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*Forthcoming Version of*  
DO “TOO-BIG-TO-FAIL” BANKS TAKE ON MORE RISK?  
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# Do “Too-Big-to-Fail” Banks Take On More Risk?

- Large or complex banks might have a greater appetite for risk if they expect future rescues.
- Using data for more than 200 banks in 45 countries, the authors find higher levels of impaired loans after an increase in government support, as measured by Fitch Ratings’ support rating floors (SRFs).
- A one-notch rise in the SRF increases an average bank’s impaired loan ratio by roughly 8 percent; the authors show similar effects on net charge-offs and for U.S. banks only.
- The authors also show that riskier banks are more likely to take advantage of potential government support.
- The findings suggest that banks classified by rating agencies as more likely to receive government support engage in more risk taking.

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## 1. INTRODUCTION

In 1984, U.S. regulators made the unprecedented move of insuring all of Continental Illinois’s liabilities. The Comptroller of the Currency indicated during the hearings after Continental’s resolution that regulators would not allow the eleven largest banks in the United States to fail. Ever since, there have been many concerns with banks deemed “too big to fail.”<sup>1</sup>

These concerns derive from the belief that the too-big-to-fail status gives large banks a competitive edge and incentives to take on additional risk. If investors believe the largest banks are too big to fail, they will be willing to offer them funding at a discount. Together with expectations of rescues, this discount gives the too-big-to-fail banks incentives to engage in riskier activities. This, in turn, could drive the smaller banks that compete with them to take on further risks,

<sup>1</sup> Continental Illinois, which was the seventh-largest bank by deposits, experienced runs by large depositors following news that it had incurred significant losses in its loan portfolio. Concerns that a failure of Continental would have significant adverse effects on other banks that had deposits with it led the Federal Reserve Board, the Federal Deposit Insurance Corporation (FDIC), and the Comptroller of the Currency, together with twenty-four U.S. banks, to announce a \$7.3 billion bailout. The rescue package comprised a \$2 billion capital injection by the FDIC and the group of twenty-four banks and a \$5.3 billion unsecured line of credit from the banks.

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exacerbating the negative effects of having too-big-to-fail banks in the financial system.

The debate around too-big-to-fail banks has given rise to a large literature. Part of this literature attempts to determine whether bank investors, including depositors, believe the largest banks are too big to fail. Some studies seek to answer this question by investigating spreads on bank bonds (Flannery and Sorescu 1996; Sironi 2003; Morgan and Stiroh 2005; Anginer and Warburton 2010; Balasubramnian and Cyree 2011; Santos, forthcoming). Other studies consider spreads on bank credit default swap contracts (Demirgüç-Kunt and Huizinga 2013; Li, Qu, and Zhang 2011), bank stock returns (Correa et al. 2012), and deposit costs (Baker and McArthur 2009). Yet others focus on the premiums that banks pay in mergers and acquisitions (Brewer and Jagtiani 2007; Molyneux, Schaeck, and Zhou 2011).

Another part of that literature investigates whether too-big-to-fail banks behave differently by looking at balance-sheet data (Gropp, Hakenes, and Schnabel 2011), syndicated loans (Gadanecz, Tsatsaronis, and Altunbas 2012), and bank z-scores (Brandão Marques, Correa, and Sapriza 2013), among other measures.

Our paper is closer to the latter studies in that we are also interested in finding out whether the too-big-to-fail status affects bank behavior. Specifically, we study whether banks that rating agencies classify as likely to receive government support increase their risk-taking.

An important novelty of our paper is the way we measure the likelihood of a bank receiving government support. Previous studies, including Haldane (2010), Lindh and Schich (2012), and Hau, Langfield, and Marqués-Ibañez (2013), attempt to infer support from the difference between Moody's all-in credit ratings (long-term bank deposit ratings, which capture a bank's ability to repay its deposit obligations and include external support) and Moody's stand-alone ratings (bank financial strength ratings, which exclude external support). The difference between Moody's all-in credit and stand-alone ratings is commonly known as a ratings "uplift." Using uplifts, however, presents two potential issues. First, a change in uplift may arise from movement in either of the two underlying ratings, with completely different implications. Second, uplift incorporates any type of external support, including from governments, parent companies, and other institutions.

To avoid the first concern, some studies rely on support ratings issued by Fitch Ratings (Gropp, Hakenes, and Schnabel [2011] and Molyneux, Schaeck, and Zhou [2010], among others). As with uplift, support ratings also include institutional, cooperative, local government, and regional government support. We sidestep both problems

by considering a new Fitch rating. Starting in March 2007, Fitch began to issue support rating floors (SRFs), which reflect its opinion of potential sovereign support only (including a government's ability to support a bank). The main advantage of using this rating is that, in contrast with earlier approaches used in the literature, the support rating floor explicitly captures government support. That is, it does not incorporate other forms of external support, such as the institutional support of a high-holder in a banking organization to a bank within its own hierarchy.<sup>2</sup>

The results of our investigation show that a greater likelihood of government support leads to a rise in bank risk-taking. Following an increase in government support, we see a larger volume of bank lending becoming impaired. Further, and in line with this finding, our results show that stronger government support translates into an increase in net charge-offs. Additionally, we find that the effect of government support on impaired loans is stronger for riskier banks than safer ones, as measured by their issuer default ratings.

Our findings offer novel evidence that government support does play a role in bank risk-taking incentives. The results are also important because they already include the effects of the government interventions undertaken throughout the latest financial crisis. At the same time, however, not enough time has elapsed since the crisis for our results to reflect the impact of the regulatory changes enacted in its wake.

The rest of our paper is organized as follows. The next section introduces our measure of government support. Section 3 describes the data sources and characterizes our sample. Section 4 introduces our methodology. Section 5 discusses our results. Section 6 presents robustness analysis. Section 7 concludes with some final remarks.

<sup>2</sup> Fitch Ratings (2013a) explicitly defines support rating floors as based on potential sovereign support (not on the intrinsic credit quality of the bank). In the case of the landesbanks, Fitch assumes that Germany's and the German states' creditworthiness are linked. For example, in August 2013, Landesbank Baden-Wuerttemberg (LBBW) had a support rating floor of A+ even though Fitch does not rate the State of Baden-Wuerttemberg. The assessment implicitly assumes that the creditworthiness of the support "is underpinned by the strength of the German solidarity system, which links the state's creditworthiness to that of the Federal Republic of Germany (AAA/Stable)" (Fitch Ratings 2013b).

## 2. MEASURING THE LIKELIHOOD OF GOVERNMENT SUPPORT

There are a number of different methods for measuring sovereign support based on rating agency assessments. Previous work uses two ratings published by Moody's to derive a measure of government support (Haldane [2010], Lindh and Schich [2012], and Hau, Langfield, and Marqués-Ibañez [2013], among others). Moody's issues bank deposit ratings based on its opinion of a bank's ability to repay punctually its deposit obligations. These ratings are all-in credit ratings that reflect intrinsic financial strength, sovereign transfer risk (for foreign currency deposits), and both implicit and explicit external support elements. Moody's also issues bank financial strength ratings, which exclude sovereign risk and external support. Uplifts—calculated as the difference between these two ratings—provide an estimate of the implicit guarantees. This measure incorporates any type of external support (not just sovereign support), including institutional backing from parent companies. To control for this support, some recent studies exclude all bank subsidiaries from their samples and focus their analysis on high-holders of banking organizations only (Brandão Marques, Correa, and Saprizza [2013], among others). Uplifts also capture cooperative, local government, and regional government support.

Although intuitive, this methodology assumes a linear functional form for the difference between these two ratings, but the relationship between external support and stand-alone ratings may be more complex. It also makes it difficult to identify the source of variation in uplifts. For example, suppose there is a one-notch increase in the stand-alone rating, but no change in the all-in credit rating. Uplift would decrease, indicating weaker external support when, in practice, there has been no change. Moreover, even if both ratings were to change, differences in Moody's publication timing would lead to spurious variation in external support.

An alternative approach relies on ratings issued by Fitch that explicitly measure external support, independent of the intrinsic credit quality of the bank. Support ratings (SRs) rely on Fitch's assessment of a supporter's propensity and ability to support a bank. Supporters can be of two types: sovereign states and institutional owners. Studies that use SRs include Gadanecz, Tsatsaronis, and Altunbas (2012) and Gropp, Hakenes, and Schnabel (2011).

In addition to support ratings, Fitch issues support rating floors based on its opinion of potential sovereign support only (including a government's ability to support a bank).<sup>3</sup>

<sup>3</sup> According to Fitch Ratings (2013a), support typically extends to the following obligations: senior debt (secured and unsecured), including insured and uninsured deposits (retail, wholesale, and interbank); obligations

## Comparison of Ratings Issued by Moody's and Fitch Ratings

	Moody's		Fitch Ratings		
	Long-term bank deposit rating	Bank financial strength	Long-term issuer default rating	Support rating	Support rating floor
Intrinsic credit quality	✓	✓	✓	✗	✗
Institutional support	✓	✗	✓	✓	✗
Sovereign support	✓	✗	✓	✓	✓

Sources: Moody's and Fitch Ratings.

Notes: Comparison of several ratings issued by Moody's and Fitch Ratings that are typically used in the calculation of government support. A check mark denotes that the definition of a given rating includes one of three characteristics listed in the table above. An "x" indicates that a characteristic is not included in the definition of the rating. For example, bank financial strength measures intrinsic credit quality, but not institutional or sovereign support.

The main difference with respect to SRs is that SRFs do not incorporate external support other than sovereign support, such as the institutional support of a high-holder in a banking organization to a bank within its own hierarchy. Isolating the support coming from the government is crucial to addressing the question of whether too-big-to-fail banks increase their risk-taking, because, in contrast to other sources of external support, sovereign support is typically unpriced and not risk-sensitive. The exhibit shows a comparison of these ratings-based approaches to measuring sovereign support.

To stress the difference between these two ratings, let us consider the case of Bank of America. Table 1 shows the history of changes in support ratings and support rating floors for Bank of America Corporation (the parent company) and Bank of America National Association (the largest national bank within the organization). Fitch expresses SRs on a five-notch, 1-to-5 scale, where a rating of 1 denotes a bank with extremely high probability of external support. SRFs use the AAA long-term scale, where AAA ratings indicate an extremely high probability of government support. SRFs include one additional point on the scale, "no floor" (NF),

arising from derivatives transactions and from legally enforceable guarantees and indemnities, letters of credit, and acceptances; trade receivables; and obligations arising from court judgments.

TABLE 1

## Example of Fitch Ratings

Date	Bank of America Corporation			Bank of America National Association		
	IDR	SR	SRF	IDR	SR	SRF
06/01/88	BBB	•	•	•	•	•
02/01/89	BBB+	•	•	•	•	•
02/15/89	A	•	•	•	•	•
06/01/90	A	•	•	•	1	•
02/01/91	A+	•	•	•	1	•
05/27/94	A+	•	•	AA-	1	•
10/03/95	A+	5	•	AA	1	•
04/11/96	A	5	•	AA	1	•
04/26/96	AA-	5	•	AA	1	•
05/20/96	A+	5	•	AA	1	•
10/01/98	AA-	5	•	AA	1	•
10/15/99	AA-	5	•	AA	2	•
07/22/03	AA-	5	•	AA	2	•
09/29/03	AA	5	•	AA	2	•
04/01/04	AA-	5	•	AA-	1	•
02/15/07	AA	5	•	AA	1	•
03/16/07	AA	5	NF	AA	1	A-
07/16/08	A+	5	NF	AA-	1	A-
01/16/09	A+	1	A+	A+	1	A+
12/15/11	A	1	A	A	1	A

Source: Fitch Ratings.

Notes: History of long-term issuer default ratings (IDRs), support ratings (SRs), and support rating floors (SRFs) of Bank of America Corporation and Bank of America National Association. NF is “no floor.”

bringing the total number of notches to twenty. According to Fitch, NF designates no reasonable presumption of potential support and translates to a probability of support of less than 40 percent (Fitch Ratings 2013a).

From March 16, 2007, to January 16, 2009, Bank of America Corporation (the parent) had the lowest level of external support (SR = 5), while Bank of America National Association enjoyed the highest level of external support (SR = 1). By looking at support ratings only, we cannot disentangle if the strong support of Bank of America National Association comes from the government or from the parent company. To answer this question, we turn to its support rating floor. The SRF of Bank of America National Association was A- over this period, indicative of strong government support.

The evolution of Bank of America National Association's support rating floors also shows how sovereign support to the national bank heightened two notches in January 2009 and

lessened one notch in December 2011, while external support (measured by SRs) remained constant. The difference in granularity between these two ratings is yet another advantage to using SRFs over SRs since they allow for higher precision and more variability in support.

A similar measure based on S&P ratings is currently not available since S&P does not issue ratings that allow measurement of sovereign support.

### 3. DATA AND SAMPLE CHARACTERIZATION

#### 3.1 Data

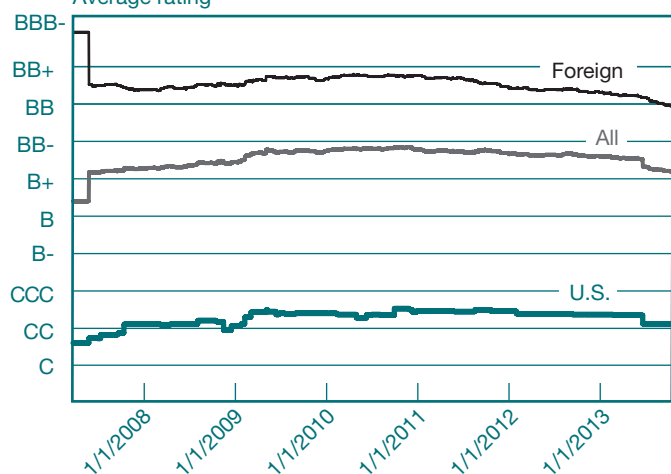
The data for this paper come from several sources. We use Bureau van Dijk's Bankscope to gather balance-sheet data on banks in our sample, including our key measures of bank risk-taking—impaired loans and net charge-offs. In addition, we use two data sets from Fitch Ratings: one containing information on government support ratings (described in detail in section 2 above) and the other containing information on bank strength ratings (long-term issuer default ratings [IDRs]). IDRs reflect Fitch's opinion on an entity's relative vulnerability to default on its financial obligations. IDRs are Fitch's primary issuer rating for financial institutions and are expressed on a AAA long-term scale, where AAA ratings denote the lowest expectation of default. IDRs incorporate not only intrinsic strength, but also external support. Even though stand-alone ratings are a cleaner measure of a bank's intrinsic strength than IDRs, we cannot rely on these ratings in our analysis because of the lack of a consistent time series during our sample period.<sup>4</sup>

<sup>4</sup> Historically, Fitch issued individual ratings on an A-E scale to assess a bank's creditworthiness on a stand-alone basis. Similar to Moody's bank financial strength ratings, these ratings aimed to capture the strength of a bank if it was unable to rely on external support. On March 7, 2011, Fitch announced a revision to the methodology used to calculate the stand-alone ratings, as well as a change from a nine-point scale (using letter ratings such as A and A/B) to a lowercase variation of the traditional nineteen-point long-term rating scale (using letter ratings such as aaa and aa+). On July 20, 2011, Fitch introduced new stand-alone ratings called viability ratings, designed to reflect the same core risks as individual ratings but with renewed definitions and greater granularity.

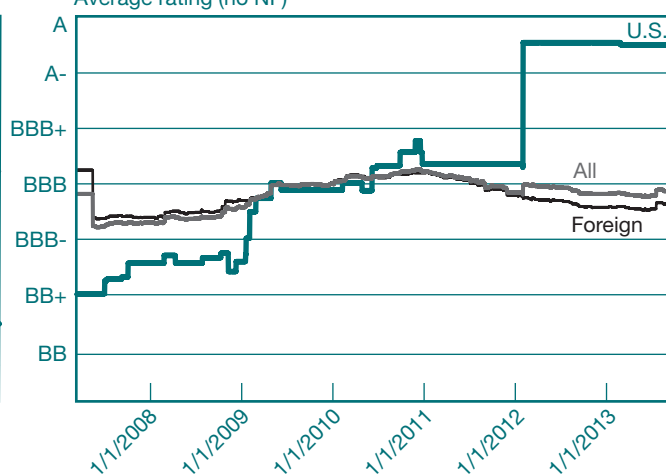
CHART 1

## Government Support by Origin

Average rating



Average rating (no NF)



Source: Authors' calculations, based on data from Fitch Ratings.

Notes: The left panel displays the average government support (measured by the support rating floor [SRF]) from March 16, 2007, to August 15, 2013, including "no floor" (NF) ratings. The right panel shows the average SRF excluding NF ratings. Trend lines capture daily ratings.

### 3.2 Sample Characterization

To construct our data set, we start with the universe of banks that have support rating floors, which Fitch began issuing on March 16, 2007. Though the most recent ratings are easily accessible online, historical ratings need manual collection. Our sample includes daily SRF observations for 612 banks (bank holding companies, commercial banks, and savings banks) from March 16, 2007, to August 15, 2013. The data span 92 countries, with 182 banks from the United States.

Our sample of changes in support rating floors comprises increases and decreases in ratings. The first change in our sample occurs on July 2, 2007, and the last one on August 14, 2013. There are 446 changes in SRFs (234 increases and 212 decreases) across 234 unique banks and 177 unique event dates. On average, each change shifts the rating about two notches.

The left panel of Chart 1 seems to support the commonly understood idea that foreign countries tend to provide stronger support to their banks than the United States does. We see the average support rating floor of a foreign bank is about four times larger than that of a U.S. bank.<sup>5</sup> Interestingly, this pattern changes dramatically when we zoom in on the set of banks with an SRF different from an NF rating: the

"supported" banks. As the right panel of Chart 1 shows, average sovereign support remains slightly humped in foreign countries (according to Fitch's ratings), but the pattern changes significantly for the United States, where, over the last six years, average government support has increased markedly. Since 2010, average sovereign support for U.S. banks has been stronger than that for foreign banks.

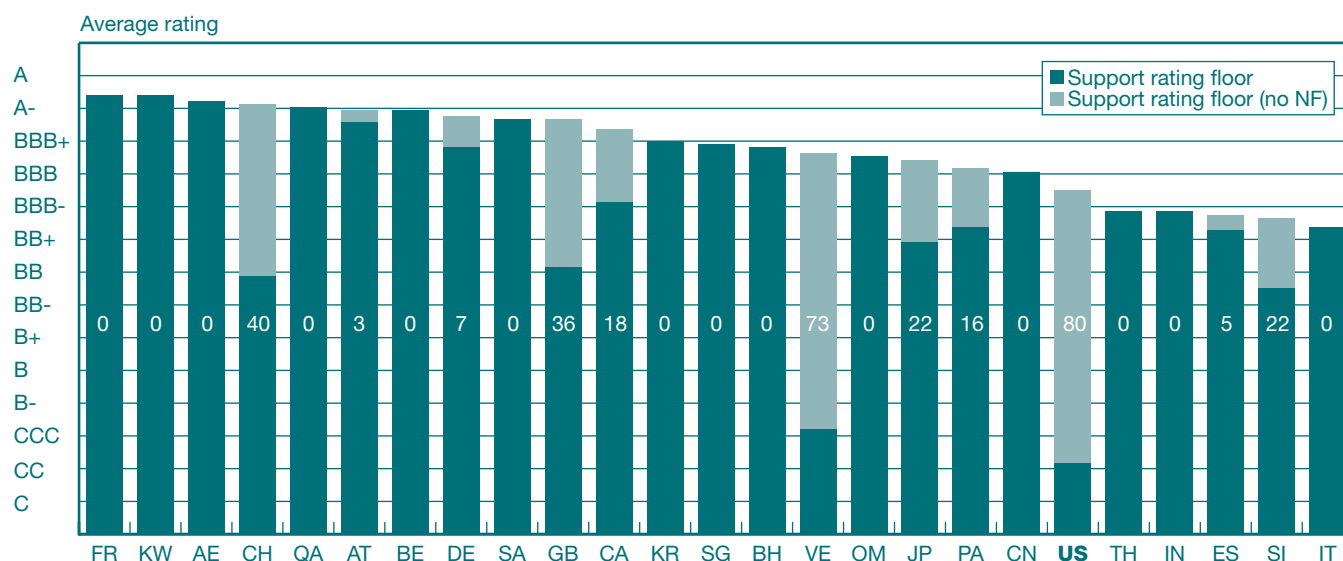
This difference in patterns seems to be driven by the larger proportion of U.S. banks that have a probability of government support lower than 40 percent. The data show that 80 percent of banks in the United States have "no floor" ratings compared with 21 percent in foreign countries. The larger the number of banks in a country with "no floor" ratings, the starker the difference between the left and right panels of Chart 1. Whether or not government support to banks is more prevalent in the United States than abroad depends on whether we take "no floor" ratings into account. Making this distinction matters because it portrays a different picture of how government support has evolved in the United States.<sup>6</sup>

<sup>5</sup> As standard in the ratings literature, we assign numeric values to the notches on the rating scale, where a value of nineteen denotes a AAA rating and zero a "no floor" rating.

<sup>6</sup> The heat map in Chart 4 highlights the unique character of the "no floor" (NF) rating. At first glance, since SRFs act as a floor for IDRs, one might think the NF rating is located one notch below D on the SRF scale. However, the distribution of IDRs for banks with NF SRFs is significantly different from IDRs for banks with SRFs expressed on the AAA scale. While banks with SRFs ranging from CCC to AA- typically have an IDR between zero to two notches higher, a bank with an NF SRF is more likely to have a BBB or A- IDR rating. This suggests a definition of average government support that excludes banks with NF ratings.



CHART 2  
Government Support by Country



Source: Authors' calculations, based on data from Fitch Ratings.

Notes: Average government support (measured by the support rating floor) by country from March 16, 2007, to August 15, 2013. Dark green bars represent average SRFs including "no floor" ratings; light green bars exclude NF ratings. The numbers in the middle of the bars indicate the percentage of "no floor" ratings in each country: France (FR), Kuwait (KW), United Arab Emirates (AE), Switzerland (CH), Qatar (QA), Austria (AT), Belgium (BE), Germany (DE), Saudi Arabia (SA), United Kingdom (GB), Canada (CA), Republic of Korea (KR), Singapore (SG), Bahrain (BH), Venezuela (VE), Oman (OM), Japan (JP), Panama (PA), China (CN), United States (US), Thailand (TH), India (IN), Spain (ES), Slovenia (SI), and Italy (IT).

Chart 2 captures this idea. It presents, for the top twenty-five countries with the strongest government support, average support rating floors including "no floor" ratings (dark green) and excluding "no floor" ratings (light green).

The cases of the United States and Venezuela stand out in that overall average sovereign support is weak but average support to banks that have a rating other than "no floor" (the "supported" banks) is very strong. Consistent with the findings of Ueda and Weder di Mauro (2012), banks headquartered in Switzerland, France, and Germany enjoy high probability of sovereign support. We also find that Arabic countries, including Kuwait, the United Arab Emirates, and Qatar, provide strong support to their banks. Table 2 shows the average level of sovereign support for the top twenty-five countries with the strongest government support as well as the number of banks per country rated by Fitch. There is significant heterogeneity in the number of rated banks per country, perhaps reflective of differences in size of each country's financial system and in the level of concentration of their banking sectors.

For information on credit quality and exposure to default, we use long-term issuer default ratings issued by Fitch. For

each bank in our sample, we obtain the history of changes in IDRs from January 1, 1988, to August 15, 2013. To present summary statistics on a comparable sample, we restrict our attention to IDR observations for which we also see an SRF. Chart 3 shows the distribution of SRFs (left) and IDRs (right) for the sample of 612 banks.

Recall from sections 2 and 3 that support rating floors reflect government support while long-term issuer default ratings incorporate both intrinsic and external support. As such, a bank's SRF acts as a floor for its IDR. Chart 4 highlights this relationship by presenting the distribution of IDRs by SRFs. The intensity of each symbol denotes the frequency (that is, a darker square indicates a more frequent relationship).

As expected, many bank ratings lie on the diagonal, indicating that Fitch's assessment of a bank's relative vulnerability to default and of a government's propensity to support a bank are identical. The rest of the observations are on the upper diagonals of the heat map, which denote that the overall strength of a bank exceeds its sovereign support. It is also interesting to note that banks rated with a probability of sovereign support of less than 40 percent (SRF = NF) are rated with IDRs ranging



TABLE 2

## Average Government Support

	Name	SRF (no NF)	SRF	Percent NF	Banks	Days	Observations
1	France	14.3	14.3	0	5	2,345	9,303
2	Kuwait	14.3	14.3	0	5	2,283	11,415
3	United Arab Emirates	14.1	14.1	0	8	2,283	15,866
4	Switzerland	14.0	8.4	40	5	2,345	11,725
5	Qatar	13.9	13.9	0	5	2,283	9,283
6	Austria	13.8	13.4	3	5	2,345	7,295
7	Belgium	13.8	13.8	0	5	2,345	9,687
8	Germany	13.6	12.6	7	7	2,345	12,215
9	Saudi Arabia	13.5	13.5	0	9	2,283	20,547
10	United Kingdom	13.4	8.7	36	20	2,345	39,843
11	Canada	13.2	10.8	18	6	2,345	13,100
12	Republic of Korea	12.8	12.8	0	5	2,283	11,415
13	Singapore	12.7	12.7	0	5	2,345	11,725
14	Bahrain	12.6	12.6	0	5	2,283	8,589
15	Venezuela	12.3	3.4	73	8	2,345	16,901
16	Oman	12.3	12.3	0	5	2,283	8,330
17	Japan	12.2	9.5	22	10	2,345	21,480
18	Panama	11.9	10.0	16	7	2,283	12,222
19	China	11.8	11.8	0	13	2,283	14,233
20	United States	11.1	2.3	80	186	2,345	342,905
21	Thailand	10.5	10.5	0	8	2,345	14,836
22	India	10.5	10.5	0	8	2,345	13,949
23	Spain	10.4	9.9	5	17	2,345	22,677
24	Slovenia	10.2	8.0	22	5	2,283	11,240
25	Italy	10.0	10.0	0	8	2,345	16,365

Source: Authors' calculations, based on data from Fitch Ratings.

Notes: The table reports each country's mean support rating floor (SRF) for countries with at least five rated banks (top twenty-five only). Ratings were issued from March 16, 2007, to August 15, 2013. NF is "no floor."

from D to AA+. Having risky banks among those with a probability of sovereign support of less than 40 percent suggests that risk alone does not drive the probability of government support. This would be the case, for example, for small banks that may not receive government support regardless of their overall financial strength.

Finally, we use the Bankscope database to augment the ratings data with quarterly information on bank characteristics spanning 2007:Q1 to 2013:Q3. Fitch issues support rating floors at the entity level, so we keep in our sample parent banks and their subsidiaries when there are multiple entities for a consolidated bank in Bankscope.

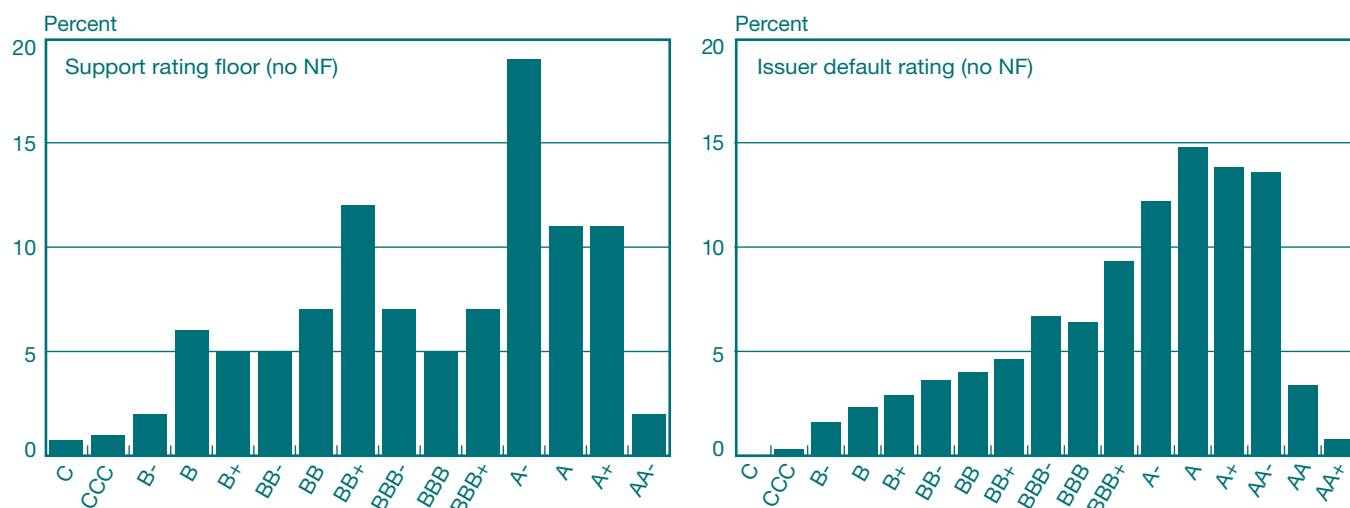
The matched sample consists of 11,929 bank-quarter observations for 601 banks.

Because of the global nature of our data, we are missing balance-sheet information for approximately 59 percent of our bank-quarter observations for which we have SRFs. To alleviate this problem, we linearly interpolate adjacent data if they are missing for less than one year in duration. Interpolation recovers approximately 15 percent of our potential data, reducing the proportion missing to 44 percent.<sup>7</sup> After matching and interpolation, we further limit our sample

<sup>7</sup> Results are qualitatively similar in the analysis without interpolation.

CHART 3

## Distribution of Fitch Ratings

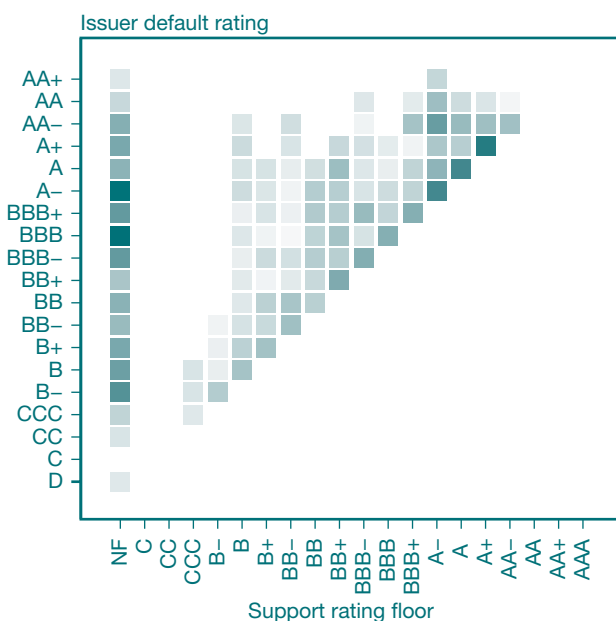


Source: Authors' calculations, based on data from Fitch Ratings.

Notes: Histograms include observations for banks with support rating floors and issuer default ratings from March 16, 2007, to August 15, 2013. Both panels exclude observations where the banks have a support rating floor of "no floor" (NF).

CHART 4

## Fitch Ratings Heat Map

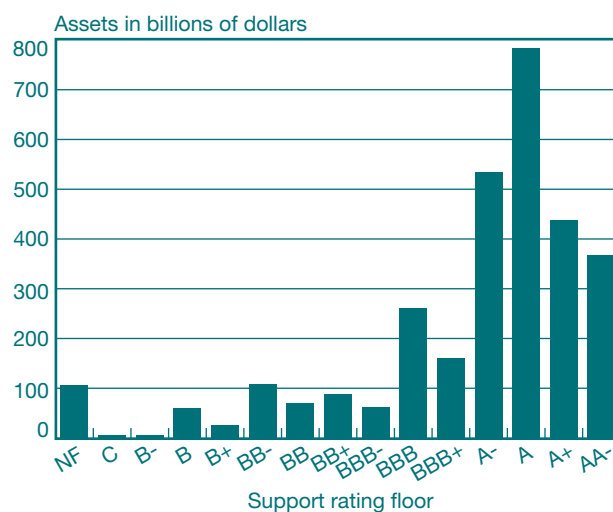


Source: Authors' calculations, based on data from Fitch Ratings.

Notes: The chart shows the distribution of issuer default ratings by support rating floor. The intensity of each symbol indicates the frequency; darker squares denote a more frequent relationship.

CHART 5

## Distribution of Bank Size by Government Support



Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Note: The chart shows total assets of banks with support rating floors and issuer default ratings from March 16, 2007, to August 15, 2013, by category of government support.

TABLE 3  
Summary Statistics

		Support Rating Floors							Total
		NF	C-CCC	B	BB	BBB	A	AA-AAA	
Total assets	Mean	110	4.2	53	92	150	600	370	200
	Median	16	4.2	33	46	51	190	180	22
	Standard deviation	380	•	45	110	180	780	690	500
Impaired loans	Mean	2.50	1.81	3.23	2.48	2.78	2.24	1.82	2.48
	Median	1.97	1.81	2.96	1.80	0.95	1.38	1.77	1.85
	Standard deviation	2.46	•	1.99	2.44	4.56	2.77	0.45	2.61
Net charge-offs	Mean	0.66	0.44	0.66	0.34	0.17	0.50	0.07	0.59
	Median	0.29	0.44	0.51	0.07	0.05	0.10	0.06	0.22
	Standard deviation	1.02	•	0.66	0.56	0.27	1.22	0.11	1.01
Return on assets	Mean	0.17	1.09	0.25	0.64	0.55	0.40	0.41	0.27
	Median	0.21	1.09	0.14	0.56	0.63	0.27	0.33	0.24
	Standard deviation	0.59	•	0.57	0.50	0.85	0.45	0.30	0.59
Tier 1 capital	Mean	11.34	6.44	8.45	8.99	7.78	11.24	6.03	10.89
	Median	9.38	6.44	8.60	8.54	7.38	7.40	4.99	8.86
	Standard deviation	11.16	•	1.79	3.00	2.99	14.23	2.45	11.08
Trading assets	Mean	1.16	0.10	2.22	2.07	3.21	3.72	3.14	1.83
	Median	0.04	0.10	1.10	0.67	0.73	0.50	3.29	0.13
	Standard deviation	4.27	•	3.45	3.47	4.20	5.35	2.49	4.53
Observations		1,153	1	52	131	65	327	10	1,739

Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Notes: The table presents summary statistics on total assets and our risk variable ratios by bins of government support. We rely on the following variables from Bankscope (series in parentheses): total assets (DATA2025), impaired loans (DATA2170), net charge-offs (DATA2150), net income (DATA2115), tier 1 capital (DATA2140), and trading assets (DATA29190). We normalize each risk measure by total assets, converted to 2012 U.S. dollars and presented in millions. NF is "no floor."

to banks with information on total assets, impaired loans, net charge-offs, tier 1 capital, and trading assets. This step leads to a final data set with 1,739 bank-quarter observations.

Most banks in the sample (75 percent) have investment-grade ratings. Many (38 percent) also have government support of BBB- or above. The median bank has total assets of \$22 billion, while the average bank has assets of \$200 billion. Size, however, changes significantly by level of government support, with highly supported banks being typically larger. The bank with a C-CCC rating (the lowest SRF in our sample) has close to \$4 billion in total assets while those with an AA-AAA rating are almost 100 times larger on average. Chart 5 shows this pattern, which is consistent with the literature that documents a positive relationship between size and government support.

Banks with a higher probability of government support also have more trading assets on average. However, as shown in Table 3, we do not find a similar pattern with return on assets (ROA), impaired loans, net charge-offs, or tier 1 capital. In our sample, the average bank has an ROA of 0.27 percent, an impaired loan ratio of 2.48 percent, a net charge-off ratio of 0.59 percent, and a tier 1 capital ratio of 10.89 percent. Table 3 tabulates descriptive statistics for our sample.

## 4. METHODOLOGY AND EMPIRICAL STRATEGY

The goal of our analysis is to investigate whether banks with higher government support engage in riskier activities. To test this hypothesis, we use a panel of bank-level data. After matching and interpolating, we further limit our sample to banks with information on total assets, impaired loans, net charge-offs, tier 1 capital, and trading assets. This restriction leads to a final panel data set with 1,739 bank-quarter observations. Although 85 percent of our bank-quarter observations correspond to domestic banks, our sample retains a global nature, spanning 224 banks in 45 countries.

We first measure the riskiness of a bank's activities by the ratio of impaired loans to total assets. We also present results for alternative measures of risk, including ratios of net charge-offs, net income, tier 1 capital, and trading assets to total assets.<sup>8</sup> Specifically, we investigate whether the ratio of impaired loans to total assets relates to government support of banks. Since we expect that a bank's response to sovereign support might take time to show up on its balance sheet, we estimate specifications of our model with progressively higher lags for all right-hand-side variables. To that end, we estimate the following model:

$$1) \quad Risk_{b,t} = \beta * SRF_{b,t-i} + \delta * IDR_{b,t-i} + \eta * Assets_{b,t-i} + \mu * OtherRisk_{b,t-i} + \gamma * Z_b + \tau * X_t + \varepsilon_{b,t},$$

where  $b$  indexes banks,  $t$  denotes time in quarters, and  $i = \{1, \dots, 11\}$  indicates the number of lags. The availability of data determines the maximum number of lags (eleven). The dependent variable  $Risk_{b,t}$  is a measure of bank riskiness. In our baseline specification, we measure riskiness as the ratio of impaired loans to total assets.  $SRF_{b,t}$  denotes the support rating floor of bank  $b$  at the end of quarter  $t$ ;  $IDR_{b,t}$  indicates the long-term issuer default rating of bank  $b$  at the end of quarter  $t$ ; and  $Assets_{b,t}$  is the natural logarithm of total assets in U.S. dollars, normalized using the consumer price index.<sup>9</sup>  $OtherRisk_{b,t}$  is a vector of our remaining risk measures as bank controls. In the baseline specification, this vector includes net charge-offs/total assets, return on assets (net income/total assets), tier 1 capital/total assets, and trading assets/total assets.

<sup>8</sup> Data on these risk measures are from Bankscope. In particular, we use the following series: DATA2170 (impaired loans), DATA2025 (total assets), DATA2115 (net income), DATA2140 (tier 1 capital), DATA2150 (net charge-offs), and DATA29190 (total trading assets).

<sup>9</sup> We use 2012 dollars as the baseline. We pull the "All Urban Consumers, All Items, Not Seasonally Adjusted" series from Federal Reserve Economic Data.

$\varepsilon_{b,t}$  is the error term. All specifications control for country fixed effects  $Z_b$  and quarter-year fixed effects  $X_t$ . We also consider specifications in which we control for bank-fixed effects instead of country-fixed effects. We refer to this alternative specification as Model 2. The standard errors are robust and adjusted to control for clustering at the bank level.

Finally, since a bank's creditworthiness will likely play a role in the effect of government support on its risk-taking activities, we also consider a version of our model that includes the interaction between the support rating floor and the long-term issuer default rating,  $\varphi * SRF_{b,t-i} * IDR_{b,t-i}$ .

## 5. RESULTS

### 5.1 Impaired Loans

Impaired loans are those that are either in default or close to default. These loans are typically behind in payments or restructured from a previous loan. They constitute a good measure of the amount of bad debt currently in the loan portfolio of a bank. Regulatory agencies require banks to write down loans as impaired under specific delinquency criteria, which may vary by country. Typically, regulators classify loans that are delinquent for ninety days (one quarter) as impaired.

In our analysis, we use impaired loans (from Bankscope) as our baseline measure of a bank's riskiness. The main hypothesis that we intend to test is that banks with higher government support engage in riskier (lending) activities. Specifically, if the level of government support affects bank preferences for risk, we would expect that banks with stronger SRFs would engage in riskier lending activity. This, in turn, implies that more loans would become delinquent, resulting in an increase in impaired loans in the following quarters.

Table 4 summarizes our results. It presents the value of the coefficient  $\beta$  on the SRF in our models of risk for different lags (one to eleven quarters) of sovereign support. The top rows of panel A show the effect of government support on the level of impaired loans. The main finding is that stronger sovereign support is associated with an increase in the ratio of impaired loans to total assets. In the model that includes country-fixed effects but no bank-fixed effects (Model 1), this result is statistically significant at the 1 percent level and the effect is economically meaningful; each notch increase in the SRF increases the impaired loan ratio by just under 0.2, which is an approximately 8 percent increase for the average

TABLE 4  
Bank Risk Response to Government Support

Panel A: Risk Measures

Variable	Model	Lags										
		1	2	3	4	5	6	7	8	9	10	11
Impaired loans	1	0.17***	0.18***	0.18***	0.19***	0.18***	0.19***	0.20***	0.20***	0.20***	0.20***	0.21***
	2	0.01	0.01	0.01	0.02	0.02	0.03	0.24*	0.26**	0.24*	0.20**	0.12***
Net charge-offs	1	-0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2	0.02***	0.02***	0.02**	0.02*	0.03***	0.02	0.08***	0.08***	0.05***	0.03***	0.06***
Observations		1,491	1,313	1,149	1,003	888	790	697	613	528	443	363

Panel B: Other Measures

Variable	Model	Lags										
		1	2	3	4	5	6	7	8	9	10	11
Return on assets	1	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01
	2	-0.00	-0.00	-0.00	-0.00	-0.00	-0.01	0.02	0.02	0.03	0.02	-0.02
Tier 1 capital	1	0.38*	0.38*	0.39*	0.40*	0.42*	0.42**	0.41**	0.40**	0.41**	0.36**	0.25*
	2	-0.04*	-0.04**	-0.05*	-0.02	0.04	0.17	1.36	1.50	1.76	1.32	0.85
Trading assets	1	0.06	0.07	0.07	0.06	0.06	0.05	0.05	0.05	0.05	0.06	0.06
	2	-0.06	-0.08*	-0.08	-0.10	-0.02	-0.05	-0.09	-0.05	-0.03	0.02	0.06
Observations		1,491	1,313	1,149	1,003	888	790	697	613	528	443	363

Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Notes: The table presents results on the relationship between government support and bank risk-taking. For each measure of bank risk, we report the value of the estimated coefficient on the support rating floor for different lags (one to eleven quarters). Model 1 corresponds to the analysis with country-fixed effects and without bank-fixed effects. Model 2 includes bank-fixed effects, but no country-fixed effects. Each specification uses robust standard errors clustered by bank.

\*\*\* Statistically significant at the 1 percent level.

\*\* Statistically significant at the 5 percent level.

\* Statistically significant at the 10 percent level.

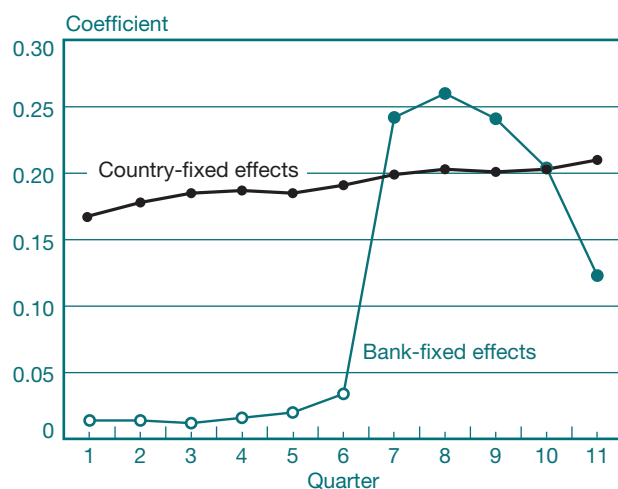
bank. The effect is persistent and roughly constant through the following ten quarters.

Results are similar but weaker in the analysis that includes bank- instead of country-fixed effects (Model 2). In particular, we find a statistically and economically significant effect of sovereign support on the proportion of a bank's impaired loans approximately seven quarters ahead. The lack of within-bank variation in government support may drive this weakness, as suggested by the lower *t*-statistics.

Chart 6 presents the relevant coefficients for both models. The circles and closed circles correspond, respectively, to the values and significance at the 10 percent level of the

support-rating floor coefficient through time. This graphing of our results illustrates the importance of timing after a change in the SRF. The black line of Chart 6 shows that an increase in sovereign support leads to a rise in the ratio of impaired loans as early as a quarter after the change in support in the model with country-fixed effects. We also see that this result is persistent and statistically significant through the following ten quarters. The green line presents the results of the specifications that control for bank-fixed effects (but no country-fixed effects). An increase in government support to a bank also leads to a higher impaired loan ratio, but the effect is only significant seven quarters after the change.

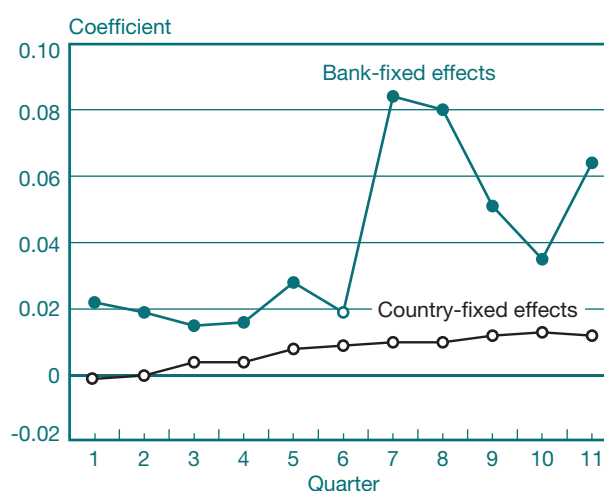
CHART 6  
Effect of Government Support  
on Impaired Loans



Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Notes: The chart presents results on the relationship between government support and impaired loans. The circles illustrate the value of the estimated coefficient on the support rating floor through time (one- to eleven-quarter lags). The closed circles denote significance at the 10 percent level. The black and green lines correspond to Models 1 and 2, respectively. Each specification uses robust standard errors clustered by bank.

CHART 7  
Effect of Government Support  
on Net Charge-Offs



Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Notes: The table presents results on the relationship between government support and net charge-offs. The circles illustrate the value of the estimated coefficient on the support rating floor through time (one- to eleven-quarter lags). The closed circles denote significance at the 10 percent level. The black and green lines correspond to Models 1 and 2, respectively. Each specification uses robust standard errors clustered by bank.

## 5.2 Net Charge-Offs

For robustness, we also look at alternative measures of a bank's riskiness. Net charge-offs are often used as a proxy for bank risk because they tend to increase with riskier lending activities. They are defined as the difference between charge-offs and recoveries, where charge-offs are debts that a bank declares likely uncollectible and recoveries are collections on debts that a bank had previously written down as charge-offs. As with impaired loans, we scale net charge-offs by the total assets of the bank. Similar to our test based on impaired loans, if changes in sovereign support affect bank preferences for risk, then we expect that increases in support rating floors would lead to riskier lending activity, resulting in an increase in net charge-offs.

The second set of rows in panel A of Table 4 presents the results of the analysis where the dependent variable is net charge-offs, with country-fixed (Model 1) and bank-fixed (Model 2) effects. Our findings support and complement our

previous result that stronger sovereign support is associated with an increase in riskier lending activity. When we control for bank-fixed effects (Model 2), we find that the effect is statistically and economically meaningful, comprising a change in net charge-offs of approximately 0.04 per SRF notch, or 7 percent of an average bank's net-charge-off level. Chart 7 shows these results. The coefficients on sovereign support are positive but not statistically significant in the model with country-fixed effects.

The dynamics and timing of debt charge-offs are complex. On the one hand, there is guidance from governments and regulators to encourage early charge-offs through tax exemptions and regulatory enforcement. On the other hand, banks still retain some discretion and may prefer to delay charging off debt within the timing established by the regulatory guidelines. Consistent with this pattern in the timing of charge-offs, we find that the effect is strongly significant for the two quarters following a change in support; it becomes weaker for the third to sixth quarters and then strongly significant after seven quarters.

TABLE 5

## Impaired Loan Response, Interaction

Panel A: Model 1

Coefficient	Lags										
	1	2	3	4	5	6	7	8	9	10	11
SRF	0.75** (2.23)	0.81** (2.24)	0.86** (2.21)	0.93** (2.22)	1.04** (2.39)	1.05** (2.38)	1.19** (2.41)	1.29** (2.43)	1.34** (2.52)	1.35** (2.55)	1.30** (2.54)
SRF * IDR	-0.04* (-1.78)	-0.04* (-1.80)	-0.04* (-1.76)	-0.05* (-1.79)	-0.06* (-1.97)	-0.06* (-1.94)	-0.06** (-2.00)	-0.07** (-2.04)	-0.07** (-2.14)	-0.07** (-2.17)	-0.07** (-2.14)
IDR	-0.46*** (-3.38)	-0.45*** (-3.18)	-0.44*** (-2.91)	-0.41** (-2.58)	-0.39** (-2.27)	-0.38** (-2.17)	-0.37** (-2.04)	-0.35* (-1.97)	-0.33* (-1.87)	-0.33* (-1.90)	-0.34** (-2.00)
Observations	1,491	1,313	1,149	1,003	888	790	697	613	528	443	363

Panel B: Model 2

Coefficient	Lags										
	1	2	3	4	5	6	7	8	9	10	11
SRF	0.28 (1.35)	0.29 (1.31)	0.34 (1.61)	0.41** (2.01)	0.60*** (3.88)	0.63* (1.85)	0.80** (2.42)	0.63** (2.16)	0.60** (2.37)	0.47* (1.89)	0.35* (1.93)
SRF * IDR	-0.02 (-1.29)	-0.02 (-1.26)	-0.02 (-1.56)	-0.03* (-1.93)	-0.04*** (-3.72)	-0.04* (-1.79)	-0.04* (-1.88)	-0.02 (-1.39)	-0.02 (-1.66)	-0.02 (-1.13)	-0.01 (-1.33)
IDR	-0.24 (-1.65)	-0.12 (-0.88)	0.03 (0.20)	0.19 (1.47)	0.25* (1.89)	0.21** (2.26)	0.22*** (2.88)	0.16 (1.44)	0.22*** (2.83)	0.18** (2.35)	0.24*** (3.72)
Observations	1,491	1,313	1,149	1,003	888	790	697	613	528	443	363

Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Notes: The table presents results on the relationship between government support, credit quality, and impaired loans. We report the value of the estimated coefficient on the support rating floor (SRF), issuer default rating (IDR), and their interaction for different lags (one to eleven quarters). Model 1 in panel A corresponds to the analysis with country-fixed effects and without bank-fixed effects. Model 2 in Panel B includes bank-fixed effects, but no country-fixed effects. Each specification uses robust standard errors clustered by bank.

\*\*\* Statistically significant at the 1 percent level.

\*\* Statistically significant at the 5 percent level.

\* Statistically significant at the 10 percent level.

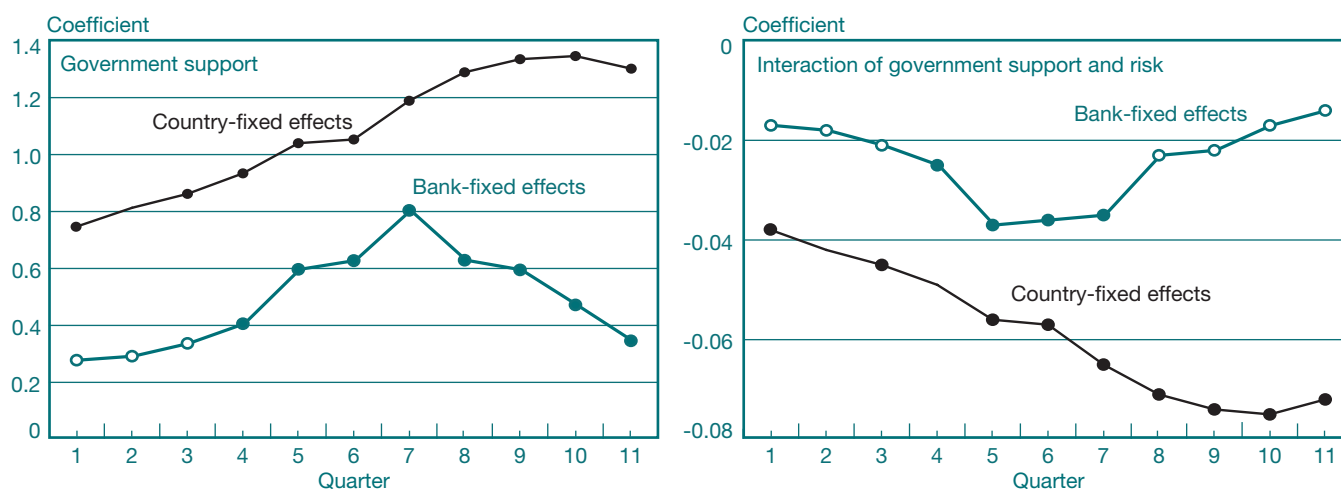
### 5.3 Does Government Support Have a Bigger Effect on Riskier Banks?

The results that we have reported thus far suggest that government support influences bank preference for risk. Given that finding, a natural question to ask is whether the link between government support and bank risk-taking varies with a bank's creditworthiness. We are particularly interested in finding out whether the link is stronger for riskier banks because, all else equal, we would expect these banks to be more prone to taking on additional risks. To test this hypothesis, we extend our impaired-loans regression

analysis and include a term for the interaction of the support rating floor and the issuer default rating. The size of the interaction captures the marginal effect of government support for safe banks relative to risky banks. As before, we estimate two models: one with country-fixed effects, Model 1, and the other with bank-fixed effects, Model 2. We include the same controls for bank size and risk, that is, (the natural logarithm of) assets and our remaining risk ratios (net charge-offs/total assets, ROA [net income/total assets], tier 1 capital/total assets, and trading assets/total assets). In each model, we estimate the different specifications for one-through eleven-quarter lags.



CHART 8  
Effects on Impaired Loans, Interaction



Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Notes: The chart presents results on the relationship between government support, credit quality, and impaired loans in our interaction regressions. The left panel represents the support rating floor coefficient; the right panel represents the support rating floor interacted with the issuer default rating coefficient. The circles illustrate the respective values of the estimated coefficients through time (one- to eleven-quarter lags). The closed circles denote significance at the 10 percent level. The black and green lines correspond to Models 1 and 2, respectively. Each specification uses robust standard errors clustered by bank.

Table 5 summarizes our results. Our main variables of interest are SRF and SRF \* IDR. For completeness, we also present the coefficient on the IDR. Panel A shows Model 1, which includes country-fixed effects, while panel B presents Model 2, which includes bank-fixed effects. Each column indicates a different quarter-lag specification. Chart 8 illustrates the timing of the SRF and SRF \* IDR coefficients in the left and right panels, respectively.

Looking across the eleven specifications in Model 1, each with a different lag, we find a persistent, statistically significant relationship for all three coefficients. As before, the level of impaired loans in a bank loan portfolio increases directly with the level of government support. Reflecting the timing of impairment, this effect increases with higher lags. Similarly, the interaction of the SRF and the IDR grows increasingly negative and significant, indicating that riskier banks are more likely to take advantage of potential sovereign support. In other words, though all banks increase impaired loans proportionately to their SRF, riskier banks do so even more. For each one-notch level of the IDR, a one-notch change in the SRF increases the impaired loan ratio by approximately 2 percent for the average bank. When we control for bank-fixed effects in Model 2, the interaction effect is still present, but it is significant only if we examine lags four through seven.

## 6. ROBUSTNESS

### 6.1 Other Measures of Risk

For completeness of our analysis, we consider three additional measures of bank risk: the tier 1 capital ratio (tier 1 capital/total assets), return on assets (net income/total assets), and trading assets (trading assets/total assets). The traditional rationale behind capital requirements is that capital acts as a buffer for protection against unexpected losses. In that sense, a higher capital ratio implies a safer bank. However, capital can also act as a measure of bank risk: The amount of capital a bank needs for protection against losses is closely related to the risk profile of the bank that will ultimately lead to those losses. From this perspective, a higher capital ratio is indicative of a riskier bank because of the requirement of a higher buffer against losses. ROA captures the profitability of a bank's assets. Banks with higher ROA typically have riskier asset portfolios and, as such, ROA can be considered a proxy for the risk preference of a bank. In a related spirit, trading assets can also act as an indirect measure of bank risk. Trading

TABLE 6

## Bank Risk Response to Government Support, Domestic Subsample

## Panel A: Baseline

Variable	Coefficient	Model	Lags										
			1	2	3	4	5	6	7	8	9	10	11
Impaired loans	SRF	1	0.18***	0.19***	0.19***	0.19***	0.19***	0.19***	0.20***	0.20***	0.20***	0.20***	0.21***
		2	0.01	0.01	0.01	0.02	0.02	0.04	0.24*	0.26**	0.24*	0.20**	0.12***
Net charge-offs	SRF	1	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
		2	0.02***	0.02***	0.02**	0.02*	0.03***	0.02	0.09***	0.08***	0.05***	0.04***	0.06***
Observations			1,267	1,155	1,047	943	854	768	684	604	522	440	361

## Panel B: Interactions

Variable	Coefficient	Model	Lags										
			1	2	3	4	5	6	7	8	9	10	11
Impaired loans	SRF	1	1.30**	1.32**	1.30**	1.25**	1.29**	1.22**	1.28**	1.29**	1.34**	1.35**	1.30**
		2	0.30	0.29	0.34	0.41**	0.60***	0.65*	0.81**	0.63**	0.60**	0.47*	0.35*
Impaired loans	SRF * IDR	1	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.08**	-0.07**
		2	-0.02	-0.02	-0.02	-0.03*	-0.04***	-0.04*	-0.04*	-0.02	-0.02*	-0.02	-0.01
Observations			1,267	1,155	1,047	943	854	768	684	604	522	440	361

Source: Authors' calculations, based on data from Fitch Ratings and Bureau van Dijk's Bankscope.

Notes: The table presents results on the relationship between government support and bank risk-taking for U.S. banks only. Panel A corresponds to the baseline specification. Panel B corresponds to the interactions specification. We report the value of the relevant estimated coefficient for different lags (one to eleven quarters). Model 1 corresponds to the analysis with country-fixed effects and without bank-fixed effects. Model 2 includes bank-fixed effects, but no country-fixed effects. Each specification uses robust standard errors clustered by bank. SRF is the support rating floor. IDR is the long-term issuer default rating.

\*\*\* Statistically significant at the 1 percent level.

\*\* Statistically significant at the 5 percent level.

\* Statistically significant at the 10 percent level.

assets are securities that banks hold for reselling at a profit (as opposed to investment purposes). As a result, we could expect that banks with a higher ratio of trading assets to total assets would engage in riskier activities. We do not discuss composite measures of bank risk, such as z-scores, because of data-availability limitations.

As shown in panel B of Table 4, banks with stronger government support have a higher tier 1 capital ratio, ROA, and trading asset ratio in the specifications with country-fixed effects. The effect is statistically significant only for the tier 1 capital ratio. As an additional robustness test to this interesting result, we consider an alternative definition of the capital ratio, calculated as the ratio of tier 1 capital to risk-weighted assets. This analysis takes into account the riskiness of bank asset portfolios. Results are similar (statistically significant at

the 5 percent level in the model with country-fixed effects) and consistent with the second interpretation of bank capital, in which riskier banks hold higher capital.<sup>10</sup>

## 6.2 Domestic Banks

In our analysis, we derive all of our results with country-fixed effects (Model 1) or bank-fixed effects (Model 2). Nonetheless, one may still worry about the large diversity of countries included in our sample. To address this concern, we limit our sample to include only banks headquartered in the

<sup>10</sup> Analysis not included, available upon request.

United States, which is the country with the largest number of banks in the sample. We are interested in understanding if the relationship between sovereign support and risk-taking documented in sections 5.1-5.3 is also present in the United States. Table 6 summarizes our main results.

We see in panel A of Table 6, consistent with our previous findings, that an increase in government support leads to a higher ratio of impaired loans and to higher net charge-offs. Similar to our results for the global sample, the effect on impaired loans is stronger for riskier banks, reflecting the fact that they are more likely to exploit potential sovereign support by engaging in even riskier activities than their safer counterparts do (panel B of Table 6).

### 6.3 Alternative Hypothesis

In this paper, we find evidence that suggests that banks with stronger sovereign support engage in riskier lending activities, which translates into a higher ratio of impaired loans. One alternative hypothesis could be that financial conditions were already deteriorating, which would lead to a higher ratio of impaired loans. Although we cannot completely rule out this premise, all of our specifications control for bank credit quality. Specifically, as shown in section 4, we control for the long-term issuer default rating of each bank at the end of each quarter to take into account variation in bank financial strength.

In addition, our results in Table 4 and Chart 6 show that the effect becomes stronger, rather than weaker, over time (that is, the value of the coefficient on government support is increasing with the number of lags). This finding is inconsistent with a story in which the deterioration was already taking place and the change in sovereign support is a response to worsening conditions.

Also inconsistent with the alternative hypothesis are our findings on the tier 1 capital ratio. If stronger government support was the response to a bank's weaker conditions, we would expect the tier 1 capital ratio to decrease rather than increase (panel B of Table 4).

As an additional robustness test, we also consider a variation of our sample in which we exclude banks that experience a simultaneous (within-quarter) change in both sovereign support and credit quality. The idea behind this analysis is to consider a sample without potential contamination of the identification. After dropping such banks from our sample (23 percent of SRF changes), we find qualitatively similar results. Overall, all these findings support our initial hypothesis that banks with stronger government support take on more risk.

## 7. FINAL REMARKS

This study offers new and relevant evidence on a long-debated question: Does the too-big-to-fail status increase bank risk-taking incentives? Our evidence is novel because it focuses on Fitch's new support rating floors, which aim at isolating the likelihood of governmental support from other sources of external support. Of course, SRFs only reflect Fitch's opinion of potential government support and of the government's ability to support a bank. As is the case in all studies based on ratings, our results hinge on this assessment's reliability. The key advantage of our approach is that support rating floors only include (Fitch's views on) sovereign support, and exclude parent corporations' support.

Our findings are also innovative in that we focus on impaired loans to measure bank risk-taking incentives. This analysis is important because impaired loans, in contrast to other, more general measures of risk, are more directly under bank control. Our results account for the governmental interventions during the financial crisis, but do not reflect the long-term effects that may arise from the regulatory changes introduced in its aftermath. An interesting area for future research would be to investigate to what extent the new regulations, in particular those dealing with the too-big-to-fail banks, affect the link we unveiled between the likelihood of governmental support and bank risk-taking policies.

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