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Sovereign Stress, Banking Stress, and Corporate Financing Costs in the Euro Area

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Sovereign Stress, Banking Stress, and Corporate Financing Costs in the Euro Area

February 2016

Abstract

In this paper, we employ firm-level data to analyze to what extent financing conditions of non-financial corporations in the Euro Area depend on country-specific factors, in particular the respective country's government bond yield and the share of non-performing loans to the corporate sector. Moreover, we assess whether this relationship has changed during the European debt crisis. It turns out that the increase in corporate financing costs during the year 2011 can partially be explained by increasing government bond yields. However, the further increase of corporate financing costs in stressed Euro area countries during the year 2012 can not be explained by these yields, but by the share of non-performing loans. This finding suggests that the ECB's policy of reducing corporate financing costs in stressed countries via government bond purchases may not be effective.

Keywords: Banking stress, bond yields, financing conditions, interest rate channel, monetary policy transmission, quantitative easing, sovereign risk

JEL Classification: E43, E44, E52.

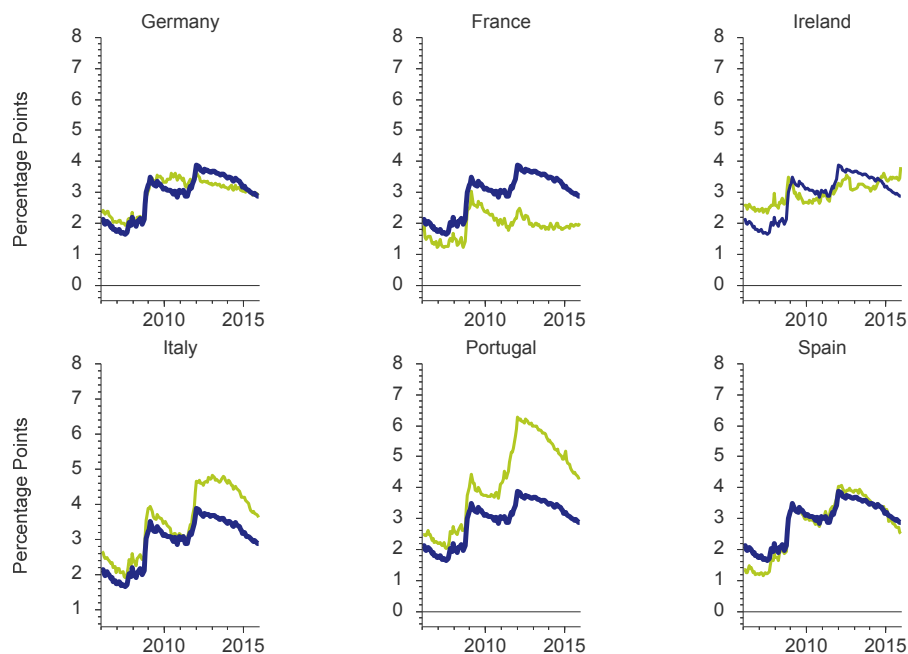
1 Introduction

In January 2015, the European Central Bank (ECB) has announced an Expanded Asset Purchase Programme (EAPP): “With key interest rates at their lower bound, the Governing Council considered outright purchases of securities with a high potential for influencing the financing conditions faced by Euro area households and firms to be warranted in view of the ECB’s price stability mandate.” ([European Central Bank, 2015](#))

The background of this statement is that the spread between bank lending rates and the money market rate in the Euro area is still considerably higher than before the financial crisis (figure 1). Until 2007, the difference between short-term bank lending rates to non-financial firms and EONIA was about two percentage points. During the year 2008 it increased to about three percentage points and during the year 2012 further to almost four percentage points. Since then the spread has been decreasing again to about three percentage points at the end of the year 2015. Furthermore the heterogeneity of the spread in the Euro area is quite large. While it lies below the Euro area average in Germany and France, it is above average in Ireland, Spain and Portugal which have been subject to a sovereign debt crisis in the recent years (stressed countries).

In the financial crisis and its aftermath major central banks around the world resorted to unconventional monetary policy measures such as asset purchase programs to provide monetary stimuli because key interest rates were close to or approaching the zero lower bound. A growing literature examines the effects of these programs on asset prices in general and on government bond yields. [D’Amico and King \(2010\)](#) estimate the effects of the Large-Scale Asset Purchase Program 1 („Quantitative Easing 1“) of the Federal Reserve on treasury yields. They find that the program significantly lowered yields, mostly through an overall reduction in the yield curve. [D’Amico et al. \(2012\)](#) confirm these results for the Large-Scale Asset Purchase Program 2 („Quantitative Easing 2“), which was put in place several months after the end of the first program. [Gagnon et al. \(2011\)](#) also look at the effects of the Large-Scale Asset Purchase Program 1 on treasury yields. Their results are in line with the findings by [D’Amico and King \(2010\)](#). [Krishnamurthy](#)

Figure 1: Difference between short-term bank lending rates and money market rate



Notes: Difference of short-term bank lending rate to non-financial firms (existing loans, up to one year) and money market rate (EONIA). Blue (thick) line for Euro area and green (thin) line for respective country. Data source: European Central Bank.

and [Vissing-Jorgensen \(2011\)](#) examine the impact of the two programs and document a reduction in the prices in various asset categories, including treasury yields. For the Euro area, [Krishnamurthy et al.](#) find decreasing effects of the Securities Markets Programme and of the Outright Monetary Transactions on government bond yields.

There are several reasons to expect government bond yields to have explanatory power for firms' financing conditions ([Barkbu et al., 2015](#)). [Corsetti et al. \(2013\)](#) argue that the costs of financial intermediation depend on sovereign risk and that higher government risk premiums therefore also increase the wedge between the risk free rate and private borrowing costs. [Bocola \(2015\)](#) shows that sovereign stress can reduce the banks' resources to finance firms and that banks may be more reluctant to lend due to a precautionary motive. In addition to sovereign stress also banking stress might increase firms' financing conditions. The quality of the credit portfolios of banks in stressed countries has deteriorated in the course of the European debt crisis. In this paper, we analyze to what extent

financing conditions of non-financial corporations in the Euro Area depend on sovereign stress as indicated by country-specific government bond yield spreads and on banking stress as indicated by the share of non-performing loans, and whether this relationship has changed during the European debt crisis. We identify the effect of government bond yields and non-performing loans on firms' financing costs by using micro level data; a single firm's financing conditions should not have a causal effect on government bond yields. Furthermore, we control for firm-specific factors which determine the firm-specific risk premium.

We show that (1) corporate financing costs in stressed countries and in non-stressed countries moved in significantly different directions during the years 2011 and 2012 while they moved in the same direction before the sovereign debt crisis; (2) that the increase of corporate financing costs in both stressed and non-stressed countries during the year 2011 can partially be explained by increasing government bond yields; and (3) that the increase in corporate financing costs during the year 2012 cannot be explained by increasing government bond yields but by the share of non-performing loans. Overall, these findings suggest that the ECB's policy of trying to reduce corporate financing costs in stressed countries via government bond purchases may not have been effective after 2012 due to banking stress in the crisis countries.

The remainder of the paper is organized as follows. Section 2 introduces the micro-level data used throughout the analysis and describes our measure of firms' financing costs. Section 3 analyzes to what extent the financing costs of firms can be explained by the evolution of government bond yield spreads (sovereign stress) before and after the crisis. Afterward we extend the analysis in section 4 to include non-performing loans as an indicator for banking stress. Finally, section 5 concludes.

2 Data

2.1 Firm-level data

The firm-level data used is based on the “Amadeus” data set provided by Bureau van Dijk. It contains annual balance sheet data of a large number of firms in different countries, sectors and with different legal forms. Examples of the use of this data set include [de Almeida \(2015\)](#), who use “Amadeus” data to examine the relationship between the financing conditions of firms in a several Euro area peripheral countries and sectoral inflation, and [Egger et al. \(2015\)](#), who look at the relation between firm-level productivity or quality of products and domestic sales and exports in France.

Our sample comprises the following nine member countries of the Euro area: Austria, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, and Spain¹; it spans the time from 2004 to 2013.

From the balance sheet data of firms we utilize eight variables which are relevant for determining the financing conditions of the respective firm ([Altmann, 2000](#); [Altmann et al., 2014](#)). Table 1 lists the variables used in the analysis and the exact definitions. Summary statistics of the variables are provided in table 2. Overall our data set comprises 11.152.736 observations for 2.256.791 firms, of which 60.61% are small, 33.19% medium sized and 6.20% large. All sectors are represented.

2.2 Measuring financing conditions at the firm level

We measure financing conditions at the firm level by interest payments divided by the average of liabilities in the current and previous period and call this variable financing conditions indicator (R_{ijt}). Since the available data is balance sheet information reported for a given reference date, taking the average of the two periods instead of simply using the current period value alone is necessary to capture the dynamics between the reference

¹Due to insufficient numbers of observations, we exclude Belgium, Greece and Luxembourg from the sample.

Table 1: Firm-level variables used

Variable	Description	Definition
cashflow	cashflow	cashflow/balance sum
fassets	fixed assets	fassets/balance sum
cassets	current assets	cassets/balance sum
ltbfunds	long-term borrowed funds	ltbfunds/balance sum
stbfunds	short-term borrowed funds	stbfunds/balance sum
ofrentability	ownfunds rentability	profit/ownfunds*100
ofratio	ownfunds ratio	ownfunds/balance sum*100
roi	return on investment	profit/balance sum*100

Notes: Variables are taken from the „Amadeus“ data set of Bureau van Dijk.

Table 2: Descriptive statistics of micro-level variables

Variable	mean	min	max	sd	p25	median	p75
cashflow	6.4	-71.5	50	9.5	1.6	4.9	10.4
fassets	37.2	0	99.4	30.7	9.6	29.5	61.6
cassets	62.8	0.6	100	30.7	38.4	70.5	90.4
ltbfunds	23.1	0	100	24.5	2.8	14.7	36.5
stbfunds	48.1	0	100	27.3	25.6	48.2	70.5
refinancing costs	2.4	0.0	11.6	1.8	1.0	2.06	3.4
ofrentability	9.7	-259.5	250	44.0	0	6.92	23.0
ofratio	28.8	-148.8	100	25.2	9.5	23.9	44.8
roi	2.2	-104.8	45.1	8.7	-0.24	1.2	5.0

Notes: All statistics in percent, i.e shares (see table 1) are multiplied by a factor of 100.

dates.² It should be noticed that this indicator does not represent marginal lending costs but rather average lending costs in a specific period.

²Due to the resulting requirement of observing two consecutive years of data per firm for the variables involved in the computation described above, the generated financing conditions indicator has missing values for parts of the observations. These observations are dropped from the sample for the empirical analysis. To rule out selection bias problems we check the characteristics of the micro variables in the two subgroups „refinancing conditions indicator is missing or zero“ and „refinancing conditions indicator is positive“. We find the differences between the subgroups to be insignificant.

Using the financing conditions indicator variable described above, we construct average financing costs for each country by aggregating the firm-level specific financing costs according to

$$\bar{R}_{jt} = \frac{1}{N_{jt}} \sum_{i=1}^{N_{jt}} R_{ijt}, \quad j = 1, \dots, J \quad (1)$$

and

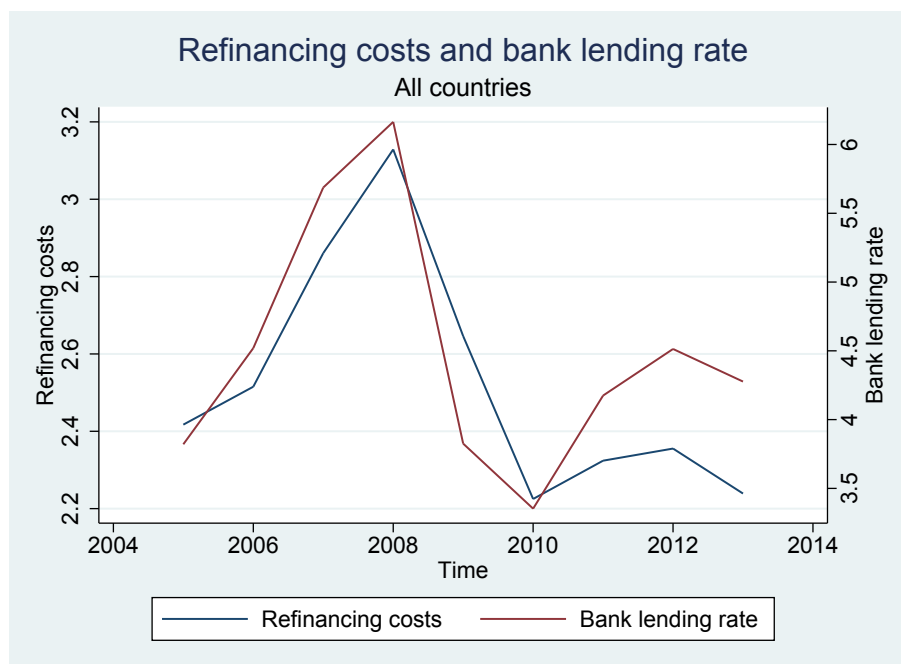
$$\bar{R}_t = \frac{1}{\sum_{j=1}^J N_{jt}} \sum_{j=1}^J \sum_{i=1}^{N_{jt}} R_{ijt}, \quad (2)$$

for the Euro area as a whole, where $J = 9$ is the number of countries, N_{jt} the number of observations for country j in period t , and R_{ijt} is the financing condition indicator for firm i in country j in period t .

To assess the reasonableness of the generated indicator, figure 2 depicts aggregate bank lending rates for non-financial corporations for the Euro area together with the average value of the financing conditions indicator for each year in the Euro area as a whole.³ As can be seen, the dynamics of both time series are similar. Comparable results also hold if we examine the individual countries separately (see figure 9 in the appendix). Therefore, the aggregated micro-level data and aggregate bank lending rates capture the same underlying dynamics. Financing costs for firms started rising in 2005 and reached a peak in 2008 before decreasing in 2009 and 2010. Afterward, rates rose again in the wake of the European debt crisis. We conclude that our constructed financing conditions indicators is a valid proxy for micro-level financing costs.

³Depicted financing conditions are based on unweighted averages across all countries. Figure 10 in the appendix compares the unweighted average to one weighted by firms' balance sum. With the exception of the year 2013, the dynamics are very similar.

Figure 2: Financing conditions indicator and aggregate bank lending rate



Bank lending rate denotes the short-term bank lending rate as published by the ECB and refinancing costs the financing conditions indicator constructed from individual firm data.

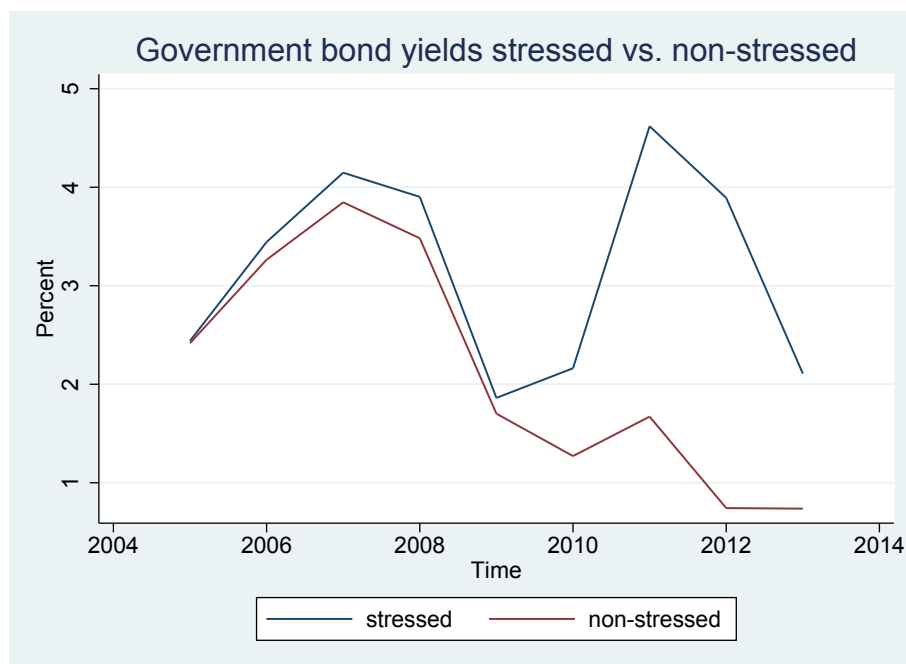
3 Sovereign stress and firm-level refinancing costs

3.1 Evidence on the link between government bond yields and firms' refinancing costs

From the perspective of a bank, government bonds are alternative assets for loans to private households and non-financial corporations. Therefore, the return of government bonds and loans to private households and firms should be connected. According to the expectation hypothesis of the term structure, government bond yields should reflect expected changes in the money market rate such that bank lending rates and government bond yields of similar maturities should exhibit similar dynamics over time.⁴ We use the spread of government bond yields against a reference country (Germany) in order to eliminate the common Euro area wide component of government bond yields.

⁴For further details on the relationship between bank lending rates and government bond yields see [Elton et al. \(2001\)](#), [Chatelain and Tiomo \(2001\)](#); [Chatelain et al. \(2003\)](#) and [Bocola \(2015\)](#).

Figure 3: Government bond yields in stressed and non-stressed countries



Notes: Stressed countries are Ireland, Italy, Spain and Portugal. Non-stressed countries refers to Austria, Finland, France, Germany and the Netherlands. FTSE Global Government Bond Yield, 1-3 Years. Source: ThomsonReuters Datastream

Turning to the yields on government bonds in the Euro area countries, we see in figure 3 the sharp bifurcation between stressed and non-stressed countries. The classification into the two subgroups is based on the respective country's government bond yield spread as compared to Germany: Those countries with spreads above the Euro area average are labeled „stressed“ (Ireland, Italy, Spain and Portugal), whereas those with lower spreads are labeled „non-stressed“ (Austria, Finland, France, Germany and the Netherlands).⁵ In the first half of the sample until 2009, government bond yields evolved in a parallel manner with only a minimal average premium for the later stressed countries. This, however, changed completely in the second half of the sample. Starting in 2010, the yields for both country groups diverge substantially, reaching a difference of three percentage points in 2012, in the wake of the European debt crisis. Because of a decline in the yields for the stressed countries, the difference then diminished somewhat in 2013. This divergence in developments becomes even more clear when looking at the spread of each country's

⁵This corresponds to the classification in Corsetti et al. (2013), although these authors consider some additional countries which are not in our sample.

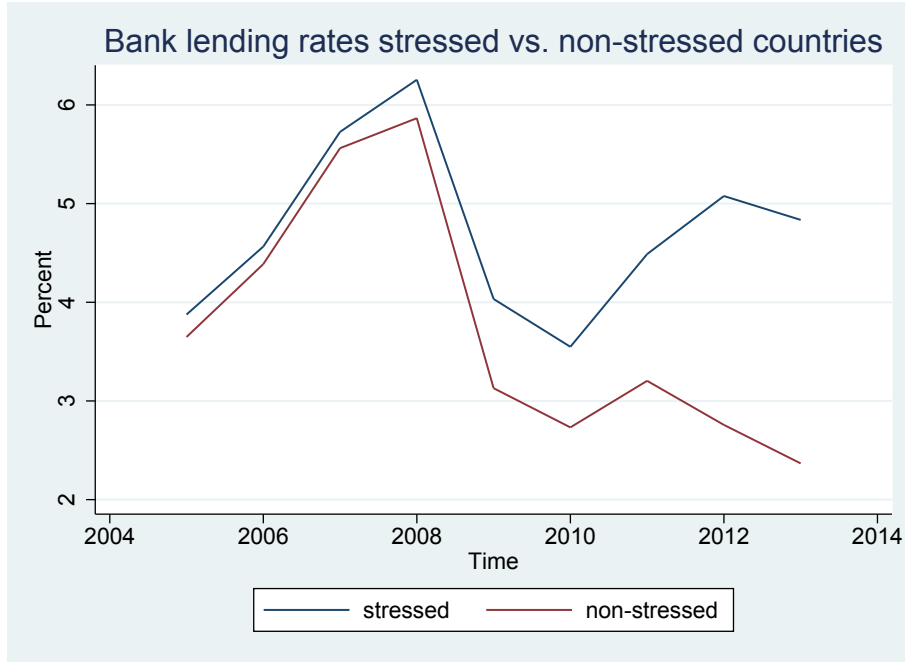
bond yields with the one of Germany as a reference (see figure 11 in the appendix): While the measure for the non-stressed countries registers only a slight increase, the spread rises dramatically for the stressed countries.

3.2 Firm-level financing conditions in stressed and non-stressed countries

We find the analogue to the divergent path of government bond yields in the developments of the aggregate bank lending rates (figure 4) and our constructed refinancing cost variable (figure 5). For both variables, the dynamics of the rates in the different country groups are the same in the first half of the sample. However, in contrast to the government bond yields which started to exhibit different dynamics in 2010, these rates only diverge in 2012, rising in the stressed and falling in the non-stressed countries. This matches results in Ferrando et al. (2015), who find that stressed countries had a higher probability to be credit constrained after the crisis (their definition of stressed countries is the same as in our paper, except that they also include Greece in the group which we dropped from our sample).

While insightful, the graphical analysis of aggregate measures can not answer the question whether the differences in observed outcomes are based on country-specific variables or on differences between the examined country groups with respect to the underlying micro-level data. If these were heterogeneous across countries, we would also expect financing costs to be different. To assess potential differences across countries, table 3 provides summary statistics of the micro variables used for each country. While the differences are small for many variables, they are substantial for some, especially with respect to borrowed funds, both long- and short-term, own funds rentability and the return on investment. The latter two are pronouncedly lower in the group of stressed countries (Spain, Ireland, Italy and Portugal). Using micro data we are able to control for these differences on the firm-level. Since the aggregate outcomes in the respective country are exogenous to the characteristics and behaviour of a single firm, we are thus able to

Figure 4: Bank lending rates in stressed and non-stressed countries



Bank lending rates denote the short-term bank lending rate as published by the ECB. Stressed countries are Ireland, Italy, Spain and Portugal. Non-stressed countries refer to Austria, Finland, France, Germany and the Netherlands.

identify the causal effect of government bond yields on financing costs of firms, given the micro-level characteristics.

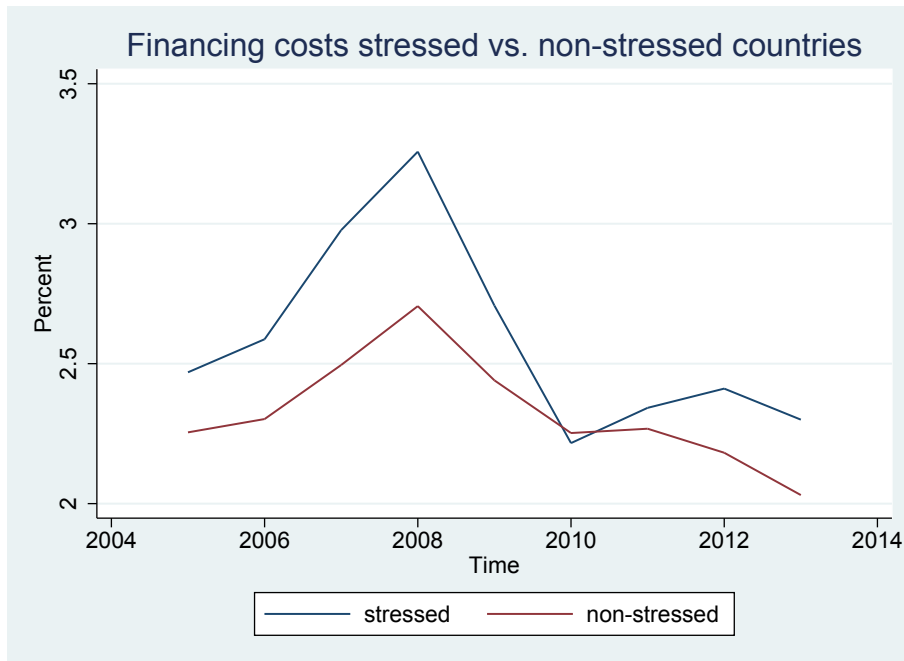
To assess the divergence in aggregate financing costs more formally, we estimate a set of difference-in-difference models including observations for two consecutive years, respectively:

$$R_{ijt} = \beta_0 + \beta_1 year_d + \beta_2 stressed * year_d + \beta_3 small + \beta_4 medium + \sum_{k=1}^K \gamma_k z_{ikt} + \alpha_i + \varepsilon_{ijt}, \quad (3)$$

where $year_d, d = 2008, \dots, 2013$ denotes the dummy for the second year in the sample, respectively, $stressed * year_d$ the interaction term between this year dummy and the variable $stressed$ which is equal to 1 if firm i is located in a stressed country and zero otherwise. z_{ikt} denotes a set of K firm-specific control variables. $small$ and $medium$ refer to firm sizes and α_i are firm fixed effects. Each estimation contains the observations of year d and $d - 1$.

According to the results presented in table 4, the change in refinancing costs (while con-

Figure 5: Financing conditions in stressed and non-stressed countries



Financing costs constructed from individual firm data. Stressed countries are Ireland, Italy, Spain and Portugal. Non-stressed countries refer to Austria, Finland, France, Germany and the Netherlands. Unweighted averages, respectively.

trolling for firm-specific variables) has been negative for non-stressed countries ($\beta_1 = -0.108$), but positive for stressed countries during the year 2012 ($\beta_1 + \beta_2 = 0.079$); the difference is significant. The same is true when considering the change in financing costs in 2011, where the difference was even larger ($\beta_1 + \beta_2 = 0.1353$). In 2013, financing costs have been lower for both country groups, although the reduction was smaller in stressed countries ($\beta_1 + \beta_2 < 0, \beta_2 > 0$). Between 2008 and 2010, in contrast, the change in financing costs was amplified in stressed compared to non-stressed countries; 2008 with positive, 2009 and 2010 with negative changes in financing costs. Note also that the change in financing costs was significantly higher for small firms only in the years 2012 and 2013, while the premium for medium sized firms was significantly positive throughout the entire period.

Table 3: Descriptive statistics of micro-level variables per country

Variable	Statistic	AT	DE	ES	FI	FR	IE	IT	NL	PT	Total
cashflow	mean	9.0	9.7	5.6	12.4	9.8	6.3	4.7	11.0	6.8	6.4
	sd	9.9	9.9	9.2	13.0	10.3	10.9	7.9	8.5	10.3	9.5
	median	7.8	8.0	4.6	11.2	8.8	5.4	3.5	9.9	5.6	4.9
fassets	mean	40.3	36.4	43.7	50.7	38.3	42.9	31.2	39.3	32.3	37.2
	sd	29.5	29.1	31.0	30.9	29.6	34.0	30.0	25.6	28.1	30.7
	median	35.7	29.7	40.1	52.3	31.1	38.3	20.5	36.7	24.8	29.5
cassets	mean	59.7	63.6	56.3	49.4	61.6	57.1	68.8	60.7	67.7	62.8
	sd	29.6	29.1	31.0	30.9	29.6	34.0	30.0	25.6	28.1	30.7
	median	64.3	70.3	59.9	47.9	68.9	61.7	79.5	63.3	75.2	70.5
ltbfunds	mean	12.7	36.2	25.8	32.8	16.6	20.7	22.2	20.3	20.4	23.1
	sd	12.3	26.3	25.6	26.6	20.6	27.2	23.4	18.5	25.3	24.5
	median	9.5	30.3	18.0	27.6	8.2	7.4	14.1	15.8	8.9	14.7
stbfunds	mean	52.5	32.6	42.0	35.3	49.4	39.0	55.1	44.8	49.0	48.1
	sd	24.4	27.5	26.9	23.5	23.4	27.6	27.3	20.3	27.2	27.3
	median	53.9	27.7	39.7	31.9	49.5	33.9	58.2	44.3	48.9	48.2
refinancing costs	mean	1.8	2.8	2.6	3.0	2.0	2.5	2.2	2.8	2.9	2.4
	sd	1.7	2.0	1.9	1.8	1.6	2.0	1.8	2.0	2.1	1.8
	median	1.3	2.5	2.3	2.7	1.7	2.0	1.9	2.5	2.4	2.0
ofrentability	mean	13.1	17.5	8.4	16.6	19.1	11.7	5.9	19.0	7.5	9.7
	sd	41.8	45.0	42.3	49.8	41.8	42.7	45.0	30.9	43.7	44.0
	median	11.0	11.5	5.5	14.7	15.6	7.5	4.8	15.9	5.6	6.9
ofratio	mean	34.7	31.2	32.2	31.9	33.9	40.3	22.8	34.9	30.7	28.8
	sd	23.1	24.8	27.7	28.1	23.6	31.0	22.2	19.5	24.9	25.2
	median	31.0	27.8	28.1	30.4	32.1	39.7	16.1	34.0	27.1	23.9
roi	mean	4.3	4.6	1.4	4.7	5.5	2.8	1.2	6.2	1.5	2.2
	sd	9.4	9.0	8.5	12.0	9.9	10.8	7.3	8.0	9.0	8.7
	median	3.1	3.0	1.1	3.6	4.6	2.0	0.5	5.0	1.2	1.2

Notes: Variables are taken from the „Amadeus“ data set of Bureau van Dijk. All statistics in percent, i.e. shares (see table 1) are multiplied by a factor of 100.

3.3 Effect of sovereign stress on firms' financing costs

In order to explore the impact of government bond yields on firm-specific financing conditions, we estimate the following panel regression model:

$$\Delta R_{ijt} = \sum_{t=2006}^{2013} \beta_t \Delta spread G_{jt} + \delta \Delta i_m + \sum_{k=1}^K \gamma_k \Delta z_{ikt} + \sum_{l=1}^L \zeta_l \Delta w_{jt} + \alpha_i + \varepsilon_{ijt}, \quad (4)$$

where $\sum spread G_{jt}$ denotes a set of interaction terms between the spread of the government bond yield for country j in period t to the corresponding yield for Germany and year dummies, Δi_m the change in the money market rate, z_{ikt} denotes a set of K firm-specific control variables, w_{jt} a set of L country-specific macro control variables and α_i firm fixed effects. The model is specified in first differences in order to account for unobserved

Table 4: Difference-in-difference models for financing conditions

Dependent variable is financing costs (R_{ijt})

Variable	2008	2009	2010	2011	2012	2013
year dummy	0.107*** (0.0027)	-0.349*** (0.0028)	-0.220*** (0.0024)	-0.0187*** (0.0021)	-0.108*** (0.0021)	-0.141*** (0.0022)
stressed*year dummy	0.0981*** (0.0033)	-0.280*** (0.0033)	-0.291*** (0.0029)	0.154*** (0.0025)	0.187*** (0.0025)	0.0172*** (0.0026)
small	-0.0040 (0.0142)	-0.0175 (0.0142)	0.0142 (0.0129)	0.0050 (0.0108)	0.0363** (0.0118)	0.0615*** (0.0129)
medium	0.129*** (0.0140)	0.0718*** (0.0142)	0.0891*** (0.0129)	0.0698*** (0.0110)	0.0923*** (0.0119)	0.126*** (0.0131)
micro controls	yes	yes	yes	yes	yes	yes
cons	2.671*** (0.0568)	3.829*** (0.341)	2.490*** (0.240)	2.004*** (0.0352)	2.473*** (0.0323)	2.489*** (0.123)
N	2.248.494	2.461.972	2.533.495	2.546.448	2.526.877	2.327.946
R^2	0.022	0.123	0.109	0.015	0.010	0.018
adj. R^2	0.022	0.123	0.109	0.015	0.010	0.018
$\beta_1 + \beta_2$	0.2051	-0.629	0.511	0.1353	0.079	-0.1238
$F(\beta_1 + \beta_2 = 0)$	11216.55	1.2e+05	1.1e+05	10134.68	3303.14	7651.90
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: Dependent variable is financing costs. The set of firm-specific variables (micro controls) is described in the text. Marginal effects reported in all columns with cluster-robust standard errors at the firm level in parentheses. Statistical significance at the 5, 1, 0.1 percent levels denoted by *, **, ***, respectively. „Sum coeff“ refers to the sum of the coefficients of the year dummy and the interaction between this year dummy and the dummy indicating a stressed country in each regression. F reports the F -statistic for the Wald-test on the hypothesis that this sum is equal to zero and p is the corresponding p -value

firm-specific heterogeneity. The sample is 2005 to 2013. The results are shown in table 5.

Column 1 presents our baseline specification. The coefficient on the government bond yield spread is positive and significant. Accordingly, the spreads significantly increase financing costs in the respective countries, controlling for the firm-specific variables described above. Specifying interaction terms between the spread and a set of year dummies in column 2 allows us to analyze the effect of the spreads in different years. Before the crisis (2006, 2007) and after the peak in 2009 and 2010, the government bond yield spread coefficient is negative; the spread does not have an increasing effect on firms' financing costs. However, in crisis years (2008, worldwide financial crisis) and 2011-2013 country-specific spreads significantly influence firms' financing costs. All interaction coefficients are significant at the 0.1% level. The results are qualitatively robust to the inclusion of the unemployment rate as macroeconomic control variable in column 3.

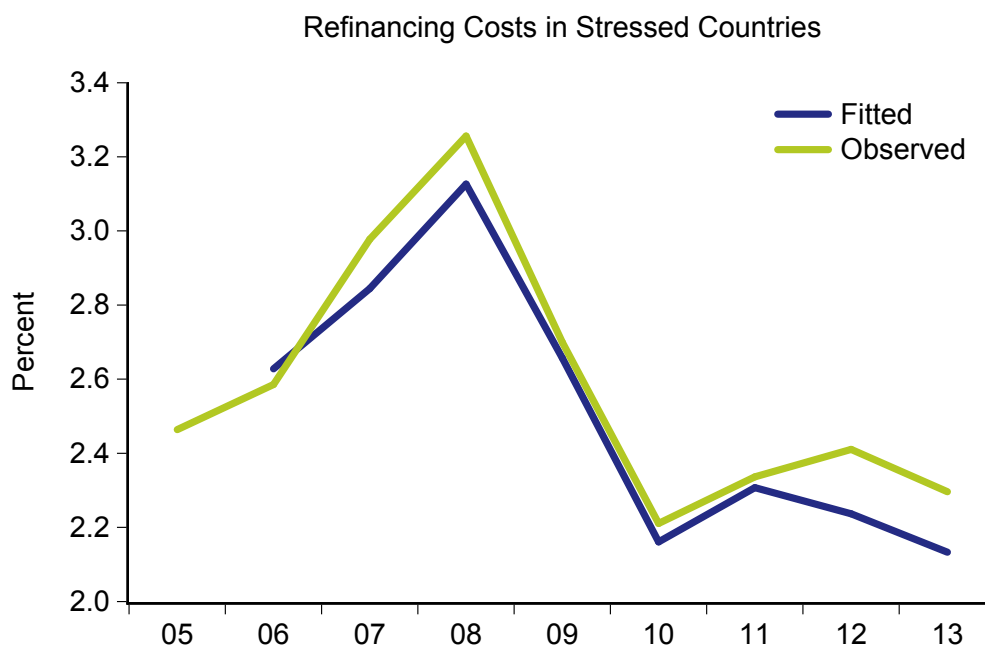
With respect to the other variables included in the regressions we find that changes in

Table 5: Results of panel estimation sovereign stressDependent variable is the difference of financing costs (ΔR_{ijt})

Variable	1	2	3	4	5	6	7
spread G	0.0214*** (0.000416)			0.0208*** (0.000416)	0.0164*** (0.000419)		
imd	0.175*** (0.000488)	0.167*** (0.000555)	0.166*** (0.000578)	0.195*** (0.000585)	0.197*** (0.000585)	0.159*** (0.00102)	0.153*** (0.00106)
small	-0.0323*** (0.00624)	-0.0253*** (0.00617)	-0.0254*** (0.00617)	-0.0304*** (0.00624)	-0.0348*** (0.00619)	-0.0244*** (0.00616)	-0.0252*** (0.00615)
medium	-0.0413*** (0.00613)	-0.0552*** (0.00607)	-0.0556*** (0.00608)	-0.0352*** (0.00613)	-0.0650*** (0.00608)	-0.0531*** (0.00606)	-0.0570*** (0.00606)
spread G*2006		-0.156*** (0.0110)	-0.156*** (0.0110)			-0.138*** (0.0110)	-0.146*** (0.0110)
spread G*2007		-0.604*** (0.0185)	-0.604*** (0.0185)			-0.553*** (0.0187)	-0.563*** (0.0187)
spread G*2008		0.975*** (0.00732)	0.973*** (0.00742)			0.804*** (0.00982)	0.835*** (0.0101)
spread G*2009		-0.112*** (0.00492)	-0.113*** (0.00495)			-0.0926*** (0.00498)	-0.0948*** (0.00498)
spread G*2010		-0.591*** (0.00223)	-0.590*** (0.00225)			-0.626*** (0.00360)	-0.615*** (0.00364)
spread G*2011		0.0161*** (0.000621)	0.0163*** (0.000632)			0.0466*** (0.00105)	0.0433*** (0.00107)
spread G*2012		0.0720*** (0.00191)	0.0725*** (0.00195)			0.0278*** (0.00205)	0.0386*** (0.00213)
spread G*2013		0.104*** (0.000917)	0.103*** (0.00103)			0.0546*** (0.00148)	0.0475*** (0.00152)
ur			-0.000314 (0.000171)		-0.0217*** (0.000163)		-0.00526*** (0.000247)
npl				0.0470*** (0.000674)	0.0813*** (0.000752)		
npl2006						0.0624*** (0.00539)	0.0416*** (0.00558)
npl2007						0.0386*** (0.00312)	0.0301*** (0.00323)
npl2008						0.0674*** (0.00227)	0.0592*** (0.00233)
npl2009						-0.0245*** (0.00161)	-0.0255*** (0.00160)
npl2010						0.0985*** (0.00505)	0.120*** (0.00517)
npl2011						-0.0471*** (0.00188)	-0.0258*** (0.00217)
npl2012						0.0564*** (0.00118)	0.0735*** (0.00144)
npl2013						-0.0426*** (0.00126)	-0.0287*** (0.00142)
cons	0.115*** (0.00575)	0.155*** (0.00571)	0.159*** (0.00600)	0.0755*** (0.00578)	0.301*** (0.00595)	0.149*** (0.00577)	0.195*** (0.00613)
micro con.	yes	yes	yes	yes	yes	yes	yes
N	7.923.144	7.923.144	7.923.144	7.923.108	7.923.108	7.923.108	7.923.108
R^2	0.032	0.052	0.052	0.032	0.035	0.054	0.054
adj. R^2	0.032	0.052	0.052	0.032	0.035	0.054	0.054
df_m	11	18	19	12	13	26	27

Notes: Dependent variable is the difference of the financing conditions indicator. The set of firm-specific variables (micro controls) is described in the text. Marginal effects reported in all columns with cluster-robust standard errors at the firm level in parentheses. Statistical significance at the 5, 1, 0.1 percent levels denoted by *, **, ***, respectively.

Figure 6: Observed financing costs and fitted values in stressed countries for the specification with sovereign stress



Notes: Depicted fitted values are based on the specification in column 2 of table 5. Financing costs constructed from individual firm data for stressed countries (Ireland, Italy, Spain and Portugal).

the money market rate have the expected positive effect on financing costs. In addition, we include dummies for the size of firms. Both small and medium sized firms are estimated to have lower financing cost compared to large corporations, although effect is very negligible.

Based on the results in table 5 we construct fitted values to compare the model fit to the observed financing costs. Figure 6 depicts the results for the stressed countries. As can be seen the model is successful in tracking the evolution of firms' financing costs in the first half of the sample. Especially, government bond yield spreads help explaining the increase of financing costs in the financial crisis and the following even stronger fall thereafter. The model fails, however, to capture the increase in financing costs in the stressed countries in 2012. Arguably, this increase is driven by other factors than sovereign stress. It is this missing factor that we turn to now.

4 Banking stress and firm-level refinancing costs

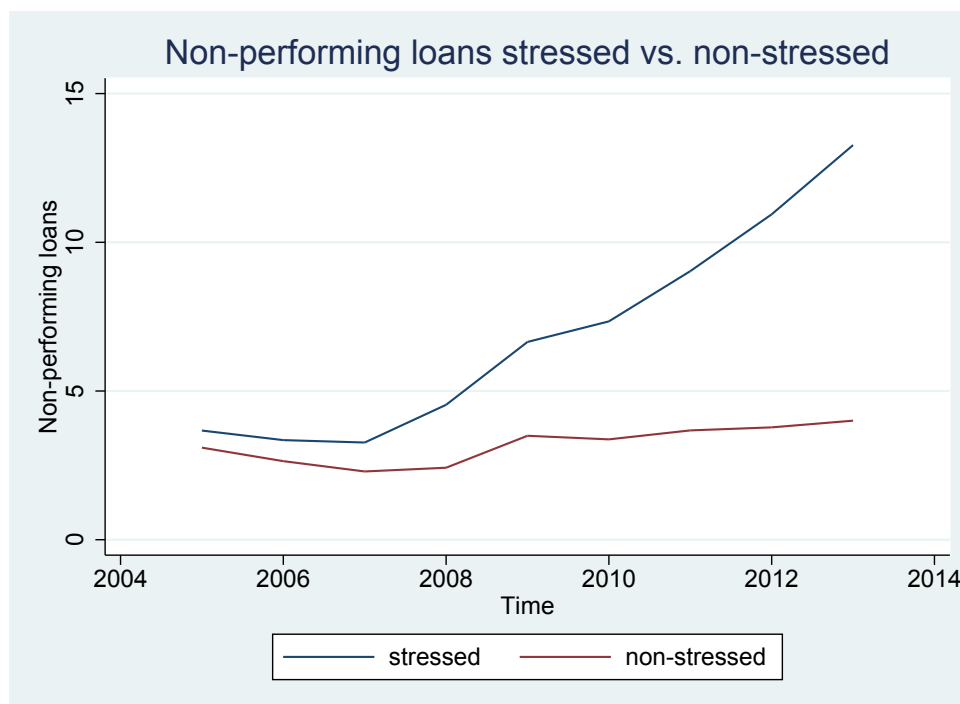
4.1 Evidence on the link between banking stress and firms' refinancing costs

Considering the results in section 3, sovereign stress alone can not explain the further increase in financing costs in stressed countries after 2011. A potential shortcoming of government bond yield spreads in explaining firm refinancing costs in the European debt crisis is that though they are an important determinant of banking stress, they may not fully capture the distortions in the financial sector. Stress through the financing side is one aspect, however, one also needs to take into account banking stress through the asset side of banks' balance sheets, when real economic fundamentals in stressed countries deteriorate. One variable to measure this dimension is the share of non-performing loans of banks. If the aggregate share of defaults on corporate loans increases in a country, the banks in the respective country may be forced to demand a premium when granting new loans.⁶

Figure 7 depicts the share of non-performing loans to the private sector for stressed and non-stressed countries over time. Initially the measure is almost identical and small for both country groups with an only marginally higher share in the stressed countries. Moreover, it declines further until 2007. With the Great Recession non-performing loans rise in both countries until 2009, when the paths for the two country groups diverge: While the share of non-performing loans decreases somewhat for the non-stressed countries in 2010 and thereafter increases only slightly, the respective share in the stressed countries continues to rise with increasing velocity. As a consequence, in 2013 the share of non-performing loans is roughly three times as large in the stressed countries as in the non-stressed group.

⁶See Corsetti et al. (2013) and Zoli (2013) for further considerations on the effects of non-performing loans.

Figure 7: Non-performing loans in stressed and non-stressed countries

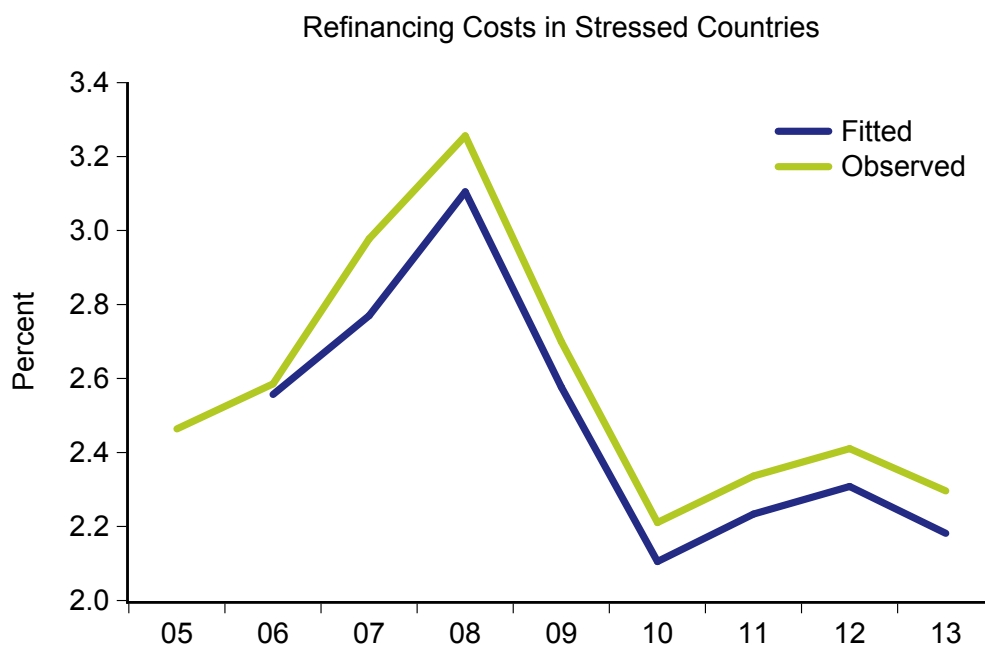


Notes: Non-performing loans are defined as bank non-performing loans to total gross loans in percent. Source: World Development Indicators (World Bank).

4.2 Effect of banking stress on firms' financing costs

Columns 4-7 of table 5 present the results of the regressions including non-performing loans. Column 4 again contains our baseline specification incorporating the country-specific government bond spread and non-performing loans. The coefficients are qualitatively unchanged compared to the results in column 1, especially the coefficient on the spread is almost identical. Non-performing loans are estimated to significantly increase firms' financing costs. This result is robust to the inclusion of the unemployment rate. Note that, while the coefficient estimates are relatively small, the overall effect is relevant: Non-performing loans in stressed countries increased by roughly 10 percentage points, implying an increase in firms' financing costs by 0.47% and 0.8%, respectively. In the last two columns we add interaction terms for both the spread and non-performing loans with a set of year dummies, again allowing us to analyze the impact of the variables in specific years. First, including the interaction terms with non-performing loans does not change the signs of the interaction terms with the country-specific spreads, the effect

Figure 8: Observed financing costs and fitted values in stressed countries for the specification including non-performing loans



Notes: Depicted fitted values are based on the specification in column 6 of table 5. Financing costs constructed from individual firm data for stressed countries (Ireland, Italy, Spain and Portugal).

on financing costs is still significantly positive in 2011-2013. Second, the estimates for non-performing loans suggests a more heterogeneous effect: In the European debt crisis the coefficients significantly increase firms' financing costs only in 2012, while the effect is negative in 2011 and 2013.

Based on the results in table 5 we construct fitted values to compare the model fit to the observed financing costs. Figure 8 depicts the results for the stressed countries. Including both government bond spreads as an indicator for sovereign stress and the share of non-performing loans as an indicator for banking stress helps to explain the further increase in firms' refinancing costs during the year 2012.

5 Conclusions

Within its Extended Asset Purchase Programme the ECB mainly buys government bonds and therefore influences the corresponding yields. The aim of this unconventional mon-

etary policy measure is to also reduce the financing costs of firms, especially in stressed countries. In this paper, we analyze to what extent financing conditions of non-financial corporations in the Euro Area depend on country-specific factors, in particular the respective country's government bond yield and the share of non-performing loans. To identify the causal effect of these country-specific factors, we employ micro-level data taken from firms' balance sheets, thereby controlling for firm-specific differences across countries.

We find that while the increase in sovereign stress in the year 2011 helps to explain the increase in firms' refinancing costs during that year, while this is not the case in the year 2012. However, the further increase of firms' financing costs during the year 2012 in stressed countries can be explained by banking stress. Therefore, policies which aim at further decreasing firms' financing costs in stressed countries should focus on reducing the risk exposure of banks in these countries. Further decreasing firms' financing costs by buying government bonds may not be effective since the share of non-performing loans in stressed countries is still elevated.

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Data

Macro-level data

Money market rate: The money market rate is the Euro Overnight Index Average (EO-NIA) published by the ECB.

Bank lending rate: Loans to non-financial corporates rate, new business, up to one year, up to one million euro, ECB MFI Statistics (downloaded via ThomsonReuters Datastream, code: [JJ]IRUU1B, where [JJ] denotes the country code).

Government bond yields: FTSE Global Government Bond Yield, 1-3 Years, Euro (downloaded via ThomsonReuters Datastream, code: RG[JJ]1T3(RY), where [JJ] denotes the country code).

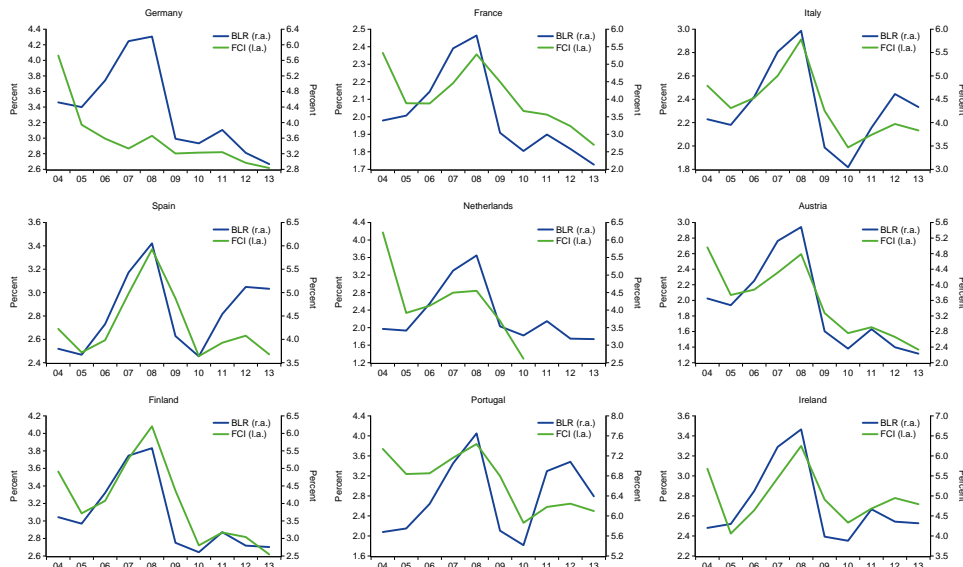
Non-performing loans: Bank non-performing loans to total gross loans in percent from World Development Indicators, published by the World Bank.

Gross domestic product: Yearly growth rate of gross domestic output, chain linked volumes, published by Eurostat.

Unemployment rate: Unemployment rate, annual average, published by Eurostat.

Additional graphs and tables

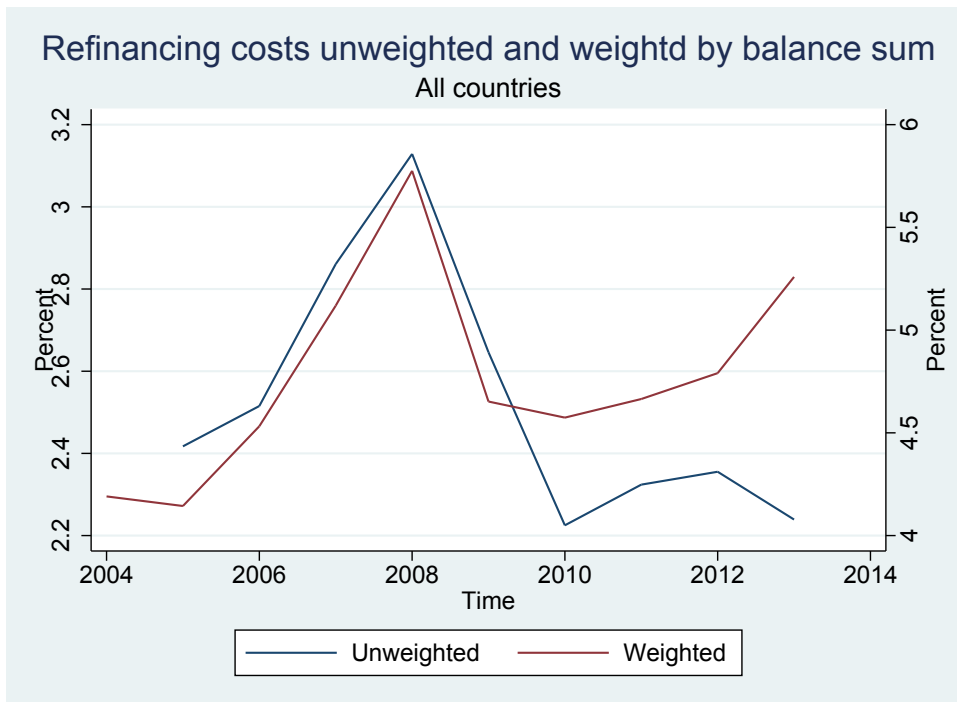
Figure 9: Financing conditions indicator and aggregate bank lending rate



Notes:

Dependent variable is the difference of the financing conditions indicator. The set of firm-specific variables (micro controls, mic. cons.) is described in the text. Marginal effects reported in all columns with standard errors in parentheses. Statistical significance at the 10, 5, 1, 0.1 percent levels denoted by *, **, ***, \diamond , respectively.

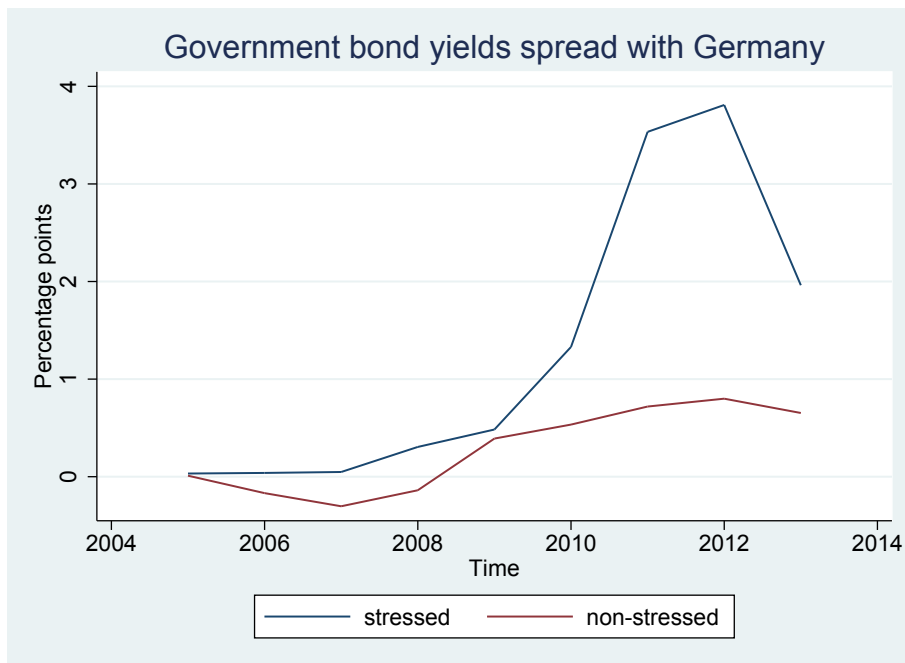
Figure 10: Financing conditions indicator unweighted and weighted by balance sum



Notes:

Unweighted and weighted averages across all countries, respectively.

Figure 11: Government bond yield spread versus Germany for stressed and non-stressed countries



Stressed countries are Ireland, Italy, Spain and Portugal. Non-stressed countries refer to Austria, Finland, France, Germany and the Netherlands.

Table 6: Diff-in-diff estimation results complete

Dependent variable is financing costs

Variable	2008	2009	2010	2011	2012	2013
year dummy	0.107**** (0.0027)	-0.349**** (0.0028)	-0.220**** (0.0024)	-0.0187**** (0.0021)	-0.108**** (0.0021)	-0.141**** (0.0022)
stressed*year dummy	0.0981**** (0.0033)	-0.280**** (0.0033)	-0.291**** (0.0029)	0.154**** (0.0025)	0.187**** (0.0025)	0.0172**** (0.0026)
small	0.0363*** (0.0118)	-0.0040 (0.0142)	-0.0175 (0.0142)	0.0142 (0.0129)	0.0050 (0.0108)	0.0615**** (0.0129)
medium	0.0923**** (0.0119)	0.129**** (0.0140)	0.0718**** (0.0142)	0.0891**** (0.0129)	0.0698**** (0.0110)	0.126**** (0.0131)
cashflow	0.257**** (0.0511)	-0.00000126**** (2.33e-08)	-0.00000164**** (1.11e-08)	0.638**** (0.0792)	0.265**** (0.0651)	0.210**** (0.0721)
fassets	0.199**** (0.00837)	0.588**** (0.0196)	-0.226 (0.350)	0.253 (0.240)	0.366**** (0.0367)	0.138**** (0.00898)
cassets	-0.231**** (0.00997)	0.00518* (0.00280)	-0.725** (0.349)	-0.114 (0.240)	-0.0701** (0.0332)	-0.196**** (0.0109)
ltbfunds	-0.203**** (0.0289)	-0.105* (0.0545)	-0.257** (0.127)	-0.00571**** (0.00100)	-0.000458 (0.000401)	-0.105 (0.123)
stbfunds	-0.252**** (0.0349)	-0.108** (0.0545)	-0.272** (0.126)	-0.0243* (0.0130)	-0.000589 (0.000402)	-0.307** (0.123)
ofrentability	-0.0000560**** (0.0000160)	-0.000108**** (0.0000245)	-0.000104**** (0.0000218)	-0.0000156 (0.0000183)	-0.0000426*** (0.0000165)	-0.0000501*** (0.0000175)
ofratio	0.000284 (0.000320)	0.00170*** (0.000561)	0.00198 (0.00127)	0.00278**** (0.000136)	0.00278**** (0.0000897)	0.000368 (0.00123)
roi	-0.00480**** (0.000496)	-0.00298**** (0.000174)	-0.00452**** (0.000159)	-0.00866**** (0.000789)	-0.00513**** (0.000628)	-0.00465**** (0.000701)
cons	2.473**** (0.0323)	2.671**** (0.0568)	3.829**** (0.341)	2.490**** (0.240)	2.004**** (0.0352)	2.489**** (0.123)
N	2526877	2248494	2461972	2533495	2546448	2327946
R-sq	0.010	0.022	0.123	0.109	0.015	0.018
adj. R-sq	0.010	0.022	0.123	0.109	0.015	0.018
sum coeff	0.079	0.2051	-0.629	0.511	0.1353	-0.1238
F	3303.14	11216.55	1.2e+05	1.1e+05	10134.68	7651.90
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: Dependent variable is financing costs. The set of firm-specific variables (micro controls) is described in the text. Marginal effects reported in all columns with cluster-robust standard errors at the firm level in parentheses. Statistical significance at the 10, 5, 1, 0.1 percent levels denoted by *, **, ***, ****, respectively. „Sum coeff“ refers to the sum of the coefficients of the year dummy and the interaction between this year dummy and the dummy indicating a stressed country in each regression. F reports the F-statistic for the Wald-test on the hypothesis that this sum is equal to zero and p is the corresponding p-value

Table 7: Results of panel estimation complete

Dependent variable is the difference of financing costs

Variable	1	2	3	4	5	6	7
spread G	0.0214*** (0.000416)			0.0208*** (0.000416)	0.0164*** (0.000419)		
imd	0.175*** (0.000488)	0.167*** (0.000555)	0.166*** (0.000578)	0.195*** (0.000585)	0.197*** (0.000585)	0.159*** (0.00102)	0.153*** (0.00106)
small	-0.0323*** (0.00624)	-0.0253*** (0.00617)	-0.0254*** (0.00617)	-0.0304*** (0.00624)	-0.0348*** (0.00619)	-0.0244*** (0.00616)	-0.0252*** (0.00615)
medium	-0.0413*** (0.00613)	-0.0552*** (0.00607)	-0.0556*** (0.00608)	-0.0352*** (0.00613)	-0.0650*** (0.00608)	-0.0531*** (0.00606)	-0.0570*** (0.00606)
cashflow	2.274*** (0.0314)	2.255*** (0.0311)	2.254*** (0.0311)	2.298*** (0.0314)	2.228*** (0.0313)	2.267*** (0.0311)	2.259*** (0.0311)
fassets	1.085*** (0.144)	1.050*** (0.143)	1.050*** (0.143)	1.092*** (0.144)	1.084*** (0.144)	1.059*** (0.143)	1.062*** (0.143)
cassets	0.361* (0.144)	0.380** (0.143)	0.381** (0.143)	0.368* (0.144)	0.370* (0.144)	0.391** (0.143)	0.393** (0.143)
ltbfunds	-0.418*** (0.102)	-0.362*** (0.101)	-0.362*** (0.101)	-0.399*** (0.102)	-0.400*** (0.102)	-0.342*** (0.101)	-0.348*** (0.101)
stbfunds	-0.911*** (0.102)	-0.874*** (0.101)	-0.874*** (0.101)	-0.899*** (0.102)	-0.888*** (0.102)	-0.859*** (0.101)	-0.863*** (0.101)
ofrentability	-0.0000724*** (0.0000142)	-0.0000321* (0.0000140)	-0.0000319* (0.0000140)	-0.0000730*** (0.0000142)	-0.0000548*** (0.0000142)	-0.0000343* (0.0000140)	-0.0000328* (0.0000140)
ofratioid	-0.00958*** (0.00102)	-0.00997*** (0.00101)	-0.00997*** (0.00101)	-0.00948*** (0.00102)	-0.00945*** (0.00103)	-0.00985*** (0.00101)	-0.00988*** (0.00101)
roid	-0.0239*** (0.000319)	-0.0230*** (0.000316)	-0.0230*** (0.000316)	-0.0240*** (0.000319)	-0.0233*** (0.000318)	-0.0230*** (0.000316)	-0.0229*** (0.000316)
spread G*2006		-0.156*** (0.0110)	-0.156*** (0.0110)			-0.138*** (0.0110)	-0.146*** (0.0110)
spread G*2007		-0.604*** (0.0185)	-0.604*** (0.0185)			-0.553*** (0.0187)	-0.563*** (0.0187)
spread G*2008		0.975*** (0.00732)	0.973*** (0.00742)			0.804*** (0.00982)	0.835*** (0.0101)
spread G*2009		-0.112*** (0.00492)	-0.113*** (0.00495)			-0.0926*** (0.00498)	-0.0948*** (0.00498)
spread G*2010		-0.591*** (0.00223)	-0.590*** (0.00225)			-0.626*** (0.00360)	-0.615*** (0.00364)
spread G*2011		0.0161*** (0.000621)	0.0163*** (0.000632)			0.0466*** (0.00105)	0.0433*** (0.00107)
spread G*2012		0.0720*** (0.00191)	0.0725*** (0.00195)			0.0278*** (0.00205)	0.0386*** (0.00213)
spread G*2013		0.104*** (0.000917)	0.103*** (0.00103)			0.0546*** (0.00148)	0.0475*** (0.00152)
ur			-0.000314 (0.000171)		-0.0217*** (0.000163)		-0.00526*** (0.000247)
npl				0.0470*** (0.000674)	0.0813*** (0.000752)		
npld2006						0.0624*** (0.00539)	0.0416*** (0.00558)
npl2007						0.0386*** (0.00312)	0.0301*** (0.00323)
npl2008						0.0674*** (0.00227)	0.0592*** (0.00233)
npl2009						-0.0245*** (0.00161)	-0.0255*** (0.00160)
npl2010						0.0985*** (0.00505)	0.120*** (0.00517)
npl2011						-0.0471*** (0.00188)	-0.0258*** (0.00217)
npl2012						0.0564*** (0.00118)	0.0735*** (0.00144)
npl2013						-0.0426*** (0.00126)	-0.0287*** (0.00142)
cons	0.115*** (0.00575)	0.155*** (0.00571)	0.159*** (0.00600)	0.0755*** (0.00578)	0.301*** (0.00595)	0.149*** (0.00577)	0.195*** (0.00613)
micro con.	yes	yes	yes	yes	yes	yes	yes
R ²	0.032	0.052	0.052	0.032	0.035	0.054	0.054
adj. R ²	0.032	0.052	0.052	0.032	0.035	0.054	0.054
df _m	11	18	19	12	13	26	27

Notes: Dependent variable is the difference of the financing conditions indicator. The set of firm-specific variables (micro controls) is described in the text. Marginal effects reported in all columns with cluster-robust standard errors at the firm level in parentheses. Statistical significance at the 5, 1, 0.1 percent levels denoted by *, **, ***, respectively.