Implicit guarantees and market discipline: Has anything changed over the financial crisis?*

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Abstract

This paper provides a quantitative assessment of the long-run effect of implicit bailout guarantees and analyzes how the effect of market discipline has changed over the financial crisis. By using bank-specific information on CDS spreads as well as ratings regarding the financial strength and regarding the probability for receiving external support, we confirm the existence of cost advantages for banks that benefit from implicit guarantees. We further highlight the significantly heterogeneous effect of the intrinsic creditworthiness of a financial institution: Banks are punished for excessive risk-taking the more the lower the probability for external support. Moreover, we show that banks' individual strength and banks' support were priced heterogeneously over the various episodes of the financial crisis.

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1 Introduction

The importance of market discipline as a regulatory instrument has been stressed extensively by both academics and policy makers. Due to its importance, the principle has been included in the Basel framework as the third pillar. However, the most recent financial crisis has demonstrated the power of a strong antagonist of market discipline, the too-systemic-to-fail doctrine. Whenever the expected costs of a bank failure in terms of negative externalities on the rest of the financial system exceed the costs of a bailout, financial support will be provided to a financial institution in case of distress. Debt holders benefit from this contingency insurance since they do not have to carry the entire loss in case of a default which in turn should weaken market discipline. The aim of this paper is to analyze both principles. In a first step, we will provide a quantitative assessment of the long-run effect of both implicit bailout guarantees and market discipline. This exercise is similar to the ongoing research on quantifying the value of governmental subsidies. In a second step, after having derived the value of the contingency insurance, we will then qualify the disciplinary effect of markets in the run-up to the financial crisis.

The fact that the too-systemic-to-fail doctrine is an antagonist of the principle of market discipline has been known by policy makers for quite a long time, with the intention to disentangle the two principles by generating a 'constructive ambiguity' about the probability of external support in case of a bank's default. However, in case of a systemic crisis event, the 'constructive ambiguity' might convert to a principle of 'almost certainty', as the most recent financial crisis has demonstrated as a real-life example. Even small banks have received bailout subsidies which yield to a decrease in market discipline (see, e.g., Hett and Schmidt (2013)).

This paper provides some contradictory evidence on this point. In line with Barth and Schnabel (2013), we find that market participants have priced the individual strength of a bank to a larger extent after the recent crisis in the risk premium they demand for insuring their senior debt claims. Moreover, we find a positive value for the implicit government insurance in line with the literature on quantifying the value of bank's bailout subsidy. The value of this insurance, however, is found to be heterogeneous across the intrinsic financial strength of an institution. Markets price the value of the bailout subsidy particularly high for banks with a weak intrinsic financial strength.

Concerning the strand of the literature on quantifying the value of structural subsidies for

systemically relevant financial institutions, there are in fact three different approaches in common place.[1] First, there are contingent claims models that use option pricing theory in order to determine the value of the subsidy. This methodology compares actual CDS-spreads on bank bonds that take into account both the probability of bank distress and the probability for receiving extraordinary support if needed with a counter-factual fair-value CDS-spread derived from equity prices that disregards the possibility of government support. The starting point of deriving a fair CDS price is the condition that the value of the governmental subsidy can be understood as the value of a put option. If the value of a firm's total assets is above the threshold minimum asset value at the time the option expires, the option would be worthless. But if the value of assets breaches this threshold, the option's payoff would be the difference between the threshold and the asset values. This method was applied for example by Schweikhard and Tsesmelidakis (2012) who use a Merton-type credit model to investigate the impact of government guarantees on the pricing of debt. The paper concludes that there exists a significant relationship between the systemic relevance of an institution and the difference between its actual and fair-value CDS-spread. The contingent claim approach, however, is very sensitive towards different assumptions for calculating a fair value of a CDS-spread, in particular with respect to the calculation of the firm's risk-neutral survival probability. A second methodology to quantify the value of bailout subsidies is the simple comparison of bond yields of the two groups of banks, systemically important banks and non-systemically important banks. Acharya, Anginer, and Warburton (2014) for example apply this methodology and find bond credit spreads to be sensitive to risk for most financial institutions, but not for the largest ones. The authors conclude from this negative relationship between the risk premium and an institution's systemic importance that there is lower market discipline for systemic important banks. A similar study has been conducted by Santos (2014) who finds for a given credit rating a significant cost advantage for the largest banks vis-à-vis their smaller peers using information from bonds. Although this cost advantage for large firms is also visible in the non-financial sector, the benefits are found to be significantly larger in the banking sector. This second approach, however, suffers from being misleading in identifying a causal relationship. For example, the methodology ignores the potential of genuine economies of scale. Comparing the cost advantage of large firms between the financial and non-financial sector cannot mitigate this issue completely since it neglects the

[1] An overview over different methodologies can be found in Lambert, Ueda, Deb, Gray, and Grippa (2014).

very likely option of heterogeneous levels in the economies of scale for different industries. Finally, a third methodology uses public information from rating agencies in terms of different rating categories. In this way, Ueda and Weder di Mauro (2013) find a positive value for the structural subsidies emanating from a rating uplift using rating informations of Fitch Ratings,[2] and Schich and Lindh (2012) find a positive value of bailout guarantees using informations of the rating agency Moody's.

We apply in our paper this third method that combines directly different bank-specific ratings with refinancing costs. A drawback of this approach might be that it relies strongly on the subjective assessment of rating agencies. However, under the assumption of precise firm ratings, the rating-based approach seems to be superior to the two other methods, as has been shown by Noss and Sowerbutts (2012). Moreover, the correct assessment of default risk by rating agencies is not too much of importance for our question at hand. Our aim is more to analyze whether and to what extent financial markets use the information provided by rating agencies in order to exert market discipline or to 'reward' systemic institutions when pricing CDS-spreads on bonds.

The paper is organized as follows. In Section 2, we introduce the concepts of Fitch Ratings' Support Rating and Viability Rating. Section 3 states the main hypotheses, provides data sources, describes the major variables used in the empirical analysis, and introduces the model. The empirical results as well as some robustness checks are shown in Section 4. Section 5 concludes.

2 Support Rating versus Viability Rating

We collect data from Fitch Ratings in order to analyze the importance of the both phenomena market discipline as well as implicit bailout guarantees due to a too-systemic-to-fail status. For the purpose of our analysis, rating data from Fitch Ratings is particularly useful since it provides a judgment of different dimensions of the creditworthiness of financial institutions. Fitch Rating publishes beside the common Long-Term Issuer Default Rating with a Viability Rating and a Support Rating two additional rating categories

[2]Our paper is most closely related to the work of Ueda and Weder di Mauro (2013). However, compare to Ueda and Weder di Mauro (2013) who only analyze the effect of a rating uplift at two points in time (end 2007 and end 2009), we are able to provide a much more detailed picture by using a full history of rating data.

that allow to distinguish between the likelihood that a bank would run into significant financial difficulties such that it would require external support and, the likelihood that the institution will receive external support in the default event.[3]

Support Ratings are assigned to all banks and reflect the view of Fitch Ratings on the likelihood that a financial institution will receive extraordinary support, if necessary, to prevent a default on its senior obligations. The rating agency does, however, not distinguish between the source of external support. In this way, the Support Rating captures both the probability of receiving extraordinary support from the national authority where the bank is domiciled (sovereign support), support from the institutions' shareholder (institutional support) as well as support from other sources as for example international financial institutions or regional governments. When assigning the rating, Fitch Ratings takes not only the willingness of the sovereign and the parent institution, respectively, into account, but also the ability to provide extraordinary support. Fitch Ratings uses a five-point scale to indicate the probability of support, which map into a minimum level of the bank's Long-Term Issuer Default Rating. While a high Support Rating of '5' represents the lowest probability of extraordinary support (i.e." a possibility of external support, but it cannot be relied upon.", see Fitch Ratings (2014)), a value of '1' indicates a extreme high probability of support. In the empirical part of the paper in section 4, we multiply the Support Rating with (-1) such that higher values correspond to a higher probability of support.

Fitch Ratings provides additionally to the Support Rating a Support Rating Floor. Those rating floors reflect only the likelihood of receiving extraordinary support from the national authorities of the country where it is domiciled while it excludes possible institutional support. Support Rating Floors are assigned to all commercial and policy banks where sovereign support is more likely than institutional support and represent the minimum rating level the Long-Term Issuer Default Rating could fall at for a given level of support. They are assigned on the classical 'AAA' rating scale with the lowest level of 'No Floor, (NF)', indicating that Fitch Ratings does not perceive a reasonable assumption for forthcoming governmental support.

[3]We focus on information of Fitch Ratings rather than of Moody's Investors Service since their rating definition are best suited for our analysis. Moody's, too, provides with a 'Baseline Credit Assessment' and with a 'Long-Term Credit Rating' similar information as Fitch Ratings. However, their assessment does not allow to calculate the rating uplift from external support, as the 'Baseline Credit Assessment' does not provide an opinion on the severity of the default, see Moody's Investors Service (2015).

Viability Ratings as a third rating measure reflect the view of Fitch Ratings on the likelihood that the financial institution will fail in a sense that it either defaults on its senior obligations to third-party non-governmental creditors or it requires extraordinary support to restore its viability. Thus, Viability Ratings measure the intrinsic stand-alone creditworthiness of a financial institution. More precisely, Fitch Ratings judges the bank's operating environment, the company profile, the management and strategy, the bank's risk appetite as well as its financial profile when determining the Viability Rating. The scale on which Viability Ratings are published is virtually identical to the classical 'AAA' rating scale with the only difference of using lower case letters and a bottom end rating of 'f' that represents Fitch Ratings' view that a financial institution has failed. While Viability Ratings have only been published from 2012 onwards, there preceding measure of Individual Ratings was published on a scale between 'A' and 'F' with gradations among the ratings 'A' to 'E'.[4]

3 Empirical Analysis

3.1 Hypotheses

We attempt to explain bank CDS spreads using information on bank-specific ratings. A credit default swap (CDS) as an insurance against a credit event demands the protection seller to cover any incurred loss in case of a default. Therefore, the price of a CDS is paid by the insurance buyer in terms of a swap premium, and it is a function of the expected losses on bank liabilities. The market expectation about the probability of default (PD), which is beside the loss given default the second component of the expected loss on bank liabilities, can be further seen as a function of the bank-specific fundamental probability of default and a probability of receiving support in case of distress, i.e.

$$PD = (1 - \text{bailout probability—fundamental default}) \cdot \text{fundamental PD}.$$

Thus, CDS spreads are a function of the three parts loss given default, expected fundamental probability of default and expected probability of receiving external support.

[4]The transformation of all rating categories to numerical values can be found in Table A2 in Appendix A.

In the following, we postulate 4 hypotheses which will be analyzed empirically in section 4. The first hypothesis relates to the funding cost advantage of banks with an implicit bailout guarantee. An implicit bailout guarantee can be seen as an insurance of debt holders against a default. Due to this insurance, debt holders lower the risk premium they require for providing funds. The Support Rating as the assessment of Fitch Ratings about the probability of having such an insurance should be used by market participants in their own judgment about the support probability. Thus, for a given individual strength, we expect banks with a higher expected probability of external support in terms of a better (i.e. lower) Support Rating to display lower CDS spreads. This leads us to Hypothesis 1:

Hypothesis 1 ('Expected External Support') *Ceteris paribus, CDS-Spreads are lower for banks with a better Support Rating.*

The second hypothesis refers to the Viability Rating and thus to the individual strength of a bank. A high rating implies the view of Fitch Ratings for a low probability of default and a well-developed business model without excessive risk-taking. This information should be taken into account by market participants in their own expectation of a bank's probability of default. If markets had a disciplinary effect, we would expect a punishment for banks with high risk and therefore CDS spreads to be higher for banks with a low Viability Rating. This is postulated in Hypothesis 2.

Hypothesis 2 ('Expected Individual Strength') *Ceteris paribus, CDS-Spreads are lower for banks with a better Viability Rating.*

The value of the insurance due to external support should depend on the default probability of the institution. Thus, the individual strength of an financial institution matters for the determination of the value of the contingency insurance. We expect that the effect of a higher Support Rating is particularly strong when the intrinsic financial strength is poor. Similarly, a bank's individual performance should matter most when the institution cannot expect any external support if needed. The heterogeneous effect of both rating categories is stated in Hypothesis 3.

Hypothesis 3 ('Heterogeneous Effects') *The effect of Viability Ratings on CDS-Spreads decreases in the probability of support.*

In the pre-crisis period, the financial system as well as individual banks were regarded as being safe. Thus, actual risks were hardly priced and market discipline was weak. However, we expect that the financial crisis serves as a wake-up call for investors in a sense that excessive risk-taking was punished by a higher risk premium. In this way, the effect of Viability Ratings should vary over different periods of the financial crisis. While the effect of a better Viability Rating is expected to be rather small in the pre-crisis period, it should be higher in the aftermath of the crisis if market discipline grew stronger. This wake-up call effect is postulated in Hypothesis 4.

Hypothesis 4 ('Wake-up call') *The effect of a better Viability Rating on CDS spreads is stronger in the post-crisis period than in the pre-crisis period.*

3.2 Data Source

We use CDS spreads and bank-specific rating information over the period January 2005 to June 2014 in order to analyze the degree of market discipline and the subsidy of systemically important institutions, respectively. We restrict our sample only in geographical terms by including all European countries, all OECD countries and all countries with at least one bank being in the list of the 100 largest banks in the world in terms of total assets size at the end of 2013. We then include all banks in our sample that are domiciled in one of those countries and for which the necessary CDS and rating information is available.

We collect daily CDS data from markit and focus on senior CDS with a maturity of five years on debt denoted in one of the currencies euro and US dollar.[5]

All bank-specific rating information has been collected from Fitch Ratings. Fitch Ratings provides the overall history of ratings including information about the day of each single rating action, the rating at that day, and the rating action that has been taken at this date. We assume that the last given rating remains valid until it was replaced by a new one or was withdrawn, respectively. Since ratings are generally stable over a long period of time, it seems reasonable to transform the data to a monthly frequency. Thus, we use

[5]It has been shown in European Central Bank (2008) that trading liquidity is highest for 5-year senior CDS. Mayordomo, Peña, and Schwartz (2014) compare different sources of CDS data and show that Markit and CMA contribute to a higher extent to the 'formation of prices' with newer and more influential information and are thus most informative in terms of price discovery.

the monthly average of daily CDS spreads and the rating that has been valid at the end of a month. Despite the choice of the lower frequency, some banks show extreme high values of CDS spreads, so that we winsorize the CDS data at a 1/99% level.

3.3 Descriptive Statistics

Table 1 gives a first picture about the distribution of the data. The upper part of the table describes the descriptive statistics for the overall sample period January 2005 to June 2014, while a first impression about the evolution of the variables over different sub-periods is shown in the lower part of the table. We divide the sample into different periods, reflecting the various degrees of the financial crisis. First, the period January 2005 to July 2007 describes the time before the financial crisis emerges. The following crisis period starts in August 2007 with the squeeze of liquidity in global markets and spans until the default of the investment bank Lehman Brothers in September 2008. The time between September 2008 to September 2009 is characterized by the post-Lehman financial crisis period, and was taken over by the period of the Euro crisis from October 2009 until August 2012.[6] The years from September 2012 onwards describe the post-crisis era.

3.3.1 CDS Spreads

We observe a sample average CDS spread of 158.9 basis points with a minimum value of 6.2 basis points and a maximum value of 1246.5 basis points.[7] These high values can be observed especially at banks in Greece between 2011 and 2012 (as for example Alpha Bank, Eurobank Ergasias, Piräus Bank), at banks in Iceland in autumn 2008 (Kaupthing Bank, Landsbanki Island, and Glitnir Bank), at banks in Ireland in 2011 (for example Allied Irish Bank and Permanent TSB), and Russian as well as Ukrainian banks in 2009 (inter alia, URALSIB Bank, Alfa Bank, Ukrotsbank, and UkrSibbank). As it can be seen in Figure 1, the average CDS of all banks in the sample surges dramatically during the

[6]We take the measures taken at the G20 meeting in Pittsburgh on September 25, 2009 as end date of the financial crisis and the market slow-down after the announcement of the Outright Monetary Transactions (OMT) by the European Central Bank on August 2, 2012 as the end of the Euro crisis.

[7]The descriptive Statistics of CDS spreads relates to the wisorized series. The highest CDS spread of our sample before winsorizing has been found at the Icelandic bank Kaupthing Bank in October 2008 shortly before it declared insolvency.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
		Jan 2005 - Jun 2014			
CDS	1.589	2.019	0.062	12.465	20276
Support Rating	2.163	1.44	1	5	20276
Rating Floor	6.350	2.734	0	9	9572
Viability Rating	6.719	1.709	1	10	20276
		Jan 2005 - Jul 2007			
CDS	0.229	0.37	0.062	5	5783
Support Rating	2.379	1.482	1	5	5783
Rating Floor	7.020	1.241	0	8	51
Viability Rating	7.416	1.538	2	10	5783
		Aug 2007 - Aug 2008			
CDS	1.168	1.276	0.125	12.465	2770
Support Rating	2.302	1.431	1	5	2770
Rating Floor	6.114	2.798	0	9	1042
Viability Rating	7.268	1.532	1	10	2770
		Sep 2008 - Sep 2009			
CDS	2.678	2.521	0.173	12.465	2349
Support Rating	2.018	1.346	1	5	2349
Rating Floor	6.577	2.661	0	9	1265
Viability Rating	6.451	1.864	1	10	2349
		Okt 2009 - Aug 2012			
CDS	2.434	2.314	0.28	12.465	5962
Support Rating	2.012	1.412	1	5	5962
Rating Floor	6.398	2.708	0	9	4150
Viability Rating	6.177	1.675	1	10	5962
		Sep 2012 - Jun 2014			
CDS	2.009	1.853	0.234	12.465	3412
Support Rating	2.046	1.432	1	5	3412
Rating Floor	6.262	2.785	0	8	3064
Viability Rating	6.226	1.511	1	9	3412

Descriptive Statistics of CDS-Spreads, Support Ratings, Support Rating Floors and Viability Ratings. The upper part of the table considers the overall sample period, while the lower part presents descriptive information for different subperiods. CDS spreads are winsorized at the 1/99% level.

crisis. One can observe a first peak in the aftermath of the Lehman default and a second twin peak just before the Euro crisis came to an end.

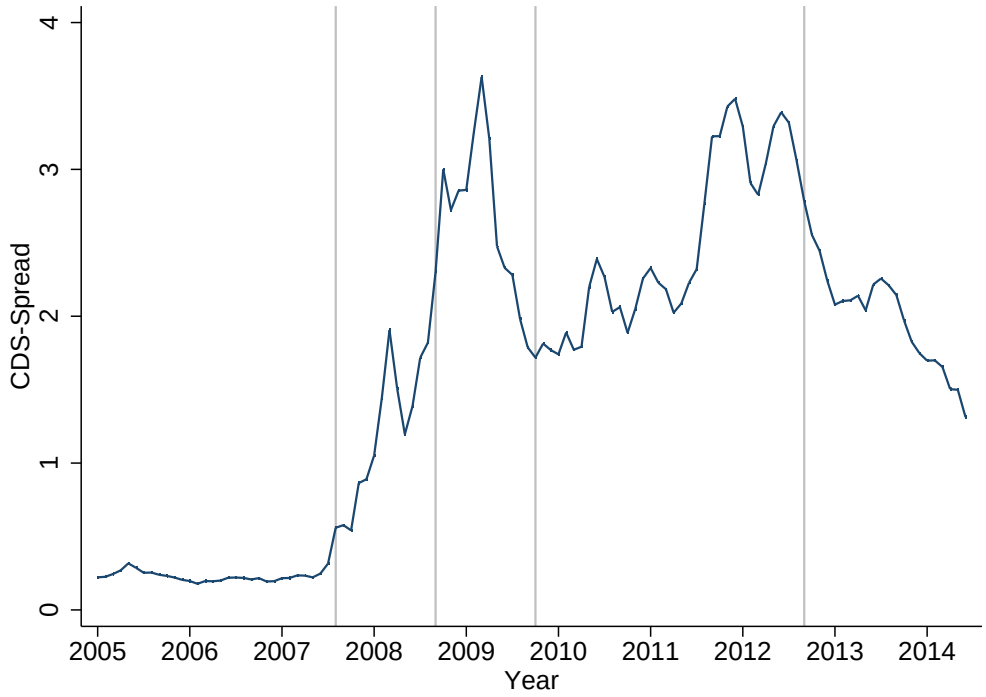


Figure 1: Average CDS-Spreads of all banks in the sample.

3.3.2 Support Rating

The average Support Rating in our sample is 2.16, implying a high probability for external support. This high probability might be partially due to fact that CDS are typically issued by larger institutions with a systemic impact on the (local) financial system. As it can be seen in the lower part of Table 1 as well as in Figure 2, the probability of receiving external support rose after the default of Lehman Brothers. The average Support Rating decreased from 2.38 in the time before the crisis to an average value of 2.01 in the period after the Lehman default. This increase in Fitch Ratings' expectations of banks receiving external support might stem from the large bailout packages that governments provided at that time. In the following years, the Support Rating increases slightly but remains on a comparable low level below the one of the pre-crisis period.

By dividing the sample into two groups, one can clearly see the heterogeneity of Support Ratings across banks (Figure 3). The upper part of Figure 3 displays the average Support

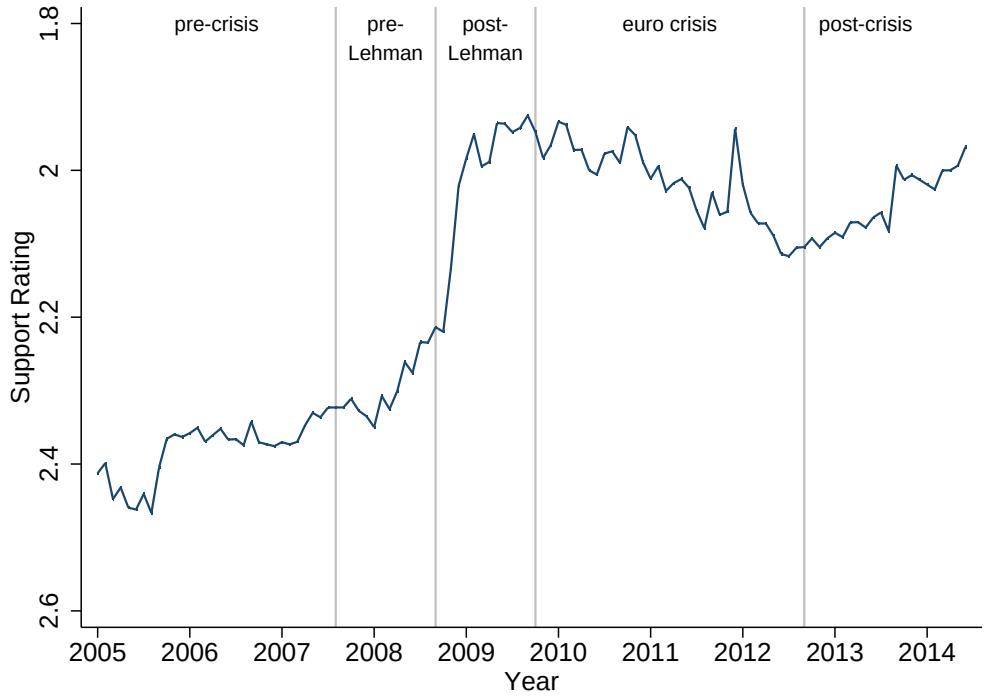


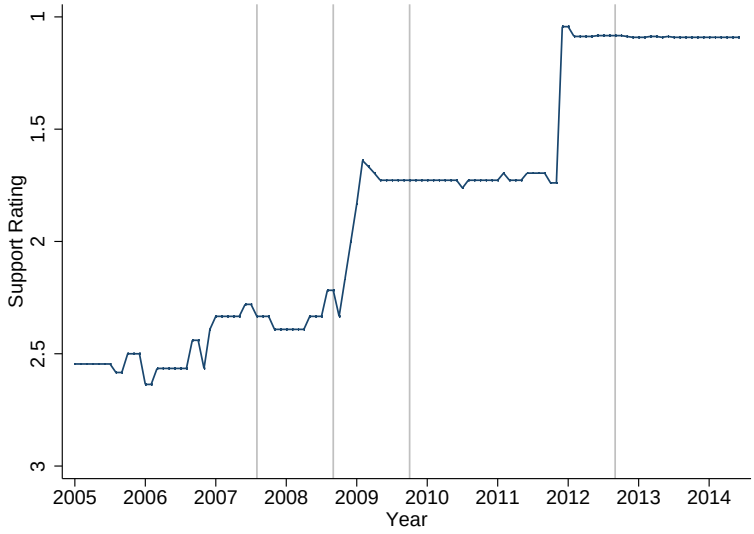
Figure 2: Average Support Ratings of all banks in the sample.

Rating of those banks that were announced to be a global systemically important institution (GSIFI) by the Financial Stability Board in November 2011, while the lower graph shows the average Support Rating for those banks that were not declared as a GSIFI.[8] For the GSIFI banks, Fitch Ratings revised its expectations regarding external support significantly after the turmoils in the financial system due to the Lehman Brothers default. The average Support Rating for this group decreased again in November 2011, when the Financial Stability Board declared the institutions as being systemically relevant. After this event, only the Spanish bank Banco Santander and the Italian bank Unicredit showed a Support Rating of '2', while all other GSIFIs had the highest Support Rating of '1'.

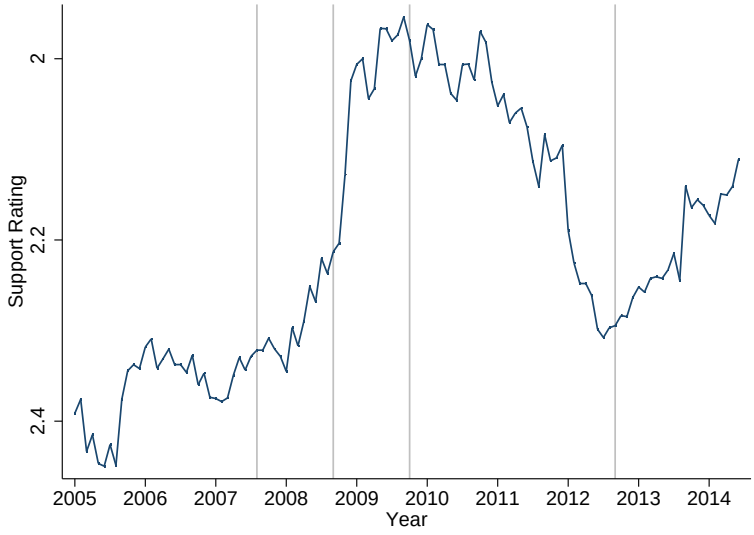
While the average Support Rating of the group of non-GSIFI banks shows a similar pattern in a sense of a strong decline after the Lehman default, Fitch Ratings' view about the probability of receiving external support has been reverted in the aftermath of the financial crisis. Especially during the time of the announcement of systemic relevant institutions by the Financial Stability Board one can observe a decrease in the support probability for the non-GSIFI banks.

[8]See Financial Stability Board (2011).

Figure 3: Average Support Ratings for two subsamples.



(a) GSIFIs



(b) non-GSIFIs

3.3.3 Support Rating Floor

Support Rating Floors were assigned to financial institutions from April 2007 onwards. However, the data coverage before January 2008 is rather poor such that we restrict the sample period to January 2008 until June 2014 for all analyses that include the Support

Rating Floor.[9]

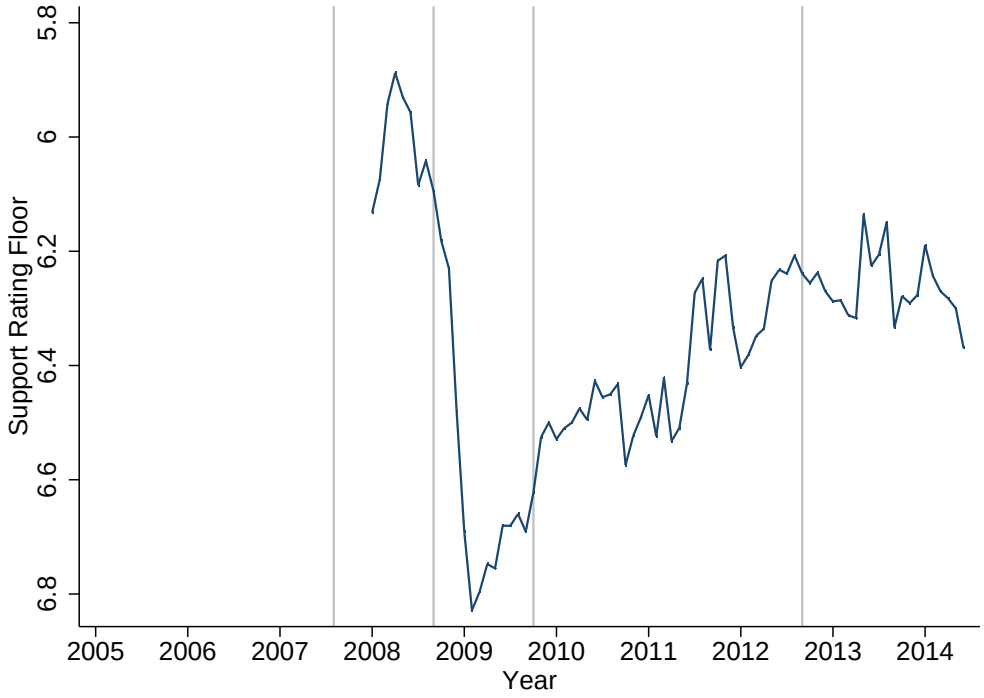
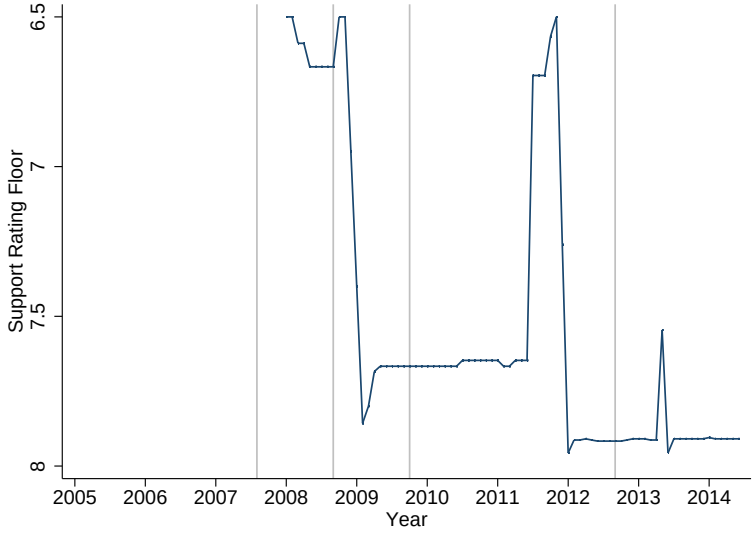


Figure 4: Average Support Rating Floors of all banks in the sample.

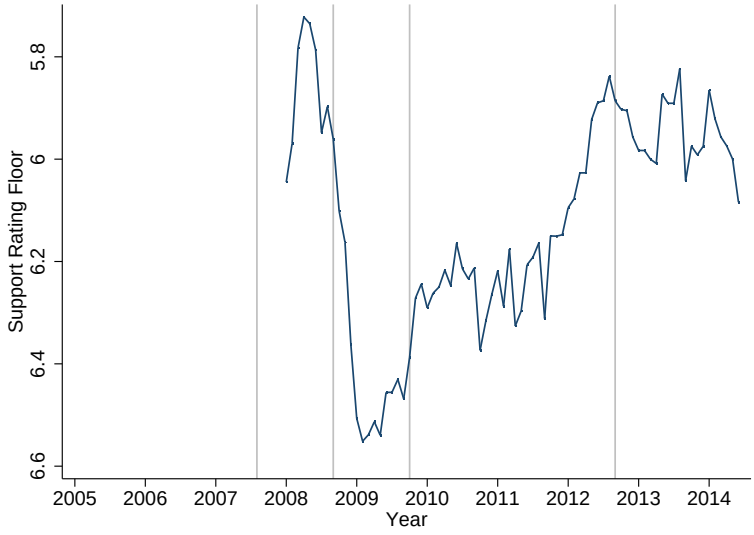
The average Support Rating Floor shows, contrary to the Support Rating, from 2009 a continuously decreasing trend and thus, a decline in the probability for receiving extraordinary governmental support, as illustrated in Figure 4. Prior to that, however, the Support Rating Floor increased sharply between the second quarter 2008 and the beginning of 2009. Here, too, one can observe an interesting pattern by dividing the sample in GSIFI and non-GSIFI banks (Figure 5). While the average Support Rating Floor of GSIFI banks rose sharply after the default of Lehman Brothers, the average Support Rating Floor of non-GSIFI banks increased continuously during the year 2008. Moreover, a second surge of the average Support Rating Floor can be observed for GSIFI banks after the announcement of the GSIFI status by the Financial Stability Board in November 2011, while the Support Rating Floor of of non-GSIFI banks decreased during those month.

[9]In January 2008, 83 banks of our sample have received a Support Rating Floor.

Figure 5: Average Support Rating Floor for two subsamples.



(a) GSIFIs



(b) non-GSIFIs

3.3.4 Viability Rating

The average Viability Rating over the sample period shows a moderate value of 6.72 which is equivalent to a rating between 'bbb+' and 'a-'. However, there is a large heterogeneity of banks' individual strength over time, as indicated by the lower part of Table 1 and by Figure 6. In this way, banks' Viability Rating decreased by 1.5 notches between 2007 and

2010.

The drop in Fitch Ratings evaluation of banks' individual strength during the financial crisis can be observed for both GSIFI and non-GSIFI banks. However, the evolution of the Viability Rating differs between the two groups in the post-crisis era. While the average Viability Rating of GSIFIs rose between 2009 and 2012 significantly, the increase in the individual strength of non-GSIFI banks is less severe and appears only relatively late.

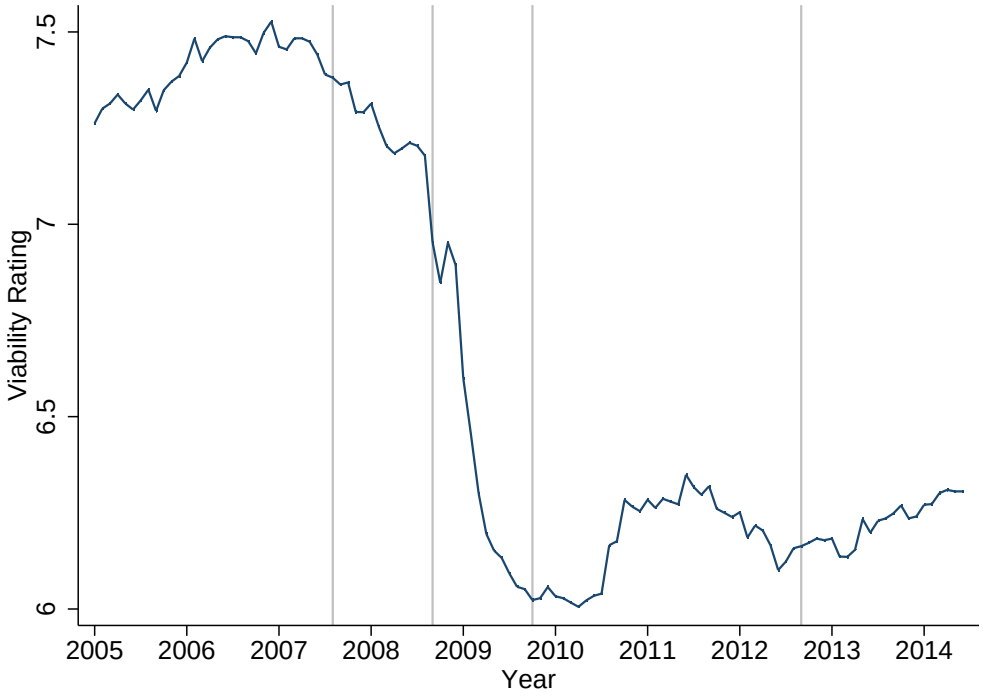


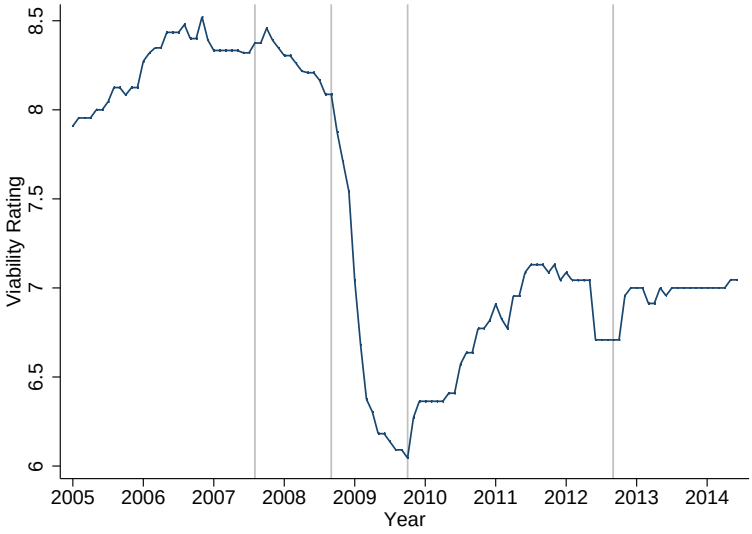
Figure 6: Average Viability Rating of all banks in the sample.

3.4 Model

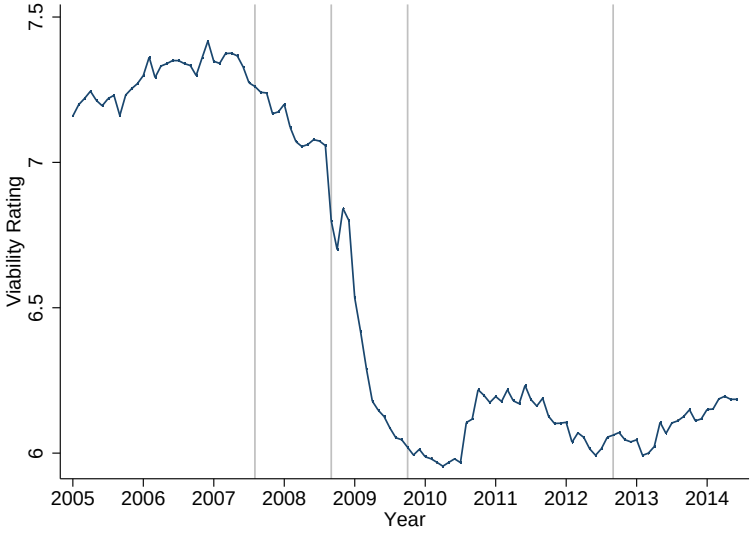
In our empirical analysis, we model bank CDS spreads as a function of bank-specific rating variables. More precisely, we model CDS spreads of bank i at time t as follows:

$$\begin{aligned} CDS_{i,t} =& \alpha + \beta \cdot Support_{i,t} + \gamma \cdot Viability_{i,t} \\ &+ \delta \cdot Support_{i,t} \cdot Viability_{i,t} + \mu_i + \nu_{t|Euro} + \rho_{t|USD} + u_{i,t}. \end{aligned} \tag{1}$$

Figure 7: Average Viability Ratings for two subsamples.



(a) GSIFIs



(b) non-GSIFIs

The variable *Support* measures the probability for external support, if needed. Thus, the coefficient β quantifies the insurance value due to implicit bailout guarantees. According to Hypothesis 1 ('Expected External Support'), we expect a negative coefficient since a higher probability for external support implies a higher expected insurance value which should translate in lower CDS spreads. A bank's individual strength is captured by the variable *Viability*. If markets have a disciplinary effect, we would expect the coefficient γ

to be negative, as it was postulated in Hypothesis 2. The interaction term of *Support* and *Viability* allows us to test Hypothesis 3. If the contingency insurance has a particular high value when an institution's individual strength is poor, the coefficient δ should be positive. Similarly, market discipline is especially visible for banks without reliable support in case of a positive coefficient δ. In order to simplify the interpretation, we subtract both the Support Rating and Viability Rating by their median. Thus, the coefficient β displays the average effect of an one notch better Support Rating for an institution with a median Viability Rating.[10] Moreover, throughout the empirical analysis, we multiply the Support Rating by (-1) such that a higher numerical value corresponds to a higher probability for external support.

Since we use CDS spreads on debt denominated in euro for European banks and CDS spreads on debt in US dollar for all other banks, we include a separate time fixed effect for both groups. Moreover, the regression equation contains bank fixed effects as well as an idiosyncratic error $u_{i,t}$. We model in the baseline regression the contemporaneous relation between CDS spreads and the different rating categories. Fitch Ratings opinion on a bank's intrinsic financial strength as well as on the probability of external support should be an objective measure of the strength of a banks balance sheet and not affected by market prices. However, in order to deal with a potential endogeneity issue, we run as a robustness check all regressions with lagged controls.

In a first step, we analyze the existence of price advantages due to implicit guarantees on CDS-spreads for the entire sample period and thus determine the average long-run value of the implicit government insurance. However, beside the average effect of ratings on CDS-spreads, we are also interested in the change of the effect of a better rating over time, especially during the recent financial crisis. More precisely, we investigate whether market discipline has increased after the financial crisis. To this end, we look for structural breaks regarding the effect of an improved rating on CDS-spreads within the sample period 2005 to 2014. We divide the sample period in a pre-crisis time, lasting until Juli 2007, a crisis period from August 2007 until August 2012 as well as a post-crisis era in the aftermath of September 2012. The crisis period is further clustered in the months just before the Lehman collapse (August 2007 - August 2008), the post-Lehman financial crisis from September 2008 until September 2009 and the Euro crisis between

[10]Similarly, the interpretation of the coefficient γ reads as the average effect of an increase in the Viability Rating for a median Support Rating.

October 2009 and August 2012. We then estimate the coefficient β, γ and δ not only as an average effect over the entire sample period, but separately for each sup-period. According to Hypothesis 4 ('Wake-up call'), we expect that the effect of a better Support Rating on CDS spreads is stronger in the post-crisis era compared to the pre-crisis period, i. e. implicit guarantees could have been reduced and market discipline became stronger.

4 Estimation Results

As described in the previous chapter, we will first test for the existence of price advantages on CDS-spreads due to implicit guarantees and thus derive the average value of the insurance due to external support. In the second part of the empirical analysis, we will then examine whether we can observe a heterogeneous effect of implicit guarantees on CDS-spreads for the different sub-periods. In the third part of this section, we will provide several robustness checks. First, we will use a measure that explicitly captures only governmental support and neglects any form of institutional support. Second, we use an alternative coding of missing support ratings in a sense that missing ratings are treated as the lowest degree of external support. Finally, we will test whether the findings were driven by a survivorship bias. To this extent, we will analyze the results of a balanced sample.

4.1 Baseline Specification

We present the results of a simple form of equation (1) in Table 2. Columns 1 and 3 exclude the interaction term of the Viability Rating and the Support Rating such that the coefficients display the average effect of an increasing Viability Rating (Support Rating) across all banks of the sample. In column 2 and 4, we examine whether there is a heterogeneous effect of an increasing rating for both rating categories. Since we subtract from both ratings the median, the coefficient of Viability Rating (Support Rating) indicates the average effect of an one notch better Viability Rating (Support Rating) for an institution with a median Support Rating (Viability Rating). Moreover, we display the result of the contemporaneous specification in columns 1 and 2 while the results for the model with lagged regressors were shown in columns 3 and 4.

The results of the regression excluding the interaction term indicate first that an increase in the Viability Rating by one notch yields on average to a 49.6 bp lower CDS-spread, ceteris paribus. Second, a one notch better Support Rating reduces CDS-spreads on average by 29.8 bp, ceteris paribus.

Table 2: Regression results for the overall sample period

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
Support Rating	-0.298***	-0.265***		
	(0.0853)	(0.0632)		
Viability Rating	-0.496***	-0.448***		
	(0.0631)	(0.0501)		
Support Rating · Viability Rating		0.159***		
		(0.0271)		
Support Rating (t-1)			-0.278***	-0.251***
			(0.0865)	(0.0644)
Viability Rating (t-1)			-0.482***	-0.442***
			(0.0643)	(0.0509)
Support Rating (t-1) · Viability Rating (t-1)				0.150***
				(0.0281)
Constant	0.839***	0.910***	0.782***	0.845***
	(0.149)	(0.138)	(0.154)	(0.144)
Observations	20,276	20,276	19,403	19,403
R-Squared	0.554	0.583	0.542	0.566
Number of Banks	307	307	304	304
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 2 (7) in both the contemporaneous specification and the lagged specification.

However, the interaction term signals a heterogeneous effect of a rating change. The positive and highly significant coefficient indicates that a stronger external support reflected by a better Support Rating has a particular large value for banks with a weak individual financial strength. While a one-notch upgrade of the Support Rating reduces CDS-spreads of weak bank with a Viability Rating of 4 (10% quantile) by 74.2 bp, the effect is not significantly different from zero for a strong bank with a Viability Rating of 9 (90% quantile). At the same time, the positive coefficient of the interaction term indicates a stronger price effect of the individual strength on CDS-spreads the weaker the

probability for external support. In this way, an increased Viability Rating by one notch decreases CDS-spreads of banks with a Support Rating of 5 (90% quantile) on average by 92.5 bp, ceteris paribus, while the decline of the spread is only 28.8 bp for banks with a high probability of receiving external support, i.e. for banks labeled with a Support Rating of 1 (10% quantile).

Table 3: Effect of an increase in the support rating for a given viability rating

	contemporaneous regression		lagged regression	
	Coefficient	Standard Error	Coefficient	Standard Error
Viability Rating = 1	-1.21943***	(0.18034)	-1.15068***	(0.18763)
Viability Rating = 2	-1.06038***	(0.15521)	-1.00067***	(0.16146)
Viability Rating = 3	-0.90134***	(0.13087)	-0.85066***	(0.13609)
Viability Rating = 4	-0.74229***	(0.10788)	-0.70064***	(0.11203)
Viability Rating = 5	-0.58324***	(0.08729)	-0.55063***	(0.09037)
Viability Rating = 6	-0.42420***	(0.07122)	-0.40061***	(0.07325)
Viability Rating = 7	-0.26515***	(0.06322)	-0.25060***	(0.06439)
Viability Rating = 8	-0.10610	(0.06627)	-0.10058	(0.06716)
Viability Rating = 9	0.05294	(0.07911)	0.04943	(0.08036)
Viability Rating = 10	0.21199**	(0.09796)	0.19945**	(0.09994)

In Table 4 and Table 5, we present the results for both banks labeled as globally systemic important financial institutions (GSiFI) by the Financial Stability Board and banks that were not labeled as a GSiFI. The results show clearly that the judgment of Fitch Ratings regarding the probability of receiving external support hardly affects CDS-spreads of the group of GSIFIs. For those banks, only the coefficient of the individual strength displays a negative coefficient that is statistically significant. On the contrary, we find highly significant effects for the group of those banks that were not declared to be a systemically important financial institution. For this group, a one-notch increase in the Support Rating decreases CDS-spreads on average by 39.3 bp, ceteris paribus. The Viability Rating, too, displays a quantitative larger impact on CDS-spreads than for the group of globally systemic important institutions. While an improvement of the Viability Rating by one notch leads to a decline in CDS-spreads by only 14.0 bp for the group of GSIFIs, the average effect amounts 54.6 bp for the non-GSIFI banks.

Table 4: Regression results for GSIFIs for the overall sample period

VARIABLES	(1) CDS	(2) CDS	(3) CDS	(4) CDS
Support Rating	-0.0167	-0.0186		
	(0.0405)	(0.0425)		
Viability Rating	-0.140***	-0.136***		
	(0.0339)	(0.0415)		
Support Rating · Viability Rating		0.00619		
		(0.0317)		
Support Rating (t-1)			-0.00811	-0.00983
			(0.0413)	(0.0436)
Viability Rating (t-1)			-0.129***	-0.125***
			(0.0323)	(0.0387)
Support Rating (t-1) · Viability Rating (t-1)				0.00611
				(0.0307)
Constant	0.365**	0.380***	0.243	0.258*
	(0.143)	(0.132)	(0.144)	(0.140)
Observations	2,608	2,608	2,529	2,529
R-Squared	0.837	0.837	0.837	0.837
Number of Banks	28	28	28	28
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for those banks in the sample that were declined as globally systemic important institution by the Financial Stability Board in November 2011. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 1 (8) in both the contemporaneous specification and the lagged specification.

Table 5: Regression results for non-GSIFIs for the overall sample period

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
Support Rating	-0.393***	-0.166**		
	(0.134)	(0.0729)		
Viability Rating	-0.546***	-0.502***		
	(0.0724)	(0.0545)		
Support Rating · Viability Rating		0.216***		
		(0.0310)		
Support Rating (t-1)			-0.360***	-0.149**
			(0.136)	(0.0747)
Viability Rating (t-1)			-0.531***	-0.497***
			(0.0736)	(0.0559)
Support Rating (t-1) · Viability Rating (t-1)				0.204***
				(0.0321)
Constant	0.825***	0.874***	0.713***	0.746***
	(0.171)	(0.149)	(0.172)	(0.150)
Observations	17,668	17,668	16,874	16,874
R-Squared	0.546	0.585	0.535	0.568
Number of Banks	279	279	276	276
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for those banks in the sample that were not declined as globally systemic important institution by the Financial Stability Board in November 2011. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 2 (7) in both the contemporaneous specification and the lagged specification.

4.2 Time-heterogeneous effects

With the years between 2007 and 2012, our sample period contains one of the most severe financial crisis in history. As we are not only interested in the average effect of an improved Viability Rating, we also investigate whether the effect changed after a severe happening. More precisely, we want to analyze whether markets changed the pricing behavior for bank's individual strength. To this extent, we divide the entire sample period into several episodes: The pre-crisis period yields from 2005 to July 2007, and the first period of the financial crisis is lasting from August 2007 until August 2008. The second period of the financial crisis starts with the default of Lehman Brothers in September 2008 and is defined until September 2009. The months between October 2009 and August 2012 are characterized by the debt crisis in Europe while the months from September 2012 onwards

are defined as a post-crisis era. We interact all explanatory variables of equation (1) with a dummy for the respective period and are thus able to estimate for each period a separate coefficient. Table 6 (contemporaneous regressors) and Table 7 (lagged regressors) show the results for this specification. We present in columns 1 and 3 the effect of the variable in the respective period, and in columns 2 and 4 the changes in the effect to the previous period.

The results in Table 6 and Table 7, respectively, show that the probability of receiving external support was hardly priced in CDS-spreads. However, the Viability Rating and thus, the individual strength of a bank indicates a significant effect on CDS-spreads. The effects change remarkably with the onset of the financial crisis. In the first crisis period between August 2007 and August 2008, we observe a strong increase in the absolute effect of the Support Rating, and a slight increase in the effect of the Viability Rating for banks with a median Support Rating. After the Lehman default, the coefficients of both rating categories change not only in statistical terms, but also quite strongly in quantitative terms. Both coefficients increase in absolute value by more than the factor 2, implying that markets allow banks with a high probability of external support to benefit even more from the advantage of cheap funding costs. In the model assuming a homogeneous effect across all banks, CDS-spreads decrease by 56.5 bp (52.5 bp) for a one-notch improved Support Rating while the effect amounts 59.7 bp (57.6 bp) for a bank with a median Viability Rating in the model assuming heterogeneous effects in the regression with contemporaneous (lagged) regressors. For the period of the Euro crisis between October 2009 and August 2012, we observe that the effect of the individual strength remains at a very high level while the effect of the Support Rating weakens significantly. The same result is also found for the post-crisis era. Here, too, we observe a quantitative reduction of the effect of the Support Rating, while the effect of the Viability Rating remains at a high level similar to the crisis period. These findings are in line with Hypothesis 4. Markets take the intrinsic solvency situation of a bank to a much larger extent into account when pricing credit default swaps, while the value of the implicit government insurance in terms of a higher Support Rating becomes less valuable. While the results regarding the Viability Rating are in line with Hypothesis 4, a surprising result is found for the coefficient of the Support Rating. One possible reason for the time-heterogeneous value of the contingency insurance might be the increasing uncertainty about the true solvency situation of financial institutions after the default of Lehman Brothers, which again decreases with diminishing uncertainty about the solvency of banks

and growing uncertainty about the solvency situation of sovereigns.

Table 6: Regression results for all banks in the sample in different sub-periods (contemporaneous regressors)

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
		Jan 2005 - Jul 2007		
Support Rating	-0.0567		-0.00418	
	(0.0650)		(0.0480)	
Viability Rating	-0.199***		-0.190***	
	(0.0471)		(0.0400)	
Support Rating · Viability Rating			0.0258	
			(0.0234)	
		Aug 2007 - Aug 2008		
Support Rating	-0.207**	-0.150***	-0.217***	-0.213***
	(0.0798)	(0.0515)	(0.0734)	(0.0574)
Viability Rating	-0.238***	-0.0390	-0.254***	-0.0640**
	(0.0562)	(0.0332)	(0.0421)	(0.0277)
Support Rating · Viability Rating			0.0829***	0.0571**
			(0.0313)	(0.0261)
		Sep 2008 - Sep 2009		
Support Rating	-0.565***	-0.358***	-0.458***	-0.240***
	(0.120)	(0.0889)	(0.0907)	(0.0711)
Viability Rating	-0.597***	-0.359***	-0.655***	-0.401***
	(0.0768)	(0.0731)	(0.0701)	(0.0587)
Support Rating · Viability Rating			0.296***	0.213***
			(0.0503)	(0.0529)
		Oct 2009 - Aug 2012		
Support Rating	-0.319***	0.246**	-0.150***	0.307***
	(0.0905)	(0.111)	(0.0563)	(0.0942)
Viability Rating	-0.644***	-0.0471	-0.612***	0.0433
	(0.0775)	(0.0776)	(0.0605)	(0.0690)
Support Rating · Viability Rating			0.216***	-0.0799
			(0.0226)	(0.0505)
		Sep 2012 - Jun 2014		
Support Rating	-0.183**	0.136***	-0.00984	0.140***
	(0.0807)	(0.0363)	(0.0498)	(0.0390)
Viability Rating	-0.609***	0.0352	-0.515***	0.0971
	(0.0802)	(0.0601)	(0.0521)	(0.0590)
Support Rating · Viability Rating			0.211***	-0.00502
			(0.0275)	(0.0242)
Constant	1.059***	1.059***	1.036***	1.036***
	(0.113)	(0.113)	(0.102)	(0.102)
Observations	20,276	20,276	20,276	20,276
R-Squared	0.598	0.598	0.641	0.641
Number of Banks	307	307	307	307
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample. All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 2 (7).

Table 7: Regression results for all banks in the sample in different sub-periods (lagged regressors)

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
	Jan 2005 - Jul 2007			
Support Rating (t-1)	-0.0351		0.0153	
	(0.0666)		(0.0487)	
Viability Rating (t-1)	-0.189***		-0.184***	
	(0.0478)		(0.0409)	
Support Rating (t-1) · Viability Rating (t-1)			0.0225	
			(0.0244)	
	Aug 2007 - Aug 2008			
Support Rating (t-1)	-0.181**	-0.146***	-0.195**	-0.210***
	(0.0824)	(0.0536)	(0.0768)	(0.0606)
Viability Rating (t-1)	-0.211***	-0.0219	-0.238***	-0.0537*
	(0.0598)	(0.0380)	(0.0454)	(0.0314)
Support Rating (t-1) · Viability Rating (t-1)			0.0739**	0.0515*
			(0.0330)	(0.0287)
	Sep 2008 - Sep 2009			
Support Rating (t-1)	-0.525***	-0.344***	-0.475***	-0.280***
	(0.123)	(0.0914)	(0.0981)	(0.0762)
Viability Rating (t-1)	-0.576***	-0.365***	-0.662***	-0.424***
	(0.0816)	(0.0782)	(0.0794)	(0.0656)
Support Rating (t-1) · Viability Rating (t-1)			0.297***	0.223***
			(0.0618)	(0.0628)
	Oct 2009 - Aug 2012			
Support Rating (t-1)	-0.312***	0.212*	-0.152***	0.323***
	(0.0937)	(0.116)	(0.0583)	(0.102)
Viability Rating (t-1)	-0.625***	-0.0494	-0.604***	0.0578
	(0.0786)	(0.0805)	(0.0603)	(0.0757)
Support Rating (t-1) · Viability Rating (t-1)			0.219***	-0.0786
			(0.0225)	(0.0607)
	Sep 2012 - Jun 2014			
Support Rating (t-1)	-0.166**	0.147***	-0.00476	0.147***
	(0.0805)	(0.0388)	(0.0498)	(0.0408)
Viability Rating (t-1)	-0.590***	0.0355	-0.506***	0.0979
	(0.0796)	(0.0640)	(0.0559)	(0.0662)
Support Rating (t-1) · Viability Rating (t-1)			0.202***	-0.0164
			(0.0281)	(0.0260)
Constant	1.015***	1.015***	0.990***	0.990***
	(0.118)	(0.118)	(0.108)	(0.108)
Observations	19,403	19,403	19,403	19,403
R-Squared	0.583	0.583	0.622	0.622
Number of Banks	304	304	304	304
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample. All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 2 (7).

Table 8: Effect of an increase in the support rating for a given viability rating in different sub-periods based on the contemporaneous regression results

	pre-crisis	crisis 1	crisis2	euro crisis	post-crisis
Viability Rating = 1	-0.15904	-0.71483***	-2.23527***	-1.44850***	-1.27801***
	(0.15379)	(0.23431)	(0.34461)	(0.14721)	(0.16528)
Viability Rating = 2	-0.13323	-0.63193***	-1.93900***	-1.23211***	-1.06665***
	(0.1317)	(0.20432)	(0.29612)	(0.12665)	(0.13927)
Viability Rating = 3	-0.10742	-0.54904***	-1.64274***	-1.01573***	-0.85529***
	(0.11018)	(0.17480)	(0.24834)	(0.10691)	(0.11396)
Viability Rating = 4	-0.08161	-0.46615***	-1.34647***	-0.79935***	-0.64392***
	(0.08962)	(0.14602)	(0.20179)	(0.08853)	(0.08995)
Viability Rating = 5	-0.0558	-0.38325***	-1.05021***	-0.58297***	-0.43256***
	(0.07089)	(0.11854)	(0.15757)	(0.07255)	(0.06862)
Viability Rating = 6	-0.02999	-0.30036***	-0.75394***	-0.36658***	-0.22120***
	(0.05583)	(0.09349)	(0.11832)	(0.06090)	(0.05328)
Viability Rating = 7	-0.00418	-0.21746***	-0.45768***	-0.15020***	-0.00984
	(0.04805)	(0.07342)	(0.09071)	(0.05632)	(0.04984)
Viability Rating = 8	0.02164	-0.13457**	-0.16141*	0.06618	0.20153***
	(0.05098)	(0.06326)	(0.08670)	(0.06046)	(0.06035)
Viability Rating = 9	0.04745	-0.05168	0.13485	0.28256***	0.41289***
	(0.06316)	(0.06762)	(0.10894)	(0.07181)	(0.07945)
Viability Rating = 10	0.07326	0.03122	0.43112***	0.49895***	0.62425***
	(0.0805)	(0.08429)	(0.14587)	(0.08762)	(0.10246)

4.3 Robustness Check

4.3.1 Support Rating Floor

In this section, we test whether our results hold if we use the Support Rating Floor as a second measure of receiving external support. This measure captures only governmental supports and excludes institutional support. While we do observe qualitatively the same results as in the regression using the broader external support measure, the magnitude of the coefficients differs. We do find no effect for an improvement in the Support Rating Floor by one notch on CDS-spreads in both the regression without the interaction term and the regression including the interaction term for a bank with a median individual strength. However, an improvement of an one-notch increase in the Support Rating Floor is for a bank with a Viability Rating of 4 (10% quantile) associated with a significant decrease by 18.8 bp in the contemporaneous regression. An improvement in the Viability Rating by one notch leads to an average decline in CDS-spreads by 113.2 bp for a bank with a low Support Rating Floor of 0 (10% quantile) and to an average decrease in CDS-spreads by 62.0 bp for banks with a high Support Rating Floor of 8 (90% quantile).

Table 9: Regression results using Support Rating Floor for the overall sample period

VARIABLES	(1) CDS	(2) CDS	(3) CDS	(4) CDS
Rating Floor	-0.0520	0.00390		
	(0.0463)	(0.0575)		
Viability Rating	-0.713***	-0.620***		
	(0.134)	(0.119)		
Rating Floor · Viability Rating		0.0640***		
		(0.0231)		
Rating Floor (t-1)			-0.0353	0.0123
			(0.0442)	(0.0557)
Viability Rating (t-1)			-0.679***	-0.604***
			(0.133)	(0.119)
Rating Floor (t-1) · Viability Rating (t-1)				0.0527**
				(0.0235)
Constant	1.592***	1.739***	2.110***	2.334***
	(0.263)	(0.259)	(0.373)	(0.393)
Observations	9,188	9,188	8,791	8,791
R-Squared	0.438	0.447	0.429	0.435
Number of Banks	197	197	194	194
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. Both variables Support Rating Floor and Viability Rating are subtracted by the median. The median Support Rating Floor (Viability Rating) equals 8 (7) in both the contemporaneous specification and the lagged specification.

The results regarding the change in the effects over time remains qualitatively largely as before. The coefficient of the support measure stays significant in both periods of the financial crisis. However, we find no significant effect for the Support Rating Floor for the years from the Euro crisis onwards. Contrary to that, the effect of the Viability Ratings increases from the beginning of the financial crisis onwards. In this way, the effect of an improvement in the Viability Rating by one notch increases in absolute terms from on average -28.8 bp in the first period of the financial crisis to on average -90.0 bp in the time of the Euro crisis between October 2009 and August 2012.

Table 10: Regression results for all banks in the sample in different sub-periods using Support Rating Floor (contemporaneous regressors)

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
		Jan 2005 - Jul 2007		
		(omitted)		
		Aug 2007 - Aug 2008		
Rating Floor	-0.163**		-0.168	
	(0.0781)		(0.102)	
Viability Rating	-0.288***		-0.235**	
	(0.105)		(0.0927)	
Rating Floor · Viability Rating			0.0508	
			(0.0386)	
		Sep 2008 - Sep 2009		
Rating Floor	-0.216**	-0.0529	-0.173	-0.00507
	(0.101)	(0.0519)	(0.108)	(0.0428)
Viability Rating	-0.590***	-0.303***	-0.488***	-0.253***
	(0.120)	(0.107)	(0.0933)	(0.0954)
Rating Floor · Viability Rating			0.159**	0.108*
			(0.0613)	(0.0552)
		Oct 2009 - Aug 2012		
Rating Floor	-0.0312	0.185	0.0356	0.208*
	(0.0582)	(0.124)	(0.0540)	(0.122)
Viability Rating	-0.900***	-0.310**	-0.701***	-0.213**
	(0.158)	(0.141)	(0.116)	(0.0945)
Rating Floor · Viability Rating			0.153**	-0.00561
			(0.0618)	(0.0886)
		Sep 2012 - Jun 2014		
Rating Floor	0.0362	0.0673**	0.112**	0.0762*
	(0.0441)	(0.0309)	(0.0495)	(0.0412)
Viability Rating	-0.733***	0.167**	-0.629***	0.0727
	(0.143)	(0.0780)	(0.130)	(0.0981)
Rating Floor · Viability Rating			0.0646**	-0.0886**
			(0.0249)	(0.0448)
Constant	1.031***	1.031***	1.076***	1.076***
	(0.247)	(0.247)	(0.235)	(0.235)
Observations	9,188	9,188	9,188	9,188
R-Squared	0.475	0.475	0.504	0.504
Number of Banks	197	197	197	197
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample. All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. Both variables Support Rating Floor and Viability Rating are subtracted by the median. The median Support Rating Floor (Viability Rating) equals 8 (7) in both the contemporaneous specification and the lagged specification.

Table 11: Regression results for all banks in the sample in different sub-periods using Support Rating Floor (lagged regressors)

VARIABLES	(1) CDS	(2) CDS	(3) CDS	(4) CDS
	Jan 2005 - Jul 2007			
	(omitted)			
	Aug 2007 - Aug 2008			
Rating Floor (t-1)	-0.153**		-0.141	
	(0.0733)		(0.0972)	
Viability Rating (t-1)	-0.226**		-0.194**	
	(0.105)		(0.0940)	
Rating Floor (t-1) · Viability Rating (t-1)			0.0316	
			(0.0369)	
	Sep 2008 - Sep 2009			
Rating Floor (t-1)	-0.192*	-0.0394	-0.160	-0.0193
	(0.103)	(0.0525)	(0.116)	(0.0442)
Viability Rating (t-1)	-0.568***	-0.342***	-0.481***	-0.287***
	(0.126)	(0.113)	(0.100)	(0.0985)
Rating Floor (t-1) · Viability Rating (t-1)			0.124**	0.0927*
			(0.0612)	(0.0544)
	Oct 2009 - Aug 2012			
Rating Floor (t-1)	-0.0292	0.163	0.0330	0.193
	(0.0575)	(0.128)	(0.0524)	(0.131)
Viability Rating (t-1)	-0.852***	-0.284**	-0.668***	-0.188**
	(0.157)	(0.142)	(0.114)	(0.0940)
Rating Floor (t-1) · Viability Rating (t-1)			0.146**	0.0222
			(0.0638)	(0.0930)
	Sep 2012 - Jun 2014			
Rating Floor (t-1)	0.0398	0.0691**	0.108**	0.0750*
	(0.0434)	(0.0326)	(0.0483)	(0.0426)
Viability Rating (t-1)	-0.657***	0.194**	-0.568***	0.101
	(0.139)	(0.0810)	(0.129)	(0.100)
Rating Floor (t-1) · Viability Rating (t-1)			0.0579**	-0.0886*
			(0.0251)	(0.0471)
Constant	1.658***	1.658***	1.799***	1.799***
	(0.320)	(0.320)	(0.326)	(0.326)
Observations	8,791	8,791	8,791	8,791
R-Squared	0.463	0.463	0.488	0.488
Number of Banks	194	194	194	194
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample. All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. Both variables Support Rating Floor and Viability Rating are subtracted by the median. The median Support Rating Floor (Viability Rating) equals 8 (7) in both the contemporaneous specification and the lagged specification. All regressors are lagged by one period.

4.3.2 Alternative Interpretation of a Missing Support Rating

Fitch Rating's Support Rating indicates the probability that a distressed bank will receive external support if needed. Thus, there could be two alternative interpretations if a bank has not received such a rating. First, there is the possibility that Fitch Ratings does

not provide a judgment on the support probability for the respective institution. Second, it could be that Fitch Ratings quantifies the probability of external support even lower than the worst Support Rating would indicate.[11] To this extent, we add to the numerical scale of the Support Rating the value '6' which is assigned to all banks without a Support Rating.[12]

Table 12: Regression results using an alternative interpretation of a missing Support Rating for the overall sample period

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
Support Rating	-0.289***	-0.250***		
	(0.0825)	(0.0618)		
Viability Rating	-0.501***	-0.449***		
	(0.0633)	(0.0504)		
Support Rating · Viability Rating		0.156***		
		(0.0272)		
Support Rating (t-1)			-0.268***	-0.237***
			(0.0837)	(0.0629)
Viability Rating (t-1)			-0.484***	-0.441***
			(0.0640)	(0.0510)
Support Rating (t-1) · Viability Rating (t-1)				0.145***
				(0.0281)
Constant	0.851***	0.930***	0.796***	0.862***
	(0.147)	(0.137)	(0.152)	(0.142)
Observations	20,328	20,328	19,452	19,452
R-Squared	0.553	0.581	0.542	0.565
Number of Banks	307	307	304	304
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample, where a missing Support Rating was replaced by the value '6'. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 2 (7) in both the contemporaneous specification and the lagged specification.

The results coincide with the baseline specification in terms of both quality and quantity. According to Table 12, an improvement in the Support Rating by one notch decreases on

[11] For banks with the lowest Support Rating, Fitch assumes "a possibility of external support, but it cannot be relied upon".

[12] We present descriptive statistics for this alternative interpretation of a missing Support Rating in Appendix C. It is to note that the number of observations increases slightly since a missing Support Rating is a binding constraint for deriving the sample.

average CDS-spreads by 28.9 bp, ceteris paribus. An improvement in the Viability Rating by one notch yields on average to a decrease in the CDS-spread by 50.1 bp according to this specification. While a higher support probability decreases CDS-spreads of banks with a weak intrinsic financial strength, indicated by a Viability Rating of 4 (10% quantile), by 72.8 bp on average, the effect is statistically not significant for banks with a strong intrinsic financial situation, indicated by a Viability Rating of 9 (90% quantile). Moreover, the effect of an increase in the Viability Rating by one notch decreases CDS-spreads of banks with a low probability for receiving external support (Support Rating of 5, 90% quantile) by on average 91.7 bp, and of banks with a high probability for receiving external support (Support Rating of 1, 10% quantile) by on average 29.3 bp.

The time-heterogeneous effects are also in line with the baseline specification. We find a significant effect of the Support Rating only from the crisis period onwards. We also find an increase in the value of the contingency insurance with increasing uncertainty about the true solvency situation of financial institutions after the default of Lehman Brothers, which again decreases with diminishing uncertainty about the solvency of banks and growing uncertainty about the solvency situation of sovereigns. Contrary to that, the Viability Rating becomes more important over time. The quantitative effect of an improved Viability Rating by one notch decreases CDS-spreads on average by 20 bp in the month before the financial crisis and by 61.3 bp in the post-crisis period.

Table 13: Regression results using an alternative Interpretation of a missing Support Rating for the overall sample period in different sub-periods

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
		Jan 2005 - Jul 2007		
Support Rating	-0.0545		0.00753	
	(0.0639)		(0.0481)	
Viability Rating	-0.200***		-0.188***	
	(0.0476)		(0.0401)	
Support Rating · Viability Rating			0.0209	
			(0.0236)	
		Aug 2007 - Aug 2008		
Support Rating	-0.200**	-0.146***	-0.202***	-0.210***
	(0.0785)	(0.0511)	(0.0736)	(0.0573)
Viability Rating	-0.241***	-0.0414	-0.249***	-0.0614**
	(0.0566)	(0.0333)	(0.0425)	(0.0280)
Support Rating · Viability Rating			0.0770**	0.0562**
			(0.0317)	(0.0262)
		Sep 2008 - Sep 2009		
Support Rating	-0.541***	-0.341***	-0.432***	-0.230***
	(0.117)	(0.0894)	(0.0887)	(0.0717)
Viability Rating	-0.610***	-0.369***	-0.650***	-0.401***
	(0.0769)	(0.0741)	(0.0688)	(0.0589)
Support Rating · Viability Rating			0.287***	0.210***
			(0.0473)	(0.0511)
		Oct 2009 - Aug 2012		
Support Rating	-0.307***	0.234**	-0.147***	0.286***
	(0.0865)	(0.110)	(0.0538)	(0.0935)
Viability Rating	-0.649***	-0.0391	-0.610***	0.0399
	(0.0783)	(0.0785)	(0.0618)	(0.0688)
Support Rating · Viability Rating			0.205***	-0.0822*
			(0.0242)	(0.0483)
		Sep 2012 - Jun 2014		
Support Rating	-0.168**	0.139***	0.000335	0.147***
	(0.0763)	(0.0359)	(0.0475)	(0.0391)
Viability Rating	-0.613***	0.0357	-0.517***	0.0930
	(0.0815)	(0.0605)	(0.0523)	(0.0590)
Support Rating · Viability Rating			0.202***	-0.00304
			(0.0293)	(0.0236)
Constant	1.070***	1.070***	1.054***	1.054***
	(0.113)	(0.113)	(0.102)	(0.102)
Observations	20,328	20,328	20,328	20,328
R-Squared	0.596	0.596	0.638	0.638
Number of Banks	307	307	307	307
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample. Missing observation in the Support Rating were replaced by the value '6'. All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. Both variables Support Rating and Viability Rating are subtracted by the median. The variable Support Rating is multiplied by (-1). The median Support Rating Floor (Viability Rating) equals 2 (7).

4.3.3 Balanced Sample

In the course of our sample period, we could observe that many banks dropped out of the market, in particular in the meantime of the financial crisis. Therefore, we analyze in this section whether the results are driven by a survivorship bias. To this extent, we rerun the baseline regressions with a fully balanced sample.

Table 14: Regression results for the overall sample period using a balanced sample

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
Support Rating	-0.0461	-0.0662		
	(0.0494)	(0.0525)		
Viability Rating	-0.255***	-0.219***		
	(0.0687)	(0.0628)		
Support Rating · Viability Rating		0.0401		
		(0.0320)		
Support Rating (t-1)			-0.0370	-0.0561
			(0.0502)	(0.0529)
Viability Rating (t-1)			-0.249***	-0.215***
			(0.0678)	(0.0627)
Support Rating (t-1) · Viability Rating (t-1)				0.0371
				(0.0323)
Constant	0.362**	0.357**	0.330*	0.348*
	(0.171)	(0.171)	(0.179)	(0.176)
Observations	8,436	8,436	8,288	8,288
R-Squared	0.651	0.653	0.642	0.644
Number of Banks	74	74	74	74
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample for which we have an observation at each point in time (fully balanced sample). Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 1 (7) in both the contemporaneous specification and the lagged specification.

The results in Table 14 and Table 15 indicate that there is no significant effect of the Support Rating when using a balanced sample, neither on average over the entire sample period nor in one of the sub-periods. Similar to the previous results, however, we do find a significant negative effect of the Viability Rating. On average, an increase in the individual strength by one notch decreases CDS-spreads by 25.5 bp (24.9 bp) in the contemporaneous

(lagged) regression. Here, too, the evolution of the effect remains similar to before. For a bank with a median Support Rating, the strength of the average effect increases from -8.3 bp in the pre-crisis period to -28.9 bp in the post-crisis period.

Table 15: Regression results in different sub-periods using a balanced sample

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
		Jan 2005 - Jul 2007		
Support Rating	0.0631		0.0400	
	(0.0446)		(0.0486)	
Viability Rating	-0.0707		-0.0830*	
	(0.0507)		(0.0447)	
Support Rating · Viability Rating			0.00463	
			(0.0187)	)
		Aug 2007 - Aug 2008		
Support Rating	-0.0547	-0.118	-0.103	-0.143
	(0.0955)	(0.0883)	(0.131)	(0.122)
Viability Rating	-0.114	-0.0435	-0.106**	-0.0227
	(0.0714)	(0.0571)	(0.0510)	(0.0299)
Support Rating · Viability Rating			0.0317	0.0271
			(0.0499)	(0.0495)
		Sep 2008 - Sep 2009		
Support Rating	-0.0634	-0.00872	-0.120	-0.0174
	(0.123)	(0.0649)	(0.123)	(0.0637)
Viability Rating	-0.238***	-0.124**	-0.165***	-0.0594
	(0.0750)	(0.0574)	(0.0597)	(0.0484)
Support Rating · Viability Rating			0.175**	0.144***
			(0.0680)	(0.0382)
		Oct 2009 - Aug 2012		
Support Rating	-0.0186	0.0448	-0.0266	0.0937
	(0.0510)	(0.133)	(0.0543)	(0.137)
Viability Rating	-0.383***	-0.146	-0.288***	-0.123*
	(0.103)	(0.0910)	(0.0814)	(0.0640)
Support Rating · Viability Rating			0.138**	-0.0370
			(0.0634)	(0.106)
		Sep 2012 - Jun 2014		
Support Rating	0.0136	0.0322	0.0273	0.0539
	(0.0395)	(0.0363)	(0.0407)	(0.0426)
Viability Rating	-0.399***	-0.0154	-0.289***	-0.00130
	(0.0611)	(0.0826)	(0.0716)	(0.0808)
Support Rating · Viability Rating			0.122***	-0.0159
			(0.0336)	(0.0502)
Constant	0.179	0.173	0.410***	0.386***
	(0.148)	(0.151)	(0.118)	(0.119)
Observations	8,436	8,436	8,436	8,436
R-Squared	0.676	0.676	0.691	0.691
Number of Banks	74	74	74	74
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for all banks in the sample for which we have an observation at each point in time (fully balanced sample). All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. The variable Support Rating is multiplied by (-1). Both variables Support Rating and Viability Rating are subtracted by the median. The median Support Rating (Viability Rating) equals 1 (7).

5 Conclusion

This paper has analyzed the value of implicit bailout guarantees as well as the strength of a market disciplinary effect. To this extent, we use bank-specific information on CDS-spreads as well as ratings regarding the financial strength and regarding the probability for receiving external support. In a first step, we derived the average value of the contingency insurance for governmental guarantees and a quantitative assessment of the long-run effect of market discipline. In a second step, we then analyzed how the effect of market discipline has changed over time, considering various events within the sample period.

The results confirm the existence of cost advantages for banks that benefit from implicit guarantees and thus the 'too-systemic-to-fail' doctrine. We find a lower CDS-spread for banks with a higher probability for external support, implying that the positive value of the contingency insurance is priced by the market. We further find a higher CDS-spread for banks with a weak financial strength. This second result provides evidence for the existence of market discipline, as market participants punish a bad stand-alone creditworthiness of financial institutions.

This study further highlights the countervailing mechanism of market discipline and the 'too-systemic-to-fail' doctrine. For various probabilities of receiving external support, we find a significantly heterogeneous effect of the intrinsic creditworthiness of a financial institution. Banks are punished for excessive risk-taking the more the lower the probability for external support. To the contrary, the disciplinary effect is lowest for institutions with a high probability for receiving bailout subsidies. Likewise, the value of the contingency insurance is highest for banks with a low intrinsic creditworthiness. These results show to be robust across different specifications.

The second result of the analysis demonstrates that both the Viability Rating as well as the Support Rating were priced heterogeneously over the various episodes of the financial crisis. In this way, we find a quantitatively increasing effect of an improved intrinsic creditworthiness. Risks were hardly priced in CDS-spreads before the financial crisis, and the financial system was regarded as being safe. The outbreak of the crisis can then be seen as a wake-up call for market participants entailing a strong effect of the financial strength of an institution on CDS-spreads. We find furthermore a quantitative increase in the effect of a rising Support Rating in the period of the financial crisis, and a decrease in the effect after the financial crisis. A possible explanation for the non-constant value of the

insurance could be the uncertainty about the true solvency situation of banks during the crisis, and a high uncertainty about the solvency situation of the sovereign as it appeared during the sovereign debt crisis, which implies the value of the contingency insurance to be particularly low.

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A Data Description

A.1 Data Description and Data Sources

Table A1a: Data Description and Data Sources (see Fitch Ratings (2014) for a more detailed description)

Variable (Source)	Description
CDS (Markit)	Single name 5-year senior Credit Default Swap, winsorized at 1/99%
Support Rating (Fitch Ratings)	***What do Support Ratings measure*** Support Ratings reflect the opinion of Fitch Ratings on the likelihood that a financial institution will receive extraordinary support in order to prevent a default on senior debt obligations. Extraordinary support is generally provided either by the institution's shareholders (institutional support) or by national authorities of the institution's home country (sovereign support). Thus, Support Ratings indicate the lowest level at which the institution's Long-Term Issuer Default Rating can fall at. ***When are Support Ratings assigned*** Support Ratings are assigned to all commercial banks, policy institutional banks, and bank holding companies. Support Ratings may also be assigned to non-bank financial institutions as for example securities companies or asset-management companies in case of an enhancement of transparency is achieved. ***How are Support Ratings determined*** Fitch Ratings reflect in the Support Ratings not only the propensity of the supporting entity to provide financial assistance but also its ability to do so. Therefore, the key factors regarding sovereign support are on the one hand the sovereign's ability to bail out the institution and on the other hand its propensity to support (i) the banking sector as well as (ii) the specific financial institution. The key factors regarding institutional support support are besides the parent company's ability to support the subsidiary its propensity to support as well as legal and regulatory constraints. ***Definition of the Rating Scale*** Support Ratings are assigned on a five-point scale with the following rating definitions: *1:* An institution with an extreme high likelihood for receiving external support. The potential supporting entity is very highly rated in its own right and indicates a very high propensity to support the institution in question. *2:* An institution with a high likelihood for receiving external support. The potential supporting entity is highly rated in its own right and indicates a high propensity to support the institution in question. *3:* An institution with a moderate likelihood for receiving external support due to uncertainties about the ability and propensity of the potential supporting entity to do so. *4:* An institution with only a limited likelihood for receiving external support due to significant uncertainties about the ability and propensity of any potential supporting entity to do so. *5:* An institution for which there is a possibility of external support, but it cannot be relied upon, either due to a lack of propensity to provide support or a weak financial ability of the potential supporting entity.

Table A1b: Data Description and Data Sources

Variable (Source)	Description
Support Rating Floor (Fitch Ratings)	***What do Support Rating Floors measure*** Support Rating Floors reflect the opinion of Fitch Ratings on the likelihood that a financial institution will receive extraordinary support in order to prevent a default on senior debt obligations specifically from governmental authorities. Unlike the Support Rating, Support Rating Floors therefore do not capture institutional support. Thus, Support Rating Floors indicate the lowest level at which the institution's Long-Term Issuer Default Rating can fall at if Fitch Ratings does not change its view on potential sovereign support. ***When are Support Rating Floors assigned*** Support Rating Floors are assigned to commercial banks, policy banks, bank holding companies, and non-bank financial institutions where Fitch Ratings believes that sovereign support is more likely than institutional support. They are also assigned when institutional support is more reliable but Fitch Ratings believes it would be useful also to indicate the level of governmental support. ***How are Support Rating Floors determined*** Fitch Ratings reflect in the Support Rating Floor not only the propensity of the institution's home country to provide financial assistance to both the banking sector and a specific financial institution but also its ability to do so. ***Definition of the Rating Scale*** Support Rating Floors are assigned on the 'AAA' rating scale. If there is no reasonable assumption that governmental support will be provided, a Support Rating Floor of 'No Floor' will be assigned.
Viability Rating (Fitch Ratings)	***What do Viability Ratings measure*** Viability Ratings reflect the intrinsic creditworthiness of a financial institution and the opinion of Fitch Ratings on the likelihood that this financial institution will fail. Fitch views a bank as having failed when it either stopped servicing its senior debt obligations to third-party, non-governmental creditors, entered a bankruptcy procedure or requires extraordinary support to restore its viability. Fitch Ratings distinguishes between ordinary and extraordinary support when assigning the Viability Rating. While extraordinary support is captured by the Support Rating (Floor), ordinary support is included in the Viability Rating and is defined as support that a bank receives due to its status as a bank, as for example routine access to central bank liquidity or as support a subsidiary bank often receives from its parent company, as for example in terms of stability and cost of funding or transfers of expertise. ***When are Viability Ratings assigned*** Viability Ratings are assigned to all commercial banks and bank holding companies, but not to subsidiary banks without a meaningful standalone franchise. Viability Ratings are complementary to Support Ratings, and are therefore often assigned jointly in order to highlight the two components of a financial institutions creditworthiness. ***How are Viability Ratings determined*** Five broad factors are considered by Fitch Rating when assigning a Viability Rating: the institution's operating environment, company profile, management and strategy, risk appetite and financial profile.

Table A1c: Data Description and Data Sources

Variable (Source)	Description
	Definition of the Rating Scale The scale of Viability Ratings is virtually identical to the 'AAA' rating scale with the small difference of the usage of small letters and a lowest rating of 'f' indicating the bank has failed according to Fitch Ratings view: *aaa (Highest fundamental credit quality):* A 'aaa' rating indicates the lowest expectation of a failure risk and best prospects for on-going viability. Financial institutions need to have extreme strong and stable fundamental characteristics in order to achieve this rating and it is highly unlikely that this capacity is adversely affected by foreseeable events. *aa (Very high fundamental credit quality):* A 'aa' rating indicates very strong prospects for on-going viability. Financial institutions need to have very strong and stable fundamental characteristics in order to achieve this rating and that this capacity is not significantly vulnerable to foreseeable events. *a (High fundamental credit quality):* A 'a' rating indicates strong prospects for on-going viability. Financial institutions need to have strong and stable fundamental characteristics in order to achieve this rating. However, this capacity is more vulnerable to adverse business or economic conditions than it is the case for higher ratings. *bbb (Good fundamental credit quality):* A 'bbb' rating indicates good prospects for on-going viability. Financial institutions have adequate fundamentals, but adverse business or economic conditions are more likely to impair this capacity. *bb (Speculative fundamental credit quality):* A 'bb' rating indicates moderate prospects for on-going viability. Financial institutions' fundamental financial strength is moderate, and adverse business or economic conditions impose an elevated vulnerability. *b (Highly speculative fundamental credit quality):* A 'b' rating indicates weak prospects for on-going viability. Financial institutions have a material failure risk but still a limited margin of safety. *ccc (Substantial fundamental credit risk):* A 'ccc' rating indicates that the failure of the financial institution is a real possibility. The capacity to continue business operations without extraordinary support is highly vulnerable to adverse business or economic conditions. *cc (Very high levels of fundamental credit risk):* A 'cc' rating indicates that the failure of the financial institution appears probable. *c (Exceptionally high levels of fundamental credit risk):* A 'c' rating indicates that the failure of the financial institution is imminent or inevitable. *f (Failure):* A 'f' rating indicates that the financial institution has failed in Fitch Rating's view, i.e. it either has defaulted on its senior debt obligations to third-party non-government creditors, requires extraordinary support or needs to impose losses on subordinated obligations in order to restore viability.
Individual Rating (Fitch Ratings)	***Definition of the Rating Scale*** Individual Ratings were withdrawn in January 2012 and replaced by Viability Ratings. Thus, Individual Ratings measure the intrinsic creditworthiness like Viability Ratings and were assigned on the following scale: *A:* A very strong financial institution with an outstanding profitability and balance sheet integrity, franchise, management, operating environment or prospects. *B:* A strong financial institution with a strong profitability and balance sheet integrity, franchise, management, operating environment or prospects. There are no major concerns regarding the institution. *C:* An adequate financial institution with one or more troublesome aspects. There are some concerns regarding its profitability and balance sheet integrity, franchise, management, operating environment or prospects. *D:* A financial institution with weaknesses of internal and/or external origin. There are concerns regarding its profitability and balance sheet integrity, franchise, management, operating environment or prospects. *E:* A financial institution with very serious problems, which is likely to require external support or already requires support. *F:* A financial institution that has either defaulted in Fitch Ratings' view or would have defaulted without extraordinary external support.

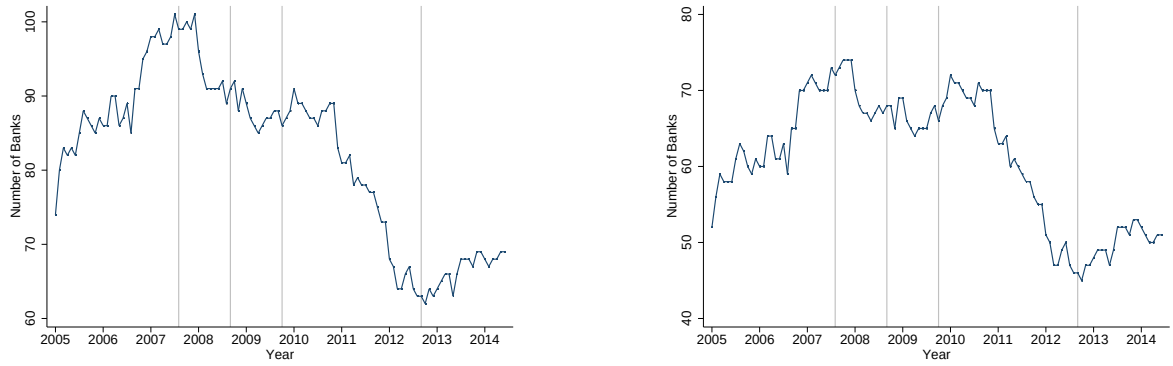
Table A2: Transformation of the Fitch Ratings Scale to numerical values

Rating	Fitch Ratings Rating	Numerical Rating
Support Rating	1	1
	2	2
	3	3
	4	4
	5	5
	NR	missing
		(as Robustnesscheck 6)
Support Rating Floor	AAA	10
	AA	9
	A	8
	BBB	7
	BB	6
	B	5
	CCC	4
	CC	3
	C	2
	D	1
	NF	0
Viability Rating	aaa	10
	aa+, aa	9
	aa-, a+	8
	a, a-	7
	bbb+, bbb, bbb-	6
	bb+, bb	5
	bb-, b+	4
	b, b-	3
	ccc, cc, c	2
	f	1
Viability Rating	A	10
(former name	A/B	9
Bank Individual Rating)	B	8
	B/C	7
	C	6
	C/D	5
	D	4
	D/E	3
	E	2
	F	1

B Descriptive Statistics across different geographical areas

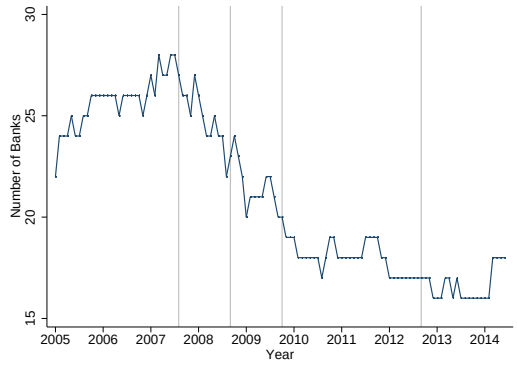
B.1 Number of Banks in the Sample

Figure B1: Number of Banks in the Sample across different geographical areas

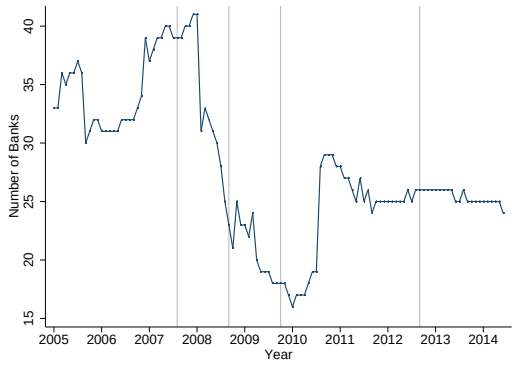


(a) EU

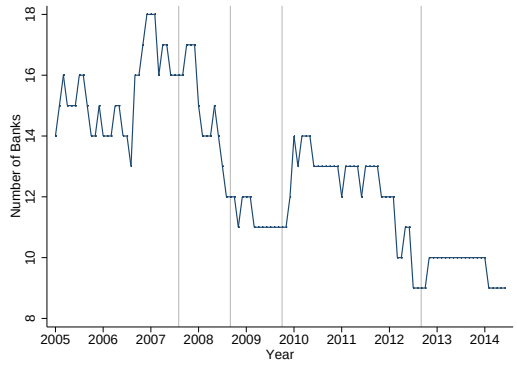
(b) Euro area



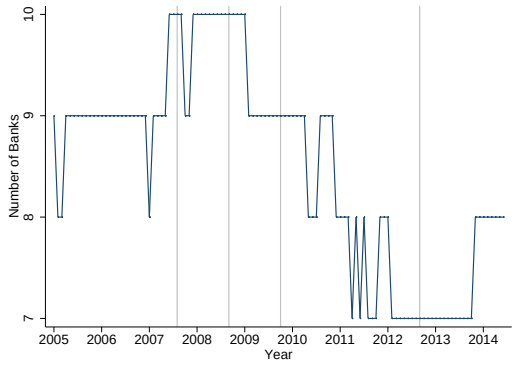
(c) EU excl. euro area



(d) USA



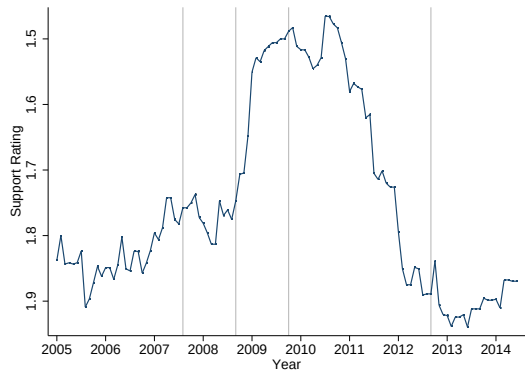
(e) Germany



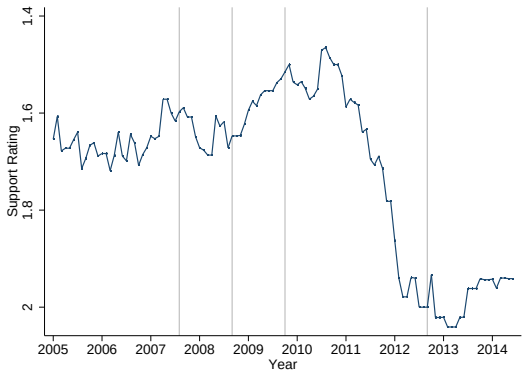
(f) Italy

B.2 Support Rating across different geographical areas

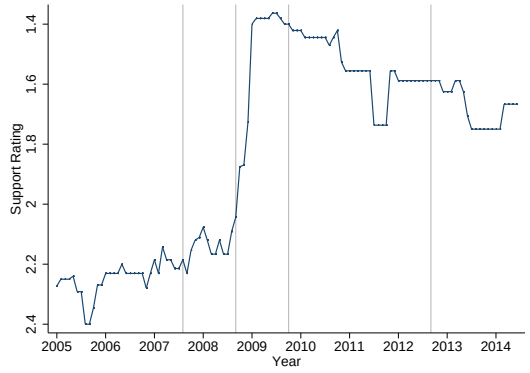
Figure B2: Arithmetic Mean of Support Ratings across different geographical areas



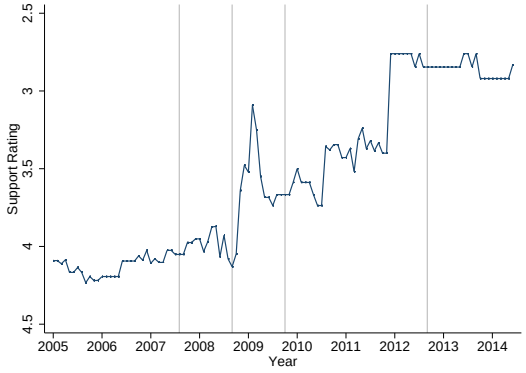
(a) EU



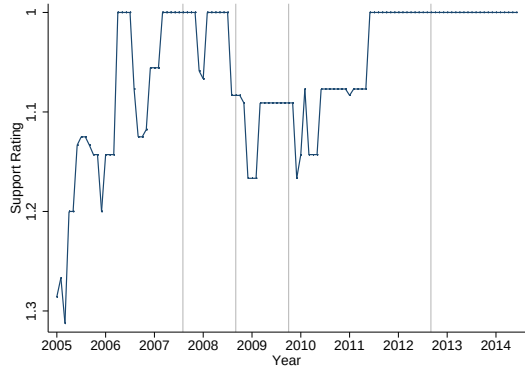
(b) Euro area



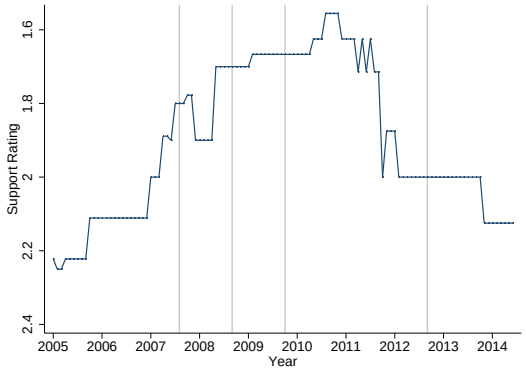
(c) EU excl. euro area



(d) USA



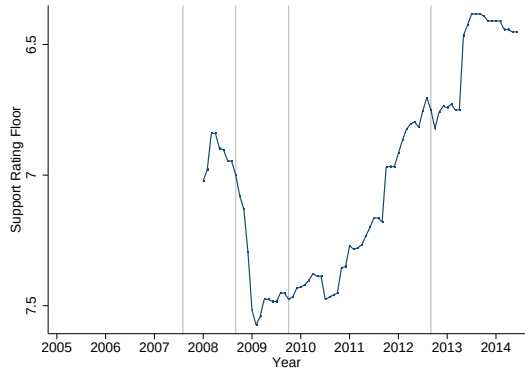
(e) Germany



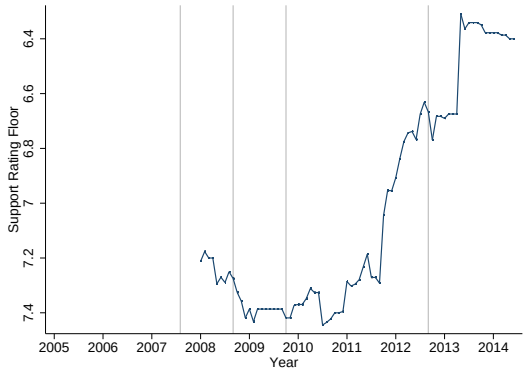
(f) Italy

B.3 Support Rating Floor across different geographical areas

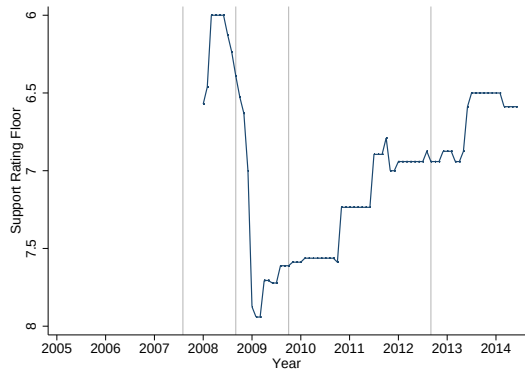
Figure B3: Arithmetic Mean of Support Rating Floors across different geographical areas



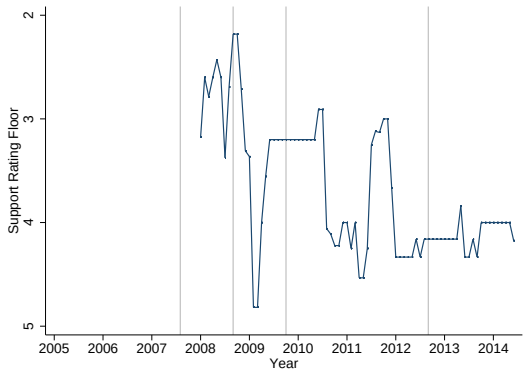
(a) EU



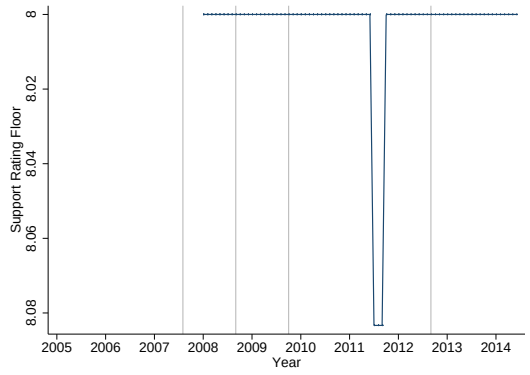
(b) Euro area



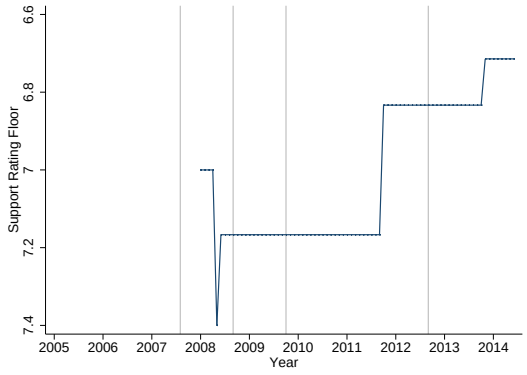
(c) EU excl. euro area



(d) USA



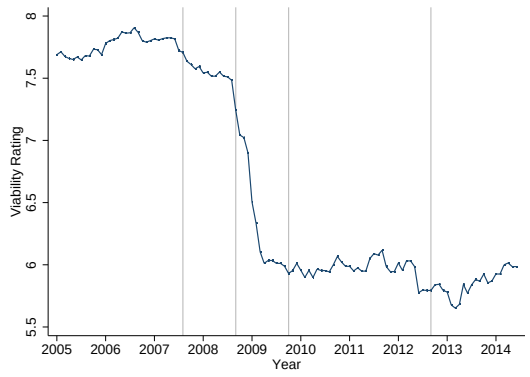
(e) Germany



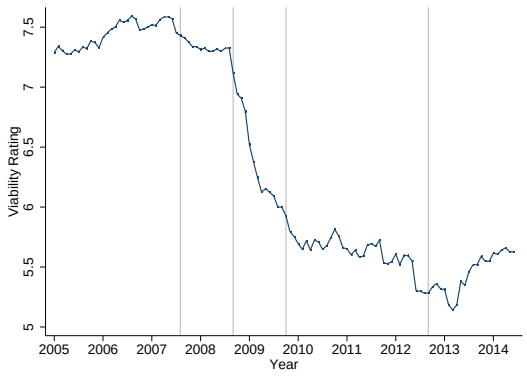
(f) Italy

B.4 Viability Rating across different geographical areas

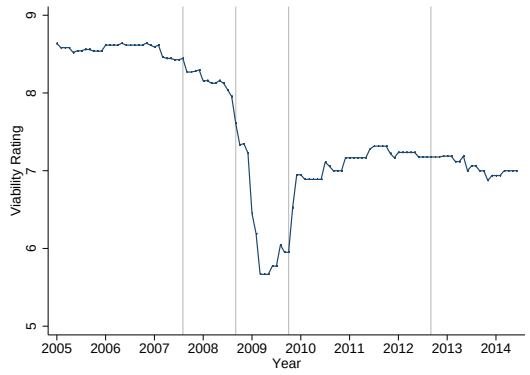
Figure B4: Arithmetic Mean of Viability Ratings across different geographical areas



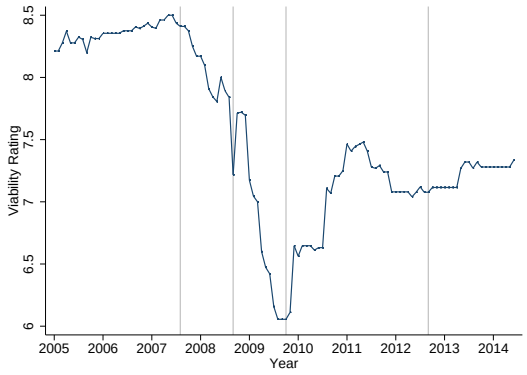
(a) EU



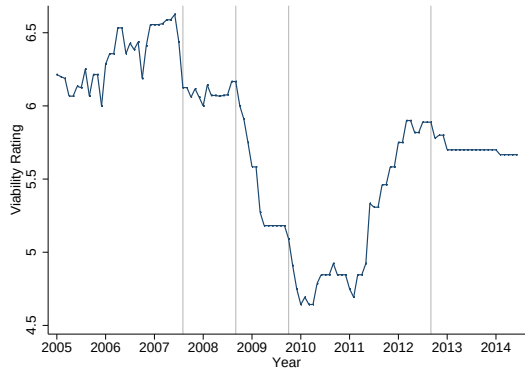
(b) Euro area



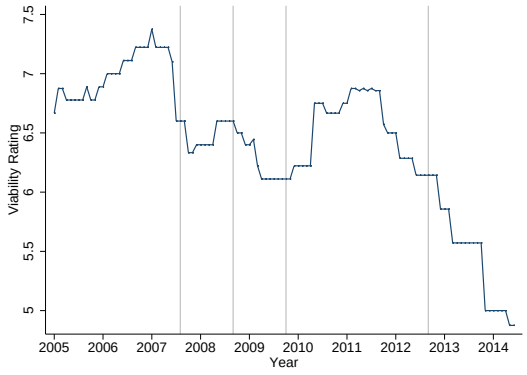
(c) EU excl. euro area



(d) USA



(e) Germany



(f) Italy

C Alternative Interpretation of a Missing Support Rating

Table C1: Descriptive Statistics Using the Alternative Interpretation of a Missing Support Rating

Variable	Mean	Std. Dev.	Min.	Max.	N
Jan 2005 - Jun 2014					
CDS	1.668	2.66	0.02	74.559	20328
Support Rating	2.173	1.452	1	6	20328
Rating Floor	6.350	2.734	0	9	9572
Viability Rating	6.72	1.71	1	10	20328
Jan 2005 - Jul 2007					
CDS	0.229	0.371	0.02	5	5783
Support Rating	2.379	1.482	1	5	5783
Rating Floor	7.020	1.241	0	8	51
Viability Rating	7.416	1.538	2	10	5783
Aug 2007 - Aug 2008					
CDS	1.168	1.277	0.125	12.792	2773
Support Rating	2.306	1.435	1	6	2773
Rating Floor	6.114	2.798	0	9	1042
Viability Rating	7.269	1.531	1	10	2773
Sep 2008 - Sep 2009					
CDS	2.966	4.273	0.173	74.559	2364
Support Rating	2.044	1.378	1	6	2364
Rating Floor	6.577	2.661	0	9	1265
Viability Rating	6.455	1.869	1	10	2364
Oct 2009 - Aug 2012					
CDS	2.571	3.155	0.28	52.681	5989
Support Rating	2.03	1.434	1	6	5989
Rating Floor	6.398	2.708	0	9	4150
Viability Rating	6.183	1.678	1	10	5989
Sep 2012 - Jun 2014					
CDS	2.031	2.009	0.234	22.195	3419
Support Rating	2.054	1.441	1	6	3419
Rating Floor	6.262	2.785	0	8	3064
Viability Rating	6.224	1.511	1	9	3419

Descriptive Statistics of CDS-Spreads, Support Ratings, Support Rating Floors and Viability Ratings for the sample where missing Support Ratings were replaced by the value '6'. The upper part of the table considers the overall sample period, while the lower part presents descriptive information for different subperiods. CDS spreads are winsorized at the 1/99% level.

D Support Rating Floor

This section shows the results for the GSIFI and non-GSIFI sample, respectively, in the various sub-periods using the Support Rating Floor instead of the Support Rating

Table D1: Regression results for GSIFIs in different sub-periods using Support Rating Floor

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
		Jan 2005 - Jul 2007		
		(omitted)		
		Aug 2007 - Aug 2008		
Rating Floor	0.0513		0.0282	
	(0.0330)		(0.0422)	
Viability Rating	0.0296		0.0441	
	(0.0931)		(0.0834)	
Rating Floor · Viability Rating			0.0158	
			(0.0208)	
		Sep 2008 - Sep 2009		
Rating Floor	-0.00485	-0.0561	-0.0362	-0.0644
	(0.0518)	(0.0510)	(0.0536)	(0.0522)
Viability Rating	-0.0654	-0.0950	-0.0699	-0.114*
	(0.0618)	(0.0634)	(0.0601)	(0.0581)
Rating Floor · Viability Rating			0.0498***	0.0340*
			(0.0177)	(0.0172)
		Oct 2009 - Aug 2012		
Rating Floor	0.0242	0.0291	0.00549	0.0417
	(0.0387)	(0.0506)	(0.0371)	(0.0507)
Viability Rating	-0.0629*	0.00248	-0.0461	0.0238
	(0.0334)	(0.0464)	(0.0299)	(0.0464)
Rating Floor · Viability Rating			0.0378	-0.0120
			(0.0274)	(0.0228)
		Sep 2012 - Jun 2014		
Rating Floor	-0.154	-0.178	-0.0532	-0.0587
	(0.155)	(0.136)	(0.118)	(0.109)
Viability Rating	-0.0261	0.0367	0.0321	0.0782
	(0.0741)	(0.0775)	(0.0878)	(0.0886)
Rating Floor · Viability Rating			0.449***	0.412**
			(0.148)	(0.157)
Constant	0.908***	0.908***	0.909***	0.909***
	(0.216)	(0.216)	(0.204)	(0.204)
Observations	1,568	1,568	1,568	1,568
R-Squared	0.716	0.716	0.725	0.725
Number of Banks	27	27	27	27
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for those banks in the sample that were not declined as globally systemic important institution by the Financial Stability Board in November 2011. All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. Both variables Support Rating Floor and Viability Rating are subtracted by the median.

Table D2: Regression results for non-GSIFIs in different sub-periods using Support Rating Floor

	(1)	(2)	(3)	(4)
VARIABLES	CDS	CDS	CDS	CDS
		Jan 2005 - Jul 2007		
		(omitted)		
		Aug 2007 - Aug 2008		
Rating Floor	-0.203*		-0.210	
	(0.112)		(0.144)	
Viability Rating	-0.337**		-0.333***	
	(0.137)		(0.114)	
Rating Floor · Viability Rating			0.0832	
			(0.0584)	
		Sep 2008 - Sep 2009		
Rating Floor	-0.237*	-0.0332	-0.268	-0.0579
	(0.136)	(0.0629)	(0.179)	(0.0974)
Viability Rating	-0.699***	-0.363**	-0.742***	-0.409***
	(0.156)	(0.141)	(0.155)	(0.147)
Rating Floor · Viability Rating			0.187**	0.104
			(0.0720)	(0.0714)
		Oct 2009 - Aug 2012		
Rating Floor	-0.0262	0.211	-0.0268	0.241
	(0.0791)	(0.144)	(0.0769)	(0.221)
Viability Rating	-1.008***	-0.308*	-0.942***	-0.200
	(0.174)	(0.172)	(0.132)	(0.151)
Rating Floor · Viability Rating			0.169**	-0.0180
			(0.0746)	(0.0975)
		Sep 2012 - Jun 2014		
Rating Floor	0.0417	0.0679**	0.126**	0.153*
	(0.0646)	(0.0341)	(0.0580)	(0.0808)
Viability Rating	-0.776***	0.232***	-0.716***	0.226**
	(0.158)	(0.0827)	(0.134)	(0.0898)
Rating Floor · Viability Rating			0.0899**	-0.0791
			(0.0349)	(0.0480)
Constant	1.535***	1.535***	1.705***	1.705***
	(0.401)	(0.401)	(0.386)	(0.386)
Observations	7,620	7,620	7,620	7,620
R-Squared	0.492	0.492	0.521	0.521
Number of Banks	170	170	170	170
Time FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

OLS regression of Equation (1) with bank fixed effects and time fixed effects for both CDS denominated in euro and CDS denominated in US dollar for those banks in the sample that were not declined as globally systemic important institution by the Financial Stability Board in November 2011. All explanatory variables are multiplied with a dummy that takes the value 1 in the respective period and 0 otherwise. Columns 1 and 3 display the effect of the relevant period, and columns 2 and 4 show the change in the coefficient to the previous period. Standard errors (in parentheses) are clustered on bank level. ***, **, * indicates significance on the 1%, 5% and 10% level. Both variables Support Rating Floor and Viability Rating are subtracted by the median.

E Descriptive Statistics of the Balanced Sample

Table E1: Descriptive Statistics of the balanced sample

Variable	Mean	Std. Dev.	Min.	Max.	N
			Jan 2005 - Jun 2014		
CDS	1.247	1.303	0.055	7.69	8436
Support Rating	2.085	1.549	1	5	8436
Rating Floor	6.277	2.996	0	9	4890
Viability Rating	7.072	1.541	1	10	8436
			Jan 2005 - Jul 2007		
CDS	0.162	0.118	0.055	1.046	2294
Support Rating	2.279	1.558	1	5	2294
Rating Floor	7.4	0.5	7	8	25
Viability Rating	7.574	1.537	2	10	2294
			Aug 2007 - Aug 2008		
CDS	0.919	0.806	0.138	7.69	962
Support Rating	2.23	1.565	1	5	962
Rating Floor	6.109	2.964	0	8	496
Viability Rating	7.796	1.279	2	10	962
			Sep 2008 - Sep 2009		
CDS	2.039	1.48	0.421	7.69	962
Support Rating	2.073	1.569	1	5	962
Rating Floor	6.29	3.041	0	9	711
Viability Rating	6.994	1.726	1	10	962
			Oct 2009 - Aug 2012		
CDS	1.883	1.391	0.381	7.69	2590
Support Rating	1.999	1.568	1	5	2590
Rating Floor	6.211	3.087	0	9	2130
Viability Rating	6.715	1.45	2	10	2590
			Sep 2012 - Jun 2014		
CDS	1.49	1.109	0.278	7.41	1628
Support Rating	1.871	1.446	1	5	1628
Rating Floor	6.4	2.871	0	8	1528
Viability Rating	6.552	1.326	1	9	1628

Descriptive Statistics of CDS-Spreads, Support Ratings, Support Rating Floors and Viability Ratings for the balanced sample. The upper part of the table considers the overall sample period, while the lower part presents descriptive information for different subperiods. CDS spreads are winsorized at the 1/99% level.