-owned banks*. There are forty-seven state-owned banks in our sample, or about 10% of the total number of banks. Columns 3 and 4 of Table 10 shows that state-owned banks do not explain our results, as the interaction term ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) coefficient is negative and significant and the triple interaction term is insignificant.

Fifth, we use a direct measure of the value of explicit and implicit government guarantees to banks based on 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 et al. (2015). Columns 5 and 6 of Table 10 show that the effect is not driven by banks with high 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.

Sixth, and finally, we show that banks' holdings of government debt do not explain our results. Gennaioli, Martin, and Rossi (2014a) and Acharya et al. (2015) 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 (*Government bondholdings*) is 6% (among positive holdings), which is in line with the figures in Gennaioli, Martin, and Rossi (2014b), and there is no difference between treated and control groups. To rule out that this mechanism is driving the effect we uncover, Columns 7 and

8 of Table 10 report estimates that include interactions with the *Government bondholdings* variable. The results are similar to the main finding of reduced bank lending following a sovereign downgrade in the sample of banks with low government bondholdings. We find that the interaction term ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) coefficient is negative and significant, and the triple interaction term is again insignificant.<sup>12</sup>

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. The mean of the gross direct long exposures to domestic sovereign debt divided by total assets (*Exposure to own country*) is 11%, and the treated banks are significantly less exposed to own-country sovereign risk than are the control banks in the same country-quarter (see panel B of Table 1). In Columns 9 and 10 of Table 10 we rerun the tests using a sample of fifty-four European Union banks from 2008–2012 and include interactions with the *Exposure to own country* variable. We find that the interaction ( $Lender\ rating = Sovereign\ rating \times Sovereign\ downgrade$ ) coefficient is negative and similar in magnitude, but is statistically insignificant in Column 9, likely due to the small sample size. The triple interaction term is insignificant.

### 3. 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 significantly more than otherwise similar banks whose ratings are not at 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 rating-sensitive sources of funding, such as 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 in general of better credit quality than control banks, thereby ruling out such alternative explanations 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

<sup>12</sup> Table IA.18 in the Internet Appendix shows that results are not affected when we rerun the tests in Table 10 using subsamples that exclude too big to fail banks, state-owned banks, banks with high rating uplift, and banks with high government bondholdings, rather than running tests with interaction terms.

relying exclusively on loans to foreign borrowers, loans made within lender-borrower relationships, and placebo tests using banking crises and recessions 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.

## Appendix

**Table A1**  
**Variable Definitions**

Variable	Definition
<b>Panel A: Lender variables</b>	
Lender rating	S&P long-term foreign currency issuer ratings mapped into twenty-two numerical categories (Bloomberg)
Sovereign rating	S&P long-term foreign currency issuer ratings of the country in which the lender is domiciled mapped into twenty-two numerical categories (Bloomberg)
Sovereign downgrade	Dummy variable that takes a value of one if the sovereign rating is downgraded, and zero otherwise
Retail deposits	Ratio of customer deposits to lagged total funding (Bankscope items 2031/11650)
Nondeposit short-term funding	Ratio of deposits and short-term funding minus deposits to lagged total funding (Bankscope items (2030–2031)/11650)
Interbank funding	Ratio of deposits from banks to lagged total funding (Bankscope items 2185/11650)
Long-term funding	Ratio of long-term funding to lagged total funding (Bankscope items 11620/11650)
CDS spread	Senior credit default swap spread in basis points with five-year tenor (Bloomberg)
Number of loans	Total number of loans made as participant or lead arranger (DealScan)
Number of loans as lead	Number of loans made as lead arranger (DealScan)
Size	Logarithm 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 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, and zero otherwise (Bankscope)

(continued)

**Table A1**  
**Continued**

Variable	Definition
Rating uplift	Difference between the Long-Term Issuer Rating and the Bank Financial Strength Rating mapped into twenty-two 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)
Exposure to own country, EBA beta	Gross direct long exposures of domestic sovereign debt divided by total assets (European Banking Authority) Beta of a bank's stock estimated using a time series regression of weekly stock return on the return of the bank's country stock market index using two years of prior data
<b>Panel B: Loan variables</b>	
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 including 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, and zero otherwise
Prior lead	Dummy variables that take a value of one if the bank served as a lead arranger for the borrower's previous loan, and zero otherwise
<b>Panel C: Borrower variables</b>	
Size	Logarithm 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 $FF\_FOR\_SALES\_PCT$ )
Unrated	Dummy variable that takes a value of one if a borrower does not have a credit rating, and zero otherwise (Bloomberg)
Rating	S&P long-term foreign currency issuer ratings mapped into twenty-two numerical categories (Bloomberg)

## References

- Abadie, A., and G. Imbens. 2011. Bias-corrected matching estimators for average treatment effects. *Journal of Business and Economic Statistics* 29:1–11.
- Acharya, V., I. Drechsler, and P. Schnabl. 2015. A pyrrhic victory? Bank bailouts and sovereign credit risk. *Journal of Finance* 69:2689–739.
- Acharya, V., T. Eisert, C. Eufinger, and C. Hirsch. 2015. Real effects of the sovereign debt crisis in europe: Evidence from syndicated loans. Working Paper, New York University.
- Almeida, H., I. Cunha, M. Ferreira, and F. Restrepo. Forthcoming. The real effects of credit ratings: The sovereign ceiling channel. *Journal of Finance*.
- Arteta, O., and G. Hale. 2008. Sovereign debt crises and credit to the private sector. *Journal of International Economics* 74:53–69.
- Ashcraft, A. 2005. Are banks really special? New evidence from the FDIC-induced failure of healthy banks. *American Economic Review* 95:1712–30.
- Augustin, P., H. Boustanifar, J. Breckenfelder, and J. Schnitzler. 2014. Sovereign credit risk and corporate borrowing costs. Working Paper, Stockholm School of Economics.
- Bebchuk, L., and I. Goldstein. 2011. Self-fulfilling credit market freezes. *Review of Financial Studies* 24: 3519–55.
- Becker, B., and V. Ivashina. 2014. Financial repression in the european sovereign debt crisis. Working Paper, Harvard Business School.
- Bedendo, M., and P. Colla. 2015. Sovereign and corporate credit risk: Spillover effects in the eurozone. *Journal of Corporate Finance* 33:34–52.
- Bernanke, B., and A. Blinder. 1989. Credit, money, and aggregate demand. *American Economic Review* 78:435–9.
- Black, S., and P. Strahan. 2002. Entrepreneurship and bank credit availability. *Journal of Finance* 57:2807–33.
- Borensztein, E., K. Cowan, and P. Valenzuela. 2013. Sovereign ceilings lite? The impact of sovereign ratings on corporate ratings in emerging market economies. *Journal of Banking and Finance* 37:4014–24.
- Brunnermeier, M. 2009. Deciphering the liquidity and credit crunch 2007–2008. *Journal of Economic Perspectives* 23:77–100.
- Carvalho, D., M. Ferreira, and P. Matos. Forthcoming. Lending relationships and the effect of bank distress: Evidence from the 2007–2008 financial crisis. *Journal of Financial and Quantitative Analysis*.
- Chava, S., and M. Roberts. 2008. How does financing impact investment? The role of debt covenants. *Journal of Finance* 63:2085–121.
- Chermenko, S., and A. Sunderam. 2012. The real consequences of market segmentation. *Review of Financial Studies* 25: 2041–69.
- Chodorow-Reich, G. 2014. The employment effects of credit market disruptions: Firm-level evidence from the 2008–09 financial crisis. *Quarterly Journal of Economics* 129:1–59.
- Cornett, M., J. McNutt, P. Strahan, and H. Tehranian. 2011. Liquidity risk management and credit supply in the financial crisis. *Journal of Financial Economics* 101:297–312.
- De Marco, F. 2014. Bank lending and the sovereign debt crisis. Working Paper, Boston College.
- Demirgüç-Kunt, A., and H. Huizinga. 2013. Are banks too big to fail or too big to save? International evidence from equity prices and CDS spreads. *Journal of Banking and Finance* 37:875–94.
- Duchin, R., and D. Sosyura. 2012. The politics of government investment. *Journal of Financial Economics* 106:24–48.
- Durand, H. 2011. Rating downgrades threaten to shrink banks' investor base. *Reuters*, June 28.

- Gennaioli, N., A. Martin, and S. Rossi. 2014a. Sovereign default, domestic banks, and financial institutions. *Journal of Finance* 68:819–66.
- Gennaioli, N., A. Martin, and S. Rossi. 2014b. Banks, government bonds and default: What do the data say. Working Paper, Purdue University.
- Gorton, G., and L. Huang. 2004. Liquidity, efficiency, and bank bailouts. *American Economic Review* 94:455–83.
- Ivashina, V., and D. Scharfstein. 2010. Bank lending during the financial crisis of 2008. *Journal of Financial Economics* 97:319–38.
- Iyer, R., S. Lopes, J.-L. Peydró, and A. Schoar. 2013. The interbank liquidity crunch and the firm credit crunch: Evidence from the 2007–09 crisis. *Review of Financial Studies* 27:347–72.
- Jayarathne, J., and P. Strahan. 1996. The finance–growth nexus: Evidence from bank branch deregulation. *Quarterly Journal of Economics* 111:639–70.
- Kaminsky, G., and S. Schmukler. 2002. Emerging market instability: Do sovereign ratings affect country risk and stock returns? *World Bank Economic Review* 16:171–95.
- Kashyap, A., O. Lamont, and J. Stein. 1994. Credit conditions and the cyclical behavior of inventories. *Quarterly Journal of Economics* 109:565–92.
- Khwaja, A., and A. Mian. 2008. Tracing the impact of bank liquidity shocks. *American Economic Review* 98:1413–42.
- Kisgen, D. 2006. Credit ratings and capital structure. *Journal of Finance* 61:1035–72.
- . 2007. The influence of credit ratings on corporate capital structure decisions. *Journal of Applied Corporate Finance* 19:65–73.
- . 2009. Do firms target credit ratings or leverage levels? *Journal of Financial and Quantitative Analysis* 44:1323–44.
- Kisgen, D., and P. Strahan. 2010. Do regulations based on credit ratings affect a firm’s cost of capital? *Review of Financial Studies* 23:4324–47.
- Kroszner, R., and P. Strahan. 2001. Bankers on boards: Monitoring conflicts of interest, and lender liability. *Journal of Financial Economics* 62:415–52.
- Kumhof, M., and E. Tanner. 2008. Government debt: A key role in financial intermediation. In *Money, crises and transition: Essays in honor of Guillermo A. Calvo*. Eds. C. Reinhart, C. Végh, and A. Velasco. Cambridge: MIT Press.
- Lemmon, M., and M. Roberts. 2010. The response of corporate financing and investment to changes in the supply of credit. *Journal of Financial and Quantitative Analysis* 45:555–87.
- Moody’s. 2007. Incorporation of joint-default analysis into Moody’s bank ratings: A refined methodology. Moody’s Investors Service Ratings Methodology, March.
- Paravisini, D. 2008. Local bank financial constraints and firm access to external finance. *Journal of Finance* 63:2161–94.
- Philippon, T., and P. Schnabl. 2013. Efficient recapitalization. *Journal of Finance* 68:1–42.
- Popov, A., and N. Van Horen. 2015. Exporting sovereign stress: Evidence from syndicated bank lending during the euro area sovereign debt crisis. *Review of Finance* 19:1825–66.
- Reinhart, C., and K. Rogoff. 2009. *This time is different: Eight centuries of financial folly*. Princeton: Princeton University Press.
- Reisen, H., and J. von Maltzan. 1999. Boom and bust and sovereign ratings. *International Finance* 2:273–93.
- Roberts, M., and T. Whited. 2012. Endogeneity in empirical corporate finance. *Handbook of the Economics of Finance* 2:493–572.

Santos, J. 2011. Bank corporate loan pricing following the subprime crisis. *Review of Financial Studies* 24: 1916–43.

Standard & Poor's. 2012. Corporate and government ratings that exceed the sovereign rating. RatingsDirect, October.

———. 2013. Ratings above the sovereign-corporate and government ratings: Methodology and assumptions. RatingsDirect, November.

Strahan, P. 2013. Too big to fail: Causes, consequences, and policy responses. *Annual Review of Financial Economics* 5:43–61.

Sufi, A. 2007. Information asymmetry and financing arrangements: Evidence from syndicated loans. *Journal of Finance* 62:629–68.

———. 2009. The real effects of debt certification: Evidence from the introduction of bank loan ratings. *Review of Financial Studies* 22:1659–91.

Tang, T. 2009. Information asymmetry and firms' credit market access: Evidence from Moody's credit rating format refinement. *Journal of Financial Economics* 93:325–51.

Vaughan, L. 2012. Moody's bank downgrades risk choking european recovery. *Bloomberg*, May 9.

Watkins, M. 2012. Bank downgrades threaten to hit funding. *Financial Times*, May 21.