Sovereign Stress, Unconventional Monetary Policy, and SMEs' Access to Finance

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Abstract

We study the effect of sovereign stress and of unconventional monetary policy on SMEs' capital structure using restricted-access data from the European Central Bank. Firms in stressed countries are more likely to be credit rationed and to face higher loan rates, as well as to issue debt securities. Following the announcement of the ECB's Outright Monetary Transactions Program, firms become less likely to be credit rationed or discouraged from applying for loans, and they reduce their use of debt securities, trade credit, and subsidized loans. SMEs with improved outlook and credit history benefit relatively more from unconventional monetary policy.

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1.   Introduction

The euro area sovereign debt crisis which unfolded in the spring of 2010 significantly disrupted financial markets and real economic activity in the euro area, both of which were at the time still reeling from the impact of the global financial crisis of 2008–09. Borrowing costs for a number of peripheral countries reached levels which endangered their ability to service their debt, banks tightened credit standards rapidly, and economic confidence hit a new all-time low.[1] The extraordinary nature of the crisis prompted the European Central Bank (ECB) to take a number of unprecedented steps to improve the functioning of the banking sector and to support the economic recovery. In terms of scale, the Outright Monetary Transactions (OMT) Program, announced in August 2012, has arguably been the most ambitious unconventional policy employed in the euro area since its inception,[2] as well as one of the most successful ones, with bond yields on sovereign debt issued by stressed countries declining immediately, sharply, and permanently.[3]

In this paper, we use restricted-access data from the ECB's "Survey on the Access to Finance of Enterprises" (SAFE) to evaluate the dual impact of the sovereign debt crisis and of the OMT announcement on credit access and on the use of alternative sources of external finance by small businesses in the euro area. Specifically, we exploit the fact that during the sovereign debt crisis, five euro area countries (Greece, Ireland, Italy, Portugal, and Spain, henceforth denoted as "stressed countries") experienced a substantial deterioration in their sovereign creditworthiness, while the rest of the countries in the euro area did not. Because banks tend to hold large

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[1] See Lane (2012) for an analysis of the causes and consequences of the crisis.

[2] Under the OMT Program, the ECB committed to purchasing in secondary markets—and under a number of strict conditions—*unlimited* amounts of government debt issued by eligible euro area governments.

[3] See Altavilla et al. (2014) for details.

quantities of debt securities issued by domestic sovereigns,[4] investors rapidly lost faith in the banking sectors of stressed countries, pushing banks' funding costs up.[5] Empirical evidence suggests that given their high reliance on bank credit (Berger and Udell, 1998; Ferrando et al., 2014), small and medium enterprises (SMEs) are particularly likely to become credit constrained when banks adjust their loan portfolios in response to negative shocks to their balance sheets (Duygan-Bump et al., 2010). Because SMEs comprise up to 99% of firms in Europe, provide two out of three private sector jobs, and contribute more than half of total business-provided value added,[6] a reduction in bank lending due to sovereign stress can have potentially significant negative consequences for real economic activity.[7] Correspondingly, the benefits from using monetary policy tools aimed at reducing sovereign pressures on bank balance sheets can be equally large.

Despite the paramount importance of these questions, our paper is the first to study how sovereign stress and unconventional monetary policy affect access to finance and the overall capital structure of SMEs. We do so in three separate dimensions. First, we study the evolution of credit constraints faced by small euro area firms, before and after the sovereign debt crisis and before and after the announcement of the OMT program. Second, we use observed proxies for firms' creditworthiness to study which firms are most affected by sovereign stress and by unconventional monetary policy. Third, we look at how small firms' use of alternative funding sources responds to changes in credit access.

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[4] For theoretical models of incentives for purchases of sovereign debt by domestic banks, see Acharya and Rajan (2013), Broner et al. (2014), and Gennaioli et al. (2014). For empirical evidence on the propensity of banks to hold domestically issued sovereign debt, see Acharya and Steffen (2015).

[5] For example, Albertazzi et al. (2012) report a sharp rise in the cost of both wholesale and of retail funding of Italian banks, following a rise in the spread on 10-year Italian sovereign bonds.

[6] See the European Commission's "Annual Report on European SMEs 2012/2013" (2013).

[7] This argument extends to the U.S., too, where SMEs account for roughly half of the labor force (Stangler and Litan, 2009).

We find that sovereign stress results in a strong supply-driven reduction in credit access. When we investigate the underlying reasons, we find evidence for credit rationing by banks, both in the quantity and in the price dimension (formal credit constraints). In particular, controlling for borrower quality and demand, firms in stressed countries are considerably more likely to receive less than 75% of the loan amount they asked for and to reject a loan offer because the cost of credit is too high, than similar firms in non-stressed countries. At the same time, firms in stressed countries are not more likely to have their loan application denied by a bank. The process of reduction in credit access is not accompanied by a flight to quality in lending in that less creditworthy firms are not more likely to become credit constrained. We also find that in order to make up for the decline in bank credit, firms in stressed countries rely considerably more on debt securities after the crisis started. However, this effect is rather small, given that only 2% of firms in the sample issue debt securities to begin with. Our evidence thus implies that the cost of funding for SMEs increases as a result of sovereign stress, and that SMEs have a hard time adjusting their capital structure in response to declining availability of bank credit.

Our second main finding is that the announcement of the OMT Program has an immediate positive effect on credit access. Relative to similar firms in non-stressed countries, firms in stressed countries are less likely to be credit rationed in the 6 months after the announcement. Such firms are also significantly less likely to be discouraged from applying for a loan (informal constraints). Importantly, we find that firms with better outlook and firms with improving credit history are relatively more likely to benefit from easier credit access. This suggests that more creditworthy firms have benefited relatively more from the ECB's unconventional monetary policy. Finally, we examine the adjustment of SMEs' capital structure after the OMT announcement. We find that following the announcement, firms in stressed countries are less likely to use government-subsidized loans, as well as to resort to more expensive sources of external finance, such as debt securities and trade credit. The evidence thus suggests that firms' capital structure adjusts fairly quickly in response to monetary policy shocks that increase the availability of bank credit.

While a number of demand-side effects clearly play a role at all stages of the sovereign debt crisis (for instance, by affecting consumers' demand for goods and services), we go to great lengths to identify the causal impact of the crisis through the channel of the supply of bank credit. We employ an exhaustive set of fixed effects, notably country-time and sector-time interactions, in order to net out the effect of common demand shocks (e.g., changes in the purchasing power of households in Spain, or in the global demand for housing). We also show that the trends in credit access that we observe during the sovereign debt crisis do not exist before the spring in 2010, suggesting that differences in access to finance across stressed and non-stressed countries are specific to the crisis period. Finally, we isolate the subset of the most creditworthy corporate borrowers, specifically, firms with the highest credit history, collateral quality, and growth opportunities. We show that even within this sample, firms in stressed countries are more likely to be credit constrained during the sovereign debt crisis than those in non-stressed countries.

Our paper builds on a rapidly growing literature on how shocks to lenders affect firms' access to finance. The most challenging issue faced by this literature is distinguishing between supply and demand effects. One research strategy, for example, is to exploit experiments that provide a laboratory that naturally accomplishes this identification (e.g., Peek and Rosengren, 1997; Khwaja and Mian 2008; Chava and Purnanandam 2011; Lin and Paravisini, 2013). While these natural experiments allow for relatively easy identification of supply shocks, they are hard to come by and have not been available during the current global crisis. Another strategy is to examine the substitution between bank loans and capital market instruments such as commercial paper (e.g., Kashyap et al., 1993) or corporate bonds (Becker and Ivashina, 2014), where the latter strategy can only be applied to firms which have access to public debt markets. Yet another alternative is to estimate demand and supply equations using data that includes firm level characteristics in a disequilibrium model that identifies credit constrained borrowers (e.g., Carbo-Valverde et al., 2015; Kremp and Sevestre, 2013). Another strategy has been to exploit credit registry data in countries where firms routinely obtain credit from multiple banks. This creates an environment that naturally controls for demand effects (e.g., Albertazzi and Marchetti, 2010; Jimenez et al., 2012; Iyer et al., 2014). The identification approach that we use in this paper is to

measure supply effects directly from a firm-level survey dataset that is specifically designed for this purpose. Because of data availability, this approach has been particularly helpful in identifying the effects of the credit crunch in Europe during the financial crisis (e.g., Popov and Udell, 2012; Beck et al., 2014; Pigini et al., 2014; Presbitero et al., 2014). However, ours is the first paper to use survey data to study the effect of sovereign stress, as well as of unconventional monetary policy, on SMEs' access to finance.

Several recent papers have examined the effect of the euro area sovereign debt crisis on bank lending, showing that banks reduce lending to the private sector in response to shocks to sovereign credit-worthiness. The reason can be direct balance sheet exposure to impaired sovereign debt (Correa, Sapriza, and Zlate, 2012; Ivashina et al., 2012; Bofondi et al., 2014; De Marco, 2014; Popov and Van Horen, 2015), spillover risk (Bedendo and Colla, 2014), or a sovereign debt ceiling policy whereby credit ratings agencies downgrade banks at the sovereign limit when the sovereign is downgraded (Adelino and Ferreira, 2014). Unlike our paper, these papers do not examine the impact of the sovereign debt crisis on the supply of credit to small firms, but mostly to large corporates. Moreover, neither of these papers considers the role of unconventional monetary policy on access to finance.

Because we focus on the effect of the OMT Program, our paper is also related to the literature on monetary policy and the bank lending channel (e.g., Bernanke and Blinder, 1988; Kashyap and Stein, 1994). The bank lending channel posits that the transmission of monetary policy operates—at least in part—through the asset side of banks' balance sheets by affecting the supply of bank loans. We use micro data to analyse the effect of the OMT announcement, so we avoid the criticism in this literature on the transmission of monetary policy that aggregate data is not up to the task (e.g., Kashyap et al., 1996). Our paper thus contributes to the literature on the effect of both conventional and unconventional monetary policy on both nominal and real economic variables (e.g., Gertler and Gilchrist, 1994; Krishnamurthy and Vissing-Jorgensen, 2011; Giannone et al., 2012; Eser and Schwaab, 2015).

Another contribution of the paper is that in our analysis of the sovereign debt crisis and of the OMT Program, we look at access to finance both in the quantity and in the price dimension.

Some other papers on the current global crisis have also considered loan pricing effects (e.g., Santos, 2011), but most focus on quantity effects only (e.g., Ivashina and Sharfstein, 2010; Puri et al., 2011; Jimenez et al., 2012).[8,9]

Finally, ours is the first paper to examine the effect of shocks to the availability of bank lending on the overall capital structure of SMEs. Several recent papers have examined the effect of shocks to credit access on firms' use of trade credit (e.g., Ferrando and Mullier, 2015; Carbo-Valverde et al., 2015; Garcia-Apenini and Montoriol-Garriga, 2015). However, our data allow us to look at the universe of financing sources available to SMEs, including equity, retained earnings, debt securities, trade credit, grants and subsidies, and loans from family and friends. We can therefore observe how SMEs substitute across funding sources over time, which gives a fuller picture of the effect of sovereign stress and of unconventional monetary policy on the overall cost of funding for small businesses.

The rest of the paper is organized as follows. Section 2 reviews the sovereign debt crisis in the euro area and the details of the ECB's OMT Program, and it presents the research hypotheses. Section 3 summarizes the data. Section 4 discusses the empirical strategy. Section 5 presents the empirical evidence on the effect of the sovereign debt crisis on credit access and firm financing. Section 6 presents the evidence on the impact of the OMT Program. Section 7 concludes.

2.   Sovereign stress, unconventional monetary policy, and access to finance

2.1.   The euro area sovereign debt crisis and the ECB's response

The sovereign debt crisis which erupted in the euro area in 2010 sent ripples through the global banking system and prompted interventions by governments and central banks on a scale comparable to the programs implemented during the financial crisis of 2008–09. Over the course

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[8] Some papers on this crisis that use firm-level survey data combine price and quantity effects based on questions that ask whether the firm was "affected by the cost or availability of credit" (e.g., Campello et al., 2010).

[9] Quantity effects include non-price credit rationing, such as denying credit or granting a smaller loan amount than the one requested (e.g., Stiglitz and Weiss, 1981).

of 2010–2012, yields on sovereign bonds issued by the governments of Greece, Ireland, and Portugal reached levels which made their overall stock of debt unserviceable, with Italy and Spain facing record costs of issuing new debt, too.[10] On the fiscal response side, the €440 billion-strong European Financial Stability Facility (EFSF) was established by the 27 member states of the EU in May 2010 with a mandate to provide financial assistance to euro area states. Its committed funding was later boosted to around €1 trillion.

On the side of monetary policy, the ECB implemented a series of non-standard monetary policy measures. In May 2010, the ECB instituted the Security Markets Program (SMP) whereby it began open market operations buying government and private debt securities in secondary markets, reaching about €220 billion in February 2012, and simultaneously absorbing the same amount of liquidity to prevent a rise in inflation (Eser and Schwaab, 2015). In December 2010, the ECB extended €489 billion in loans to more than 500 European banks at a fixed 1 percent interest rate. This was followed, in February 2012, by a second long-term refinancing operation, injecting an additional €530 billion into the banking system.[11]

Concerned that the effect of all these interventions would be short-lived, on August 2nd, 2012 the ECB announced that it would undertake outright transactions in secondary sovereign bond markets (OMT Program), aimed at safeguarding an appropriate monetary policy transmission and the singleness of the monetary policy. It set a number of conditions. First, a country seeking access to the OMT must request financial assistance from the EFSF. Second, the EU and/or IMF must agree to provide financial assistance through the EFSF and lay out the terms of a deficit reduction program that the country must abide by. Third, the applicant country must agree to the terms of the program. At this point, the ECB can start purchasing sovereign bonds

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[10] The yields on 10-year government bonds reached 12.3 percent in July 2011 (Ireland), 7.5 percent in November 2011 (Italy), 18.3 percent in January 2012 (Portugal), 48 percent in April 2012 (Greece), and 7 percent in June 2012 (Spain). Greece received a €110 billion bail-out package from the EU and the IMF in May 2010; Ireland received an €85 billion bail-out package in November 2010; and Portugal received a €78 billion bail-out package in May 2011.

[11] See ECB (2013) Box "Early repayment of funds raised through three-year longer-term refinancing operations: economic rationale and impact on the money market ", Monthly Bulletin, February.

issued by the requesting country, focusing on the shorter part of the yield curve (with maturity of 3 years or less). The ECB set no ex ante quantitative limits on the amount of government bonds that could be purchased through the OMT Program. However, in order to neutralize the potential impact on the money supply, all bond purchases would be offset by selling other securities of equal amount. The Program would run until the country regained market access and could once again fund itself normally in bond markets.

Despite the fact that no OMT Programs were ready to start at the time of the announcement, the financial markets reacted immediately by pricing in a decline of both short term and long term interest rates in all European countries previously suffering from elevated interest levels. By the end of 2013, even though the ECB did not purchase a single bond through the OMT Program, capital had flown back into stressed countries such as Italy and Spain, and government bond yields had tumbled, returning to pre-crisis levels (Altavilla et al., 2014).

2.2. Sovereign stress, unconventional monetary policy, and access to finance: Empirical mechanisms

Theory suggests two primary mechanisms through which sovereign stress can lead firms to experience a supply-driven reduction in access to finance. The first channel works through banks' direct holdings of government securities. In particular, banks' exposure to government debt makes their balance sheets more sensitive to fluctuations in sovereign risk. When sovereign debt is downgraded, the balance sheets of exposed banks are weakened and investors demand higher returns to keep funding such banks. Even when losses on sovereign bond holdings are merely expected and not yet realized, banks' funding costs will increase to reflect growing concerns about the banks' solvency (Gertler and Kiyotaki, 2010). The second channel works through the use of sovereign bonds as collateral to secure wholesale funding: an increase in sovereign risk reduces the eligibility of government debt securities as collateral, with negative consequences for banks'

funding costs.[12] In addition, sovereign stress can reduce the implicit guarantees issued by the domestic government to the banking sector (Demirguc-Kunt and Huzinga, 2013). While disentangling these mechanisms is beyond the scope of this paper, they all imply that an increase in sovereign risk will affect negatively the funding position of exposed banks. Because higher funding costs lead banks to readjust the asset side of their portfolio, we expect a negative impact on access to finance for SMEs borrowing from such banks.

Turning to the effect of monetary policy, we note that theory has emphasized both the role of borrowers' balance sheets (e.g., Bernanke and Gertler, 1989; Kiyotaki and Moore, 1993), whereby expansionary monetary policy can strengthen firms' balance sheets by increasing cash flow net of interest and by raising the value of collateral assets, as well as the role of lenders' balance sheets (e.g., Bernanke and Blinder, 1992; Kashyap et al., 1993), whereby monetary policy regulates the pool of funds available to bank-dependent borrowers in the presence of reserve requirements on bank deposits. In the case of the OMT Program, we expect the main effect to come through strengthening of the balance sheets of banks holding large amounts of sovereign debt. As the OMT announcement reduces the yields on sovereign debt, investors perceive banks with balance sheet exposures to their sovereign as less risky and demand lower rates to keep funding them. The eligibility of these securities as collateral to secure wholesale funding increases as well. Finally, reduced sovereign stress strengthens the implicit guarantees issued by the domestic government to the banking sector. Consequently, banks' funding costs go down, leading us to expect SMEs to face more favourable lending conditions.

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[12] In the Eurosystem's refinancing operations, 20% of the transactions are secured by government bonds. Furthermore, in the euro area, the amount of outstanding repos in June 2010 was equivalent to 75% of GDP, with four fifths of the transactions collateralized by government bonds (Bank for International Settlements, 2011).

3.   Data

3.1.   Firm-level data

The main data source for our analysis is the "Survey on the Access to Finance of Enterprises" (SAFE) run jointly by the ECB and the European Commission. The SAFE was conducted ten times between the summer of 2009 and March 2014. The survey started after the financial crisis initially hit the euro area. The survey waves include the period before the sovereign debt crisis (survey waves 1 and 2, from 1st January until 31st December, 2009); the period during which the sovereign debt crisis unfolded (wave 3, from 1st April until 30th September, 2010); the period of the sovereign debt crisis (waves 4, 5, and 6, from 1st October 2010 until 31st March 2012); the period during which the OMT Program was announced (wave 7, from 1st April until 30th September, 2012); and the period after the OMT Program announcement (waves 8, 9, and 10, from 1st October 2012 until 31st March 2014). The firm-level survey contains information on each respondent firm's characteristics (size, sector, autonomy, turnover, age, and ownership) and on its assessment of recent short-term developments regarding its financing including information on its financing needs and its access to finance.[13] The sample contains only non-financial firms and excludes firms in agriculture, public administration, and financial services.[14]

In our analysis, we use all of the waves, with the exception of waves 3 and 7, for a total of 68,796 observations and 44,739 firms. Most of the firms are interviewed only once in the survey but there is a small subsample of firms present in several waves. Table 1 reports descriptive statistics on the main variables of interest. All survey-based percentages are weighted statistics that restore the proportions of the economic weight (in terms of number of employees) of each size class, economic activity, and country. *Credit constrained*, our main dependent variable, is a dummy variable equal to 1 in four different cases: a) the firm's application for a bank loan or credit

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[13] The survey's main results are published in the ECB website every six months. For more information on the survey and its individual waves, see http://www.ecb.europa.eu/stats/money/surveys/sme/html/index.en.html.

[14] The SAFE data include an oversample of firms in smaller countries; thus, our empirical analyses use sampling weights that adjust the sample to be representative of the frame from which the sample was drawn.

line in the past 6 months was denied (*Loan application denied*); b) the firm received less than 75% of the loan amount it requested (*Rationed*); c) the firm refused the loan offer because the rate was too high (*Refused due to high cost*); or d) the firm did not apply for a loan because it feared a rejection (*Discouraged from* applying).[15] The variable is equal to 0 if the firm's application for a bank loan or a credit line in the past 6 months was approved. Of the 26,247 firms with positive demand for credit,[16] 35% were on average credit constrained. Of these firms, 16% are discouraged from applying. Of the 22,089 that applied, 10% were denied, 13% were rationed, and 2% refused the loan due to its high cost.

Table 1 also reports information on firm financing structure based on the qualitative survey responses. 57% of firms regularly use bank loans and credit lines and 32% regularly use trade credit. Grants and subsidised loans—the most common measure implemented by governments during the financial crisis to induce banks to reopen their lending facilities—have been used by 17% of firm. Market-based sources of finance are less common among European firms. 7% of firms report using equity while only 2% use debt securities. Additionally, it is common especially among SMEs and young firms to rely more on internal rather than external funds: 35% of the firms confirmed the importance of these funds to finance their activities. Almost half of our sample includes firms in stressed countries (Greece, Ireland, Italy, Portugal, and Spain). The survey includes mostly SMEs, with less than 10% of the firms having more than 250 employees. In terms of turnover, the majority of firms are small with annual turnover less than EUR 2 million (41%). 37% have turnover between EUR 2 and 10 million. Firms are mostly independent (84%) and are individually or family-owned (74%). Only 6% of the firms are listed on the stock market. The sample includes mostly firms that are 10 or more years old (78%), but around 20% are between 2 and 10 years old. Finally, around one quarter of companies in our sample report that their

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[15] The strategy of merging together formally and informally constrained borrowers is standard since the work of Jappelli (1990).

[16] I.e., the firm did not declare that it did not apply for bank credit "because of sufficient internal funds".

outlook—in terms of sales and profitability, their capital conditions, and their credit history—was on average improving during the sample period.

Table 2 reports the dependent variable C*redit constrained* for the three sub-periods (pre-sovereign debt crisis, sovereign debt crisis, post-OMT) and across stressed and non-stressed countries. Overall the difference between the two groups of countries was 13 percent in the first period (i.e., 46% and 33% of firms reported being credit constrained in stressed non-stressed countries respectively) increasing to 21 percent afterwards (see also Chart 1).

3.2. Country data

Summary statistics for our country level variables that capture the macroeconomic conditions over the sample period are shown at the bottom of Table 1. Table 3 shows these same variables over the three sub-periods and across stressed and non-stressed countries.

We use four variables to distinguish between credit supply and demand. The first, the average cost of lending, ranges from a minimum of 2.0% to a maximum of 6.4%, reflecting high heterogeneity across euro area countries (Table 3). Overall the cost of borrowing was lower in non-stressed countries versus stressed countries. Also, it declined over time for non-stressed countries but increased after the sovereign-debt crisis in stressed countries. The second variable is credit standards, taken from the euro area Bank Lending Survey (BLS), which summarizes the internal guidelines or criteria that reflect banks' lending policies.[17] Positive figures indicate that more banks were tightening their credit conditions than easing them. In the period 2009-2014, about 12% of banks reported on net tightening their credit standards with some instances of easing (e.g., France, pre-sovereign debt crisis).

We capture real economic activity with variables for real GDP growth and the unemployment rate. Both indicators reached their worst values during the sample period. While

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[17] The variable is calculated as the difference between the sum of the percentages of banks responding "tightened considerably" and "tightened somewhat" and the sum of the percentages of banks responding "eased somewhat" and "eased considerably". This variable is confidential for some of the euro area countries in our sample (Austria, Ireland, and Finland). Hence it will be used but not presented in the descriptive statistics.

on average GDP growth was shrinking by -0.8% across all countries and all periods, the ratio was more strongly declining in all euro area countries in the pre-sovereign debt period but recovering immediately afterwards in most non-stressed countries. In contrast, among stressed countries, real GPD only started to grow during the sovereign debt crisis in Ireland and, to a lesser extent, in Italy. GDP growth remained negative in the other stressed countries. In the third sub-period, all stressed countries reported negative GDP growth. The unemployment rate reached historically high levels in stressed countries (particularly in Greece where it reached 27% in the period 30th June – 30th September 2013, wave 9) while it remained much lower but stable in the non-stressed countries. We capture banks' perceptions of risk as it relates to general economic activity and bank credit standards with another variable taken from the BLS, the general economic outlook. Like credit standards, it is expressed as a net percentage, with higher values corresponding to higher perceptions of risk in each country. Finally we capture leverage in the financial system, private debt/GDP, calculated as the sum of debt securities and bank loans over GDP. Theoretical and empirical evidence suggests that excessive leverage sowed the seed for the financial crisis and conditioned the severity of the downturn in the euro area. In general, investment (and output) losses were commensurate with the intensity of private debt accumulation prior to the crisis. This was particular the case in Spain, Ireland and Portugal.[18]

4.   Empirical strategy and identification

We investigate the effects of sovereign stress and of unconventional monetary policy on firms' financing by employing a difference-in-differences (DID) approach. Our treatment group consists of firms in the five countries with sovereign debt problems during the 2010–2012 period (Greece, Ireland, Italy, Portugal, and Spain—stressed countries). Our control group consists of firms in six non-stressed countries (Austria, Belgium, Finland, France, Germany, and the Netherlands). The two groups are of similar size, with the treatment group consisting of 32,314

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[18] ECB 2013 "Corporate finance and economic activity in the euro area".

observations (20,746 firms) and the control group consisting of 36,482 observations (23,993 firms).

The choice of groups is motivated by the fact that all countries in the treatment group experienced severe problems in accessing government bond markets over the sample period. In 2010, 10-year bond yields reached levels usually associated with a high probability of sovereign default: 1210 basis points (Greece), 950 basis points (Ireland), 470 basis points (Italy), 750 basis points (Portugal), and 550 basis points (Spain). European policy makers recognized the severity of the sovereign problems in these five countries. Greece received a bailout from the EC and the IMF in May 2010, Ireland received one in November 2010, and Portugal agreed on a bailout in May 2011. As mentioned above, the European Central Bank instituted the SMP whereby in May 2010 it started buying (in secondary markets) Greek, Irish, and Portuguese government debt, and in August 2011 it intervened in Italian and Spanish debt markets, too. For comparison, yields on 10-year government bonds for the six countries in the control averaged 340 basis points at the end of 2010, similar to yields on 10-year US treasury bills.

We use two sources of identifying variation in our analysis: the time before and after the beginning of the euro area sovereign debt crisis, and the cross section of firms affected and not affected by the crisis because of sovereign stress. We estimate the following model:

$$\Pr ob(Credit\_constrained_{isct} = 1) = \varphi(\beta_1 Post_t \times Stressed_{isc} + \beta_2 X_{isct} + \beta_3 \phi_{sc} + \beta_4 \eta_t + \varepsilon_{isct}) \qquad (1)$$

In the main tests, $Credit\_constrained_{isct}$ is a dummy variable equal to 1 in the following cases: if the firm's application for a bank loan or credit line was denied; if the firm received less than 75% of the loan amount it requested; if the firm refused the loan offer because the cost was too high; or if the firm was discouraged from applying. Consequently, it is equal to 0 if the firm applied for a bank loan or a credit line in the past 6 months, and its application was approved, it got at least 75% of the requested amount, and the cost was "favorable". In robustness tests, we employ different proxies for credit market experience, as well as variables that capture other types of firm financing. $Stressed_{isc}$ is a dummy variable equal to 1 if firm i in sector s is domiciled in country c which belongs to the group of stressed countries (Greece, Ireland, Italy, Portugal, and

Spain), and to 0 otherwise.[19] $Post_t$ is a dummy variable equal to 1 between 1st October 2010 and 31st March 2012 (waves 4, 5 and 6), and to 0 between 1st January and 31st December, 2009 (waves 1 and 2). We do not use information from the SAFE wave that took place in 1st April and 31st September 2010 (wave 3) because this is an interim period over the course of which the sovereign debt crisis started unfolding. X_{isct} is a vector of time-varying firm-level control variables; ϕ_{sc} is an interaction of sector and country fixed effects; η_t is a time fixed effect which corresponds to each survey wave; and ε_{isct} is an i.i.d. error term. $Stressed_{isc}$ and $Post_t$ are not included in the specification on their own because the effect of the former is subsumed in the matrix of sector-country fixed effects, and the effect of the latter is subsumed in the time fixed effects.

The coefficient of interest is β_1. In a classical DID sense, it captures the change in access to finance from the pre-treatment to the post-treatment period, for the treatment group (firms domiciled in countries experiencing sovereign stress) *relative to* the control group (firms domiciled in countries not experiencing sovereign stress). A positive coefficient β_1 would imply that all else equal, access to finance deteriorated more for firms in stressed countries.

The model is saturated to provide additional identification of the credit supply effect of sovereign stress. The vector of firm-specific variables X_{isct} controls for the demand for credit by capturing the independent impact of firm-level heterogeneity related to size, age, turnover, ownership structure, etc. Ample evidence points to a negative relation between profitability and the demand for external funds (Almeida and Campello, 2010). Therefore, we expect larger and older firms, whose projects have matured, to have a lower demand for external financing. We also include interactions of sector and country fixed effects and year fixed effects. The inclusion of the former is aimed at eliminating variation in access to finance that is specific to a particular industry

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[19] While Belgium did not experience sovereign stress to the same extent as Greece, Ireland, Italy, Portugal, and Spain, yields on 10-year Belgian government bonds briefly breached the 400-basis-points threshold, and one of its bank (Dexia) was devastated by its exposure to Greek sovereign debt, ultimately necessitating government intervention. The main results of this paper are not changed by dropping Belgian SMEs from the sample, or by re-classifying them as "affected" (results available upon request).

in a particular country (e.g., construction in Spain during the housing bust). The inclusion of the latter is aimed at alleviating concerns that variation in credit access is driven by global shocks that are common to all firms (e.g., a global repricing of risk).

Our main sample period is January 1st 2009 – March 31st, 2012 (waves 1–6). The end date captures the period of the sovereign debt crisis right up to the ECB's announcement of the OMT Program in July 2012. The model is estimated using probit and standard errors are clustered at the country level. The combination of firm-level characteristics and various fixed effects addresses the concern that our estimates can be contaminated by shocks to credit demand unrelated to the supply of credit. For example, while agency cost problems may have become more severe and/or growth opportunities may have deteriorated more for firms domiciled in stressed countries, this should be accounted for by the firm-specific information and by the country-sector fixed effects.

Turning to the effect of unconventional monetary policy on credit access, we estimate a version of model (1) where we look at the two periods before and after the ECB's announcement of the OMT Program. In particular, we estimate the following empirical model:

$$\Pr ob(Credit\_constrained_{isct} = 1) = \varphi(\beta_1 Post\_OMT_t \times Stressed_{isc} + \beta_2 X_{isct} + \beta_3 \varphi_{sc} + \beta_4 \eta_t + \varepsilon_{isct})\ (2)$$

The only difference relative to Model (1) is $Post\_OMT_t$, which is a dummy variable equal to 1 between 1st October 2012 and 31st March 2013 (wave 8), and to 0 between 1st October 2011 and 31st March 2012 (wave 6)[20]. We do not use information from the wave of the SAFE survey that took place between 1st April and 31st September 2012 (wave 7) because this period coincides with the OMT announcement in July 2012. Similar to Model (1), the coefficient of interest is β_1, and it captures the change in access to finance from the pre-OMT period to the post-OMT period, for firms domiciled in countries that experienced sovereign stress relative to firms domiciled in

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[20] We believe that looking at the first 6 months after the OMT announcement is the only way to identify the effect of the OMT. In robustness tests where we study the long-run OMT effect, $Post\_OMT_t$ is a dummy variable equal to 1 between 31st March 2013 and 31st March 2014 (waves 9–10), and to 0 between 1st October 2010 and 31st March 2012 (waves 4–6).

countries that did not. A negative coefficient β_1 implies all else equal, access to finance improved more for firms in stressed countries following the OMT announcement.

5.   The impact of sovereign stress on credit access and firm financing

5.1.   Sovereign stress and credit access

5.1.1.   Main result

We first present the empirical results from the estimation of Model (1) where we test for the effect of sovereign stress on access to finance by comparing the change in credit access for firms in stressed countries vs. firms in non-stressed countries. In column (1) of Table 4 we report a version of Model (1) with firm-specific covariates, but without sector-country and time fixed effects. The data strongly reject the hypothesis that sovereign stress has no effect on credit access. The effect is significant at the 5% statistical level, and economically meaningful, too. The point estimate on the interaction term is 0.079. Given that 35% of the firms in the sample are either denied credit, quantity or price rationed, or discouraged from applying because they anticipate a rejection (see Table 1), this implies a 22.6% higher probability of being credit constrained for a firm in a stressed country relative to an otherwise identical firm in a non-stressed country in the period after the sovereign debt crisis unfolded.

A number of the firm-level covariates have the expected sign. For example, micro firms and firms with low turnover are more likely to be denied credit, potentially because they are more opaque and/or because they (or their entrepreneurs) have less collateral (e.g., Berger and Udell 1998, 2006). Older firms are less likely to be denied credit, potentially because of their lower informational opacity (Berger and Udell, 1995; Cole 1998). Finally, firms whose outlook or credit history improved in the past 6 months are less likely to be credit constrained than firms whose outlook or credit history deteriorated or did not change, implying that banks use both soft and hard information in their credit granting decisions. Whether the firm is a subsidiary or a stand-alone firm, whether it is individually-owned or family-owned rather than exhibiting a different

ownership pattern, as well as the gender of the firm owner, does not seem to matter for credit access.

In column (2), we add country-industry and time fixed effects. Once again, after firm size, age, gender of the owner, turnover, ownership, growth prospects, collateral quality, and credit history are accounted for, sovereign stress continues to exhibit a significant negative effect on firms' credit access. The point estimate implies a 35% higher probability of being credit constrained for a firm in a stressed country relative to an otherwise identical firm in a non-stressed country in the period after the sovereign debt crisis unfolded.

5.1.2. Components of credit constraints

Our main proxy for credit access so far is a dummy variable equal to 1 if the firm is rejected, quantity rationed, price rationed, or discouraged from applying. This approach is common to the literature that uses survey data to study credit access (Jappelli, 1990; Cox and Japelli, 1993; Duca and Rosenthal, 1993; Popov and Udell, 2012; Ongena et al., 2013; Ferrando and Mulier, 2015), and it captures both *formal* and *informal* credit constraints. Nevertheless, the components of this proxy are important in their own right. The empirical literature on the bank lending channel based on evidence from credit registries (e.g., Jimenez et al., 2012; Ioannidou et al., 2015) relies exclusively on empirical proxies for whether the firm's credit application has been accepted or denied by its bank. Alternatively, recent evidence lends support to the notion that in some countries, informal credit constraints can be more prevalent than formal ones (Brown et al., 2011), and that in general such constraints can vary systematically across countries in a way which can yield biased results (Popov, 2015). Furthermore, the theoretical literature has drawn a distinction between adjustment of credit supply in the quantity and in the price dimension, whereby credit rationing emerges in equilibrium in the presence of information asymmetries between borrowers and lenders which prevent interest rates from equilibrating the market (Jaffee and Russell, 1976; Stiglitz and Weiss, 1981).

To study empirically this distinction, we split the *Credit constrained* variable into its four components, i.e., into four separate dummy variables: *Loan application denied*; *Rationed*; *Refused*

due to high cost; and *Discouraged from applying* (using the same definitions for each as before). Table 5 reports the estimates from these alternative models. We find that the bulk of the increase in overall credit constraints is due to quantity and to price rationing: firms in stressed countries are 8.6 percentage points more likely to receive less than 75% of the requested loan amount after the start of the crisis than similar firms in non-stressed countries (column (2)). In addition to that, such firms are 5 percentage points more likely to be price rationed in that they refuse the loan offer because of its high cost (column (3)). Firms are also more likely to be discouraged from applying (column (4)), but this effect is not significant. Interestingly, firms in stressed countries are no less likely to receive the full amount of credit requested than firms in non-stressed countries (column (1)). Our results imply that while some of the shock to banks' balance sheets is passed on through price adjustment, asymmetric information problems may have become more severe in some lender-borrower relationships (e.g., due to an increased borrower opacity), leading to adjustment in lending in the non-price dimension, too (credit rationing).

5.1.3. Robustness

We next proceed to address a number of non-trivial concerns about our empirical model. For a start, although our DID specification allows us to control for omitted variables that affect both the treatment and the control group in a similar manner, identification of the causal effect requires controlling for any systematic shocks to the treatment group, that is, controlling for other shocks that might be correlated with the financial sector's exposure to sovereign stress. For example, it might be the case that growth opportunities in different countries changed around the time the sovereign debt crisis unfolded, or that constraints related to firm-specific net worth tightened differently across the treatment and the control group.

We address this concern by controlling for such shocks explicitly. First, we augment our regression specification to include an interaction of country and time dummies, as well as of sector and time dummies. This is a nonparametric way of controlling for time-varying shocks that are specific to a country (e.g., Greece) or to a sector (i.e., construction after the bust of the housing bubble). Column (1) of Table 6 reports that the point estimate for the effect of the sovereign debt

crisis on credit access actually increases relative to column (2) of Table 4, to 0.2523. The estimate remains statistically significant, at the 1% level.

Second, we include interactions of all firm-specific variables with the Post dummy (column (2)). This procedures aims at accounting for the possibility that the effect of various proxies for net worth is time-varying and our main explanatory variable may be picking part of it. We find that while the magnitude of the main effect declines somewhat relative to column (2) of Table 4, it is once again significant at the 1% statistical level.

We next note that the key identifying assumption of our DID approach is that in the absence of shocks to sovereign creditworthiness, firms in all countries would be subject to the same trend in credit access. This need not be the case: for example, the break in trends implied by the estimates in Table 4 may have started already during the global financial crisis of 2008-09 for reasons unrelated to sovereign stress, such as higher financial sector or corporate leverage in stressed countries. For example, two countries in our treatment group, Ireland and Spain, experienced significant housing booms during the early-to-mid 2000s causing severe problems in their banking sectors once the financial crisis unfolded in 2008.

We take advantage of the fact that our data allow us to test this assumption explicitly. Wave 1 of the SAFE took place between 1st January and 30th June 2009, while the second wave took place between 1st July and 31st December 2009. Because both survey waves took place before the sovereign debt crisis unfolded, we can apply our DID strategy to test for differences in credit access trends across firms in stressed versus non-stressed countries between SAFE waves 1 and 2. If the estimate of β_1 is once again positive and significant, we would conclude that the break in trends recorded in Table 3 predates the sovereign debt crisis. The estimate from this regression, reported in column (3) of Table 6, implies that in the fall of 2009, firms in stressed countries were *less* likely to be denied credit, compared with firms in non-stressed countries and relative to the spring of 2009, and this effect is significant at the 1% statistical level. This placebo test thus confirms that the deterioration in credit access we observe did not predate the sovereign debt crisis.

One other consideration is related to the fact that Greece is an outlier in the sample: it is the only country to have effectively been shut out of international bond markets and to have experienced a quasi-default when private investors were asked in February 2012 to accept a write off equal to 53.5% of the face value of Greek governmental bonds. We therefore test if our results are robust to the exclusion of Greek firms from the sample. The evidence reported in column (4) of Table 6 confirms that this is the case.

So far, we have attempted to identify a credit supply shock related to the sovereign debt crisis by comparing firms in countries affected by the crisis to firms in unaffected countries, accounting for shocks to credit demand by including an exhaustive list of firm-specific characteristics and a wide range of fixed effects. Arguably, a number of other developments may have affected the supply of credit by banks. For example, high unemployment and/or low GDP growth may signal a higher risk of corporate default in the future and hence deter banks from lending. Alternatively, high levels of private debt may reduce the credit supply because banks price in the deterioration of growth opportunities in an environment of private debt overhang, especially for firms with low growth opportunities (Lang et al., 1996).

Column (5) of Table 6 tests a version of Model (1) where we replace the interaction *Stressed×Post* with a range of country-specific time-varying variables that capture aspects of both credit supply and credit demand. In order to capture shocks to the credit supply, we use data on the average cost of lending to non-financial companies, and also data from the ECB's BLS in which banks report, on a quarterly basis, changes in their credit standards *related to their own balance sheets.* Both measures increased more for stressed countries during the sovereign debt crisis (see Table 3). The evidence suggests that the cost of lending is significantly and positively correlated with credit constraints at the firm level, implying that firms in need of bank credit were less likely to have access to such in countries where the cost of lending increased and credit standards tightened relatively more. We also use proxies that capture aspects of credit demand. In particular, we include real GDP growth, the level of unemployment, the banks' estimate of the general economic outlook reported in the ECB's BLS, and the private debt-to-GDP ratio. Some of

the latter have a significant effect on credit access, too, in particular, the unemployment rate and the level of private sector debt.

The evidence from these tests confirms that the tightening of credit standards related to banks' own problems continues to exhibit a strong statistically significant effect on SMEs' credit access, implying that the underlying reasons for the observed changes in credit access are not limited to negative shocks to credit demand. Nevertheless, it does suggest that aggregate developments can affect credit demand. Our results can therefore be consistent with a mechanism whereby the allocation of loanable funds is largely driven by firms' balance sheet strength (Ashcraft and Campello, 2007), more so in stressed countries where the growth prospects or creditworthiness of firms has worsened relatively more. If such a divergence in firm prospects, collateral quality, or creditworthiness has resulted in distributions that do not overlap sufficiently across stressed and non-stressed countries, then Model (1) may yield biased estimates.

We address this point formally in column (6) of Table 6. We first isolate the most profitable and creditworthy firms by focusing on the sample of firms which reported that their own growth outlook *and* the quality of their collateral *and* their credit history *improved* over the course of the past 6 months. There are 648 firms in the dataset with full balance sheet information that report an improvement along all three dimensions after the sovereign debt crisis started, about a quarter of which are domiciled in stressed countries. Then we re-run our main test on the sub-samples of firms that improved along all dimensions. The estimates strongly reject the hypothesis that the reduction in credit access we recorded so far is driven by systematic changes in the composition of credit demand and/or quality that we have somehow failed to capture: even the most creditworthy firms in stressed countries continue to be relatively more likely to be denied credit after the sovereign debt crisis started.[21]

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[21] One remaining concern is related to selection, that is, the fact that firms which apply for credit or are discouraged to do so are a non-random sample of the population of firms. To address this issue, we employ a two-stage Heckman model where in the first stage, we account for the fact that the sample of firms that declare a positive need for bank credit (and hence apply or not, or report being discouraged or not) excludes the firms which do not apply for credit because they have enough internal funds. Essentially, we use information from firms that do not need credit to account for the selection of firms into the second-stage sample. The variable *Competition*, measuring the severity of

5.2. Exploiting firm heterogeneity

We now address the question: Which firms suffer most when credit access deteriorates? Theory suggests that banks can adopt two different strategies when readjusting their portfolios away from lending. The first one is a flight to quality in lending, whereby banks reduce credit mostly to less creditworthy borrowers (i.e., firms that are informationally opaque and/or risky; see Albertazzi and Marchetti, 2010). One version of this phenomenon is the "flight home" effect (e.g., Giannetti and Laeven, 2012; Popov and Van Horen, 2015),[22] whereby banks with international operations withdraw relatively more from foreign markets and stick to their domestic relationships. The second one is an overall reduction in credit whereby banks increase credit to the riskiest firms as part of a broader "gambling for resurrection" strategy (Freixas et al., 2003).[23] Empirical evidence has provided support for both mechanisms (e.g., Caballero et al., 2006; De Haas and Van Horen, 2013).

To test the above hypotheses, we choose several firm-specific characteristics which are both theoretically justified and empirically common proxies for firms' risk. The first is firm size: relative to large firms, small firms tend to have more uncertain projects, lower quality collateral, and a higher probability of suffering an involuntary death—although the empirical evidence on this is mixed (e.g., Jovanovic, 1982; Phillips and Kirchhoff, 1989; Agarwal and Gort, 1996; Agarwal, 1996,

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the product competition the firm faces (on a scale of 1 to 10) is included in the first stage (credit demand), but not in the second stage (credit supply). We believe that the exclusion restriction is satisfied because firms that are hit by an unexpected liquidity shock, due for example to weak profits, will have a higher demand for bank credit, without necessarily affecting the bank's likelihood to grant the firm a loan. The inverse Mills' ratio from the first-stage is included in the second stage. See Ongena et al. (2013) for a more in-depth discussion in a similar context. The results from this test are reported in Appendix Table 2, and they confirm that firms in stressed countries were more likely to experience deterioration in credit access after the start of the sovereign debt crisis.

[22] This home bias has also been found in single country analysis where lenders during this crisis reduced the supply of credit to functionally distant companies (Presbitero et al., 2014).

[23] See Akerlof and Romer (1993) for empirical evidence of gambling for resurrection.

1997; and Ghosal and Loungani, 2000).[24] Empirical evidence has shown that better access to finance is disproportionately more important for small firms (e.g., Cetorelli and Strahan, 2006; Beck et al., 2008), and so credit constraints are usually more detrimental to small firms. The second set of proxies is related to the firms' own assessment of their quality and prospects: whether their own outlook improved over the past 6 months; whether the quality of their fixed assets, and hence value as collateral, improved over the past 6 months; and whether their credit history improved over the past 6 months. The full set of proxies are chosen to capture different aspects of risk: the effect of size conditional on firm quality, and the effect of firm quality conditional on size.

In order to gauge the differential impact of the sovereign crisis on firms of different riskiness in stressed countries, we estimate a difference-in-difference-in-differences model whereby we create a triple interaction $Post_t \times Stressed_{isc} \times Risk_{isc}$, where $Risk_{isc}$ is any of the four proxies for firm risk discussed above. We also include all other variables from Model (1), as well as all double interactions. The coefficient on the triple interaction measures the difference in credit access, after the crisis started, between risky and non-risky firms, in stressed countries, relative to non-stressed countries.

Table 7 reports the estimates from this modification of our main test, for all definitions of credit constraints. We find that large firms are *more* likely than small firms to be credit constrained in stressed countries than in non-stressed countries (column (1)), mostly because they are more likely to be rationed (column (3)). We also find that firms with better capital are *more* likely to be price rationed (column (4)), and firms with better credit history are *more* likely to be discouraged from applying (column (5)) in stressed countries after the crisis started. To the extent that unconditional firm quality increases in firm size, this fact is inconsistent with a flight-to-quality strategy by banks. The only suggestion of a flight-to-quality effect, is the fact that firms with better

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[24] While we are not aware of any direct evidence on this issue of whether small SMEs have lower quality collateral, indirect evidence suggests that this is the case. For example, an analysis of the probability that small business will pledge collateral finds a positive relationship with firm asset size (Berger and Udell 1995).

credit history are less likely to be price rationed (column (4)). We thus mostly reject the hypothesis that faced with deteriorating balance sheets, banks in stressed countries exhibit a flight to safety by lending relatively less to credit-unworthy borrowers. This is consistent with a study of Italian firms that also found evidence inconsistent with a flight to quality during the crisis (Presbitero et al., 2014).

5.3.   Firm financing

Having determined that access to credit tightened in stressed countries, we now proceed to test for changes in financing patterns induced by the reduction in bank lending. Firms in the SAFE were asked to give a yes/no answer to questions on whether they used an exhaustive range of funding sources: bank loans, equity, retained earnings, corporate bonds and debt securities, trade credit, and government support in the form of direct subsidies or subsidized loans.

This test serves two important purposes. First, it aims to illustrate substitution patterns across funding sources in the presence of a shock to one of them (bank credit). The literature has provided evidence of a pecking order in funding, whereby cheaper sources of funding (such as bank loans and debt securities) are preferred to more expensive sources. For example, Petersen and Rajan (1994, 1997) argue that small businesses only use trade credit if bank loans are unavailable. Nevertheless, very few data sources are rich enough to provide a full picture of substitution across the full range of possible funding sources. Second, in light of the differences in cost implied by substitution across the pecking order, this test may provide insight into the change in the overall cost of external finance driven by a tightening in credit.

Formally, we re-estimate Model (1) replacing the proxy for credit access with dummies for the various sources of funding that firms indicated they used in the past 6 months. Table 8 reports these estimates. We find that firms respond to the tightening of external finance by being more likely to issue debt securities in order to cover their financing needs (column (3))[25].

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[25] This finding is related to the evidence on the substitutability between bond and bank finance in Massa and Zhang (2013) and in Becker and Ivashina (2014), however, these papers only look at the behaviour of large listed firms which issue corporate bonds.

This is the only statistically significant response by business firms to the tightening of credit standards. Firms in stressed countries also use more retained earnings (column (1)), less equity (column (2)), more trade credit (column (4)), and more subsidized loans and government grants (column (5), but all these effects are insignificant.

Overall, the evidence implies that while in normal times firms prefer to use cheaper funding sources, such as bank loans, firms have not been able to tap into a wide range of alternative funding sources, with the exception of debt securities. We conclude that as a result of the crisis, not only has the amount of overall financing available to firms declined, but it is also likely that the overall cost of funding has increased, with potentially negative implications for firms' real investment decisions.

6.   The effect of the OMT Program

6.1.   The OMT Program and credit access

We now turn to the estimation of Model (2) which captures the effect of one of the ECB's unconventional measures announced to deal with the sovereign debt crisis, the OMT Program. After a brief respite in early 2012, the crisis intensified in the spring and summer of that year, with yields on Italian and Spanish government bonds reaching levels normally considered unsustainable. On 26th July 2012, Mario Draghi, President of the ECB, vowed in a speech in London that the ECB would do "whatever it takes" to safeguard the single currency. A week later, the ECB's Governing Council unveiled the details of the new program under which it would undertake outright transactions in secondary sovereign bond markets. Under the program, the ECB could in theory buy an unlimited amount of government bonds in secondary markets under the condition that the governments had asked for financial assistance from the European Stability Find and that the ECB would reabsorb the money pumped into the system.

In the months that followed the announcement of the OMT Program, yields on government bonds declined dramatically, in particular for debt issued by countries that had experienced severe stress between 2010 and 2012. Altavilla et al. (2014) have argued that the decline in bond yields can mainly be attributed to the ECB's OMT Program, which is quite remarkable given that during

the three years after its announcement, no euro area country has actually activated the OMT Program.

Table 9 reports the estimates from Model (2) where we compare the change in access to finance from the sovereign debt crisis period to the post-OMT period, for firms in stressed countries relative to firms in non-stressed countries. We compare the period 1st October 2011 – 31st March 2012 (wave 6) to the period 1st October 2012 – 31st March 2013 (wave 8). That is, we compare access to finance over the 6 months post-OMT to access to finance over the 6 months pre-OMT (after excluding the period during which the OMT Program was announced), thus testing for the immediate impact of the OMT announcement. The regressions continue to control for the same firm-specific characteristics, as well as for the confounding influence of unobservable factors common to all firms in a country-sector, as well as over time. Finally, in order to acquire a more complete picture of all aspects of credit access, we test for the effect of the OMT program on denial rates, quantity and price rationing, and discouragement.

Panel A reports the estimates from the main test where we use the same "treatment" and "control" countries as in the tests in Tables 4–8. The evidence reported in column (1) suggests that after the announcement of the OMT Program, credit access for SMEs in stressed countries improve by about 2 percentage points, but the effect is not statistically significant. When we split the *Credit constrained* variable into its components, we find that none of the channels is operational: firms in stressed countries are statistically no less likely to be denied credit (column (2)), quantity rationed (column (3)), price rationed (column (4)), or discouraged from applying for a bank loan (column (5)).

The most immediate explanation for this observed non-effect of the OMT program is related to the fact that Germany is a special case in that firms in Germany experienced the largest secular decline in credit constraints over the period among all countries, from 22% to 14% in 1 year.[26] This

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[26] Another possible explanation for why we find such a weak short-run effect is that the pre-OMT period was characterized by a strong easing of bank funding conditions in the euro area. In December 2011 and in March 2012, the ECB extended overall almost €1 trillion in loans to more than 500 European banks, at a fixed 1 percent interest rate. This long-term refinancing operation was designed to prevent a credit freeze, and it represented the largest such deal in ECB's history.

was largely driven by a rapid decline in the proportion of firms that are discouraged from applying for a bank loan, from 14% to 7%, and is indicative of a broad-based recovery in banking system health and business confidence.[27] Because German firms are in the control group, this may lead us to underestimate any effect of the OMT on firms in stressed (treatment) countries.

To account for this possibility, in Panel B we drop all German firms from the sample. We now find a significant OMT effect: immediately after the OMT announcement, firms in stressed countries are 6.4 percentage points less likely to be credit constraints relative to firms in non-stressed countries. This effect is significant at the 5% statistical level, and it is due to firms being less likely to be quantity rationed (column (3)) and discouraged from applying (column (5)).[28][29] The results suggest that adverse selection problems in credit markets have become less severe in the wake of the OMT announcement, leading to fewer instances of credit rationing in the non-price dimension (Stiglitz and Weiss, 1981). Moreover, the fact that firms have become less likely to be discouraged from applying for a loan provides support to theories which relate discouragement to the interest rate differential between banks and other lenders (Kon and Storey, 2003), as well as to theories which treat discouragement as a self-rationing mechanism (Han et al., 2009). A decline in discouragement rates thus implies that as a consequence of the OMT announcement, information asymmetries between lenders and borrower have become less severe, and relative interest rates charged by banks have declined.

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[27] See KFW Annual Report 2012 and the CESIfo Group Munich–Ifo Annual Report 2012.

[28] Appendix Table 2 confirms that the main results of this analysis survive when we account for the selection of firms into the credit granting process with a two-stage Heckman model.

[29] In our tests of the long-run, we compare the period 1st October 2010 – 31st March 2012 (wave 4–6) to the period 31st March 2013 – 31st March 2014 (waves 9–10). This juxtaposes the full period of the sovereign debt crisis to the post-OMT period, excluding the first 6 post-OMT months for which we have data. Appendix Table 3 reports that overall credit access deteriorated further between 1st October 2010 – 31st March 2012 and 31st March 2013 – 31st March 2014. This is due to the fact that a substantially higher proportion of firms shied away from the formal credit granting process, expecting to be denied credit. However, differences in credit access 1.5 years after the OMT announcement can be due to a number of other factors, such as the assumption of the ECB of the role of single supervisor of large banks in Europe and the implementation of an Asset Quality Review by the ECB which may have forced banks to reduce lending as part of a strategy of prudence. Hence, the short-run analysis in Table 9 remains our main tool for identifying the effect of the OMT.

6.2. Exploiting firm heterogeneity

Even though we find only find an immediate effect of the OMT program once we drop German firms from the analysis, there could still be heterogeneous effects that are masked by aggregation. Prior evidence suggests that small firms are more sensitive to monetary policy shocks (Gertler and Gilchrist, 1994; Jimenez et al., 2012), although this evidence comes from observing shocks to conventional monetary policy (changes in the policy rate). Regarding firm risk, theory suggests that if there is flight to safety in lending during negative shocks, riskier firms should benefit more from a positive monetary shock.

Table 10 reports the estimates from a DIDID framework. As in Table 7, we differentiate by firm size and by changes in firm quality in the past six months. To make the analysis consistent with Table 9, we report results with (Panel A) and without (Panel B) firms from Germany. The evidence strongly suggests that after the OMT Program announcement, firms whose outlook improved in the past six months were less likely to be credit constrained in stressed countries (column (1)) as they are less likely to be quantity rationed (column (3)), price rationed (column (4)), and discouraged (column (5)). Also firms whose credit history improved in the past six months are less likely to be credit constrained in stressed countries (column (1)), an effect that is entirely due to that fact that such firms become less likely to be rationed in the quantity dimension (column (3)). The effects are remarkably consistent across the two subsamples (including and excluding German firms), and they are economically significant, too. To the extent that improving outlook and improving credit history signal improving firm quality (such as survival ability, quality of management, or accumulation of reputational capital), our results suggest that lenders have reacted to positive changes in firm quality by granting more loans (Diamond, 1991; Aghion and Bolton, 1992). We thus observe an improvement in the credit supply induced by nonconventional monetary policy, driven by relatively higher lending to more creditworthy corporate customers.

6.3. Firm financing

Our final test is aimed at identifying the change in financing patterns induced by the improvement in credit access in the wake of the OMT Program. This test is similar to the one reported in Table 8, but this time we compare the period of the sovereign debt crisis (the pre-period) to the period after the OMT Program was announced (the post- period). In practice, we re-estimate Model (2) where we replace the proxy for credit access with dummies for whether the firm has used equity, retained earnings, debt securities, trade credit, and government grants or subsidized loans in the past six months.

The evidence from these tests is reported in Table 11. Similar to Table 9, we report results for the sample including all firms (Panel A) and for the sub-sample excluding firms from Germany (Panel B). The picture is a mirror image of the one reported in Table 8: we find that after the announcement of the OMT Program, and relative to firms in non-stressed countries, firms in stressed countries are less likely to issue debt securities (column (3)). In addition, in the sub-sample excluding all German firms from the control group, we find that firms in stressed countries are more likely to use equity, and less likely to use trade credit and government-subsidized loans. This suggests an overall improvement in bank credit that reduces firms' incentives to rely on sources of finance that are either more expensive or potentially associated with a stigma.

7.   Conclusion

We examine the dual effects of sovereign stress and of unconventional monetary policy on SME access to finance. In particular, we investigate whether firms in stressed euro area countries experience a disproportionately higher reduction in access to bank credit during the euro area sovereign debt crisis, and whether they benefited relatively more—in terms of credit access—from the ECB's OMT announcement, relative to similar firms in non-stressed countries. We also study whether shocks to access to finance are associated with a flight to quality in lending. Finally, we examine the adjustment of the capital structure of small businesses in response to shocks to credit access. We do so by comparing credit access for firms in five euro area countries that experienced sovereign debt stress to firms in six euro area countries that did not, using a restricted-access firm-level survey dataset that spans the pre-crisis, crisis, and post-crisis periods. Most of the extant

literature has only examined the impact of the credit crunch in single-country studies (e.g., Jimenez et al., 2012; Iyer et al., 2014; Presbitero et al., 2014). While there exist cross-country analyses of SME access to finance using firm-level data in Europe (e.g., Popov and Udell, 2012; Beck et al., 2014), ours is the first paper to study the impact of sovereign stress and of unconventional monetary policy on SMEs.

We find that sovereign stress has a large negative supply-driven impact on access to finance even after controlling for a wide variety of firm characteristics, as well as for country and industry fixed effects. This result survives a number of robustness checks that control for systematic shocks to the treatment group (i.e., firms in stressed countries), for trends that predate the crisis, for alternative proxies for credit access, and for a wide range of proxies for firm credit-worthiness. We also find that less creditworthy firms are not more likely to be credit constrained, suggesting no flight to quality in lending. Finally, we find that firms in stressed countries are more likely to issue debt securities in response to deteriorating credit access, but this effect does not have large macroeconomic implications as most SMEs do not have access to this source of funding.

With regard to the impact of unconventional monetary policy, we find an immediate positive impact on access to finance in stressed countries during the first six months after the announcement of the ECB's OMT Program. The impact is heterogeneous, whereby firms with an improving outlook and firms with improving credit history are particularly likely to report lower credit constraints in stressed countries. We also examine how alternative sources of finance mattered after the OMT announcement, and we find that relative to firms in non-stressed countries, firms in stressed countries are less likely to issue debt securities. Moreover, such firms are also less likely to use government-subsidized grants and trade credit, the latter result expanding upon recent evidence from single-country studies (e.g., Garcia-Appendini and Montoriol-Garriga, 2015; Carbo-Valverde et al., 2015).

Our results imply that sovereign crises can have an indirect negative effect on the economy through the channel of bank lending, and that unorthodox monetary policy can partially reverse this effect. One important question is how to design policies which ensure that bank credit supports the Schumpeterian creative destruction during recessions whereby efficient start-ups

replace inefficient incumbents. As our data only allows us to look at the intensive margin (which incumbents are more likely to benefit from improved access to finance), we leave this important question for future research.

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Figure 1. Credit constrained firms across stressed and non-stressed countries
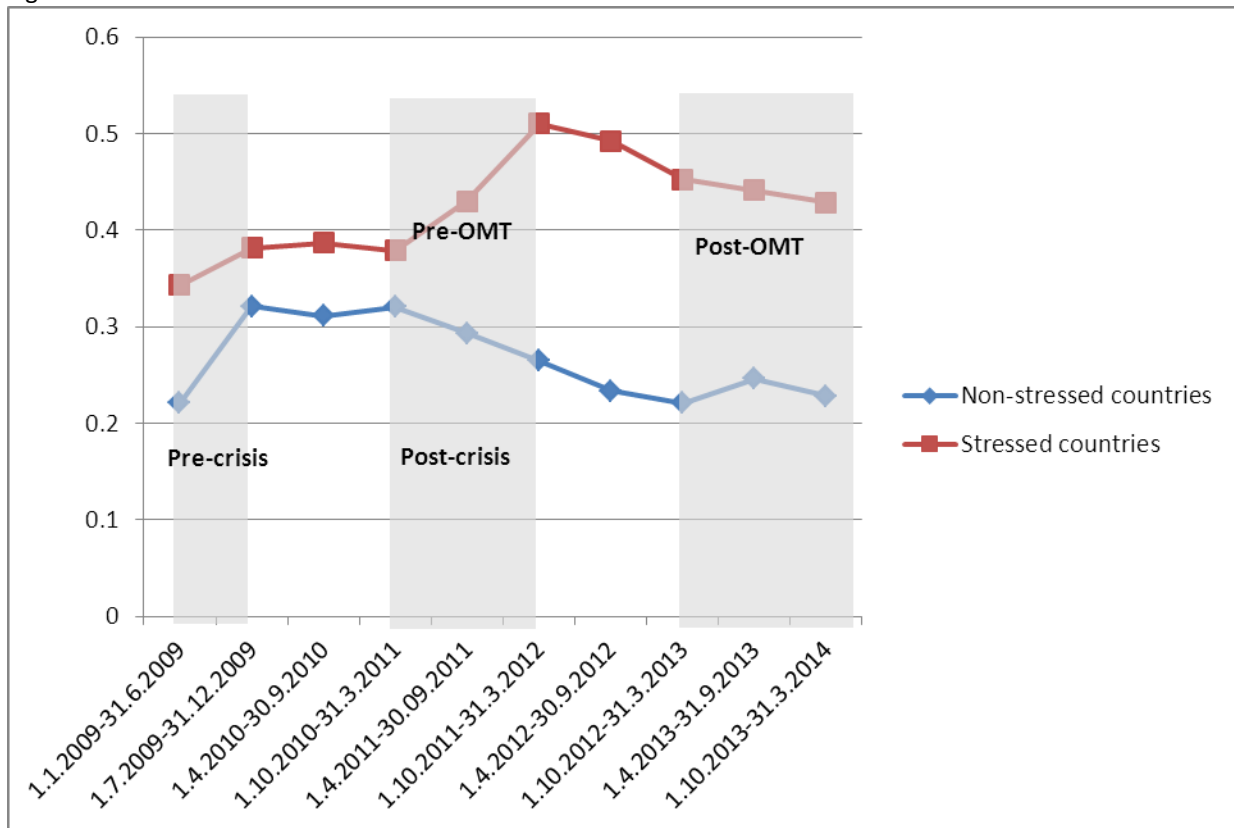
Note: The Chart summarizes weighted averages of credit constrained firms over the sample period. 'Credit constrained' is a dummy variable equal to 1 if the firm declared a positive demand for bank financing in the past 6 months, but it did not apply because of possible rejection, it applied and its loan application was rejected, it applied and got less than 75% of the requested amount, or it refused the loan because the cost was too high. 'Stressed countries' are Greece, Ireland, Italy, Portugal, and Spain. 'Non-stressed countries' are Austria, Belgium, Finland, France, Germany, and the Netherlands.

Table 1. Summary statistics

Variable	Observations	Mean	St. dev.	Min	Max
Access to finance					
Credit constrained	26247	0.35	0.48	0	1
Loan application denied	22089	0.10	0.29	0	1
Rationed	22089	0.13	0.34	0	1
Refused due to high cost	22089	0.02	0.15	0	1
Discouraged from applying	26247	0.16	0.37	0	1
Bank loans and credit lines	68395	0.57	0.50	0	1
Equity	68129	0.07	0.25	0	1
Retained earnings	68068	0.35	0.48	0	1
Debt securities	67823	0.02	0.15	0	1
Trade credit	68301	0.32	0.47	0	1
Grants or subsidies	68298	0.17	0.38	0	1
Other loans	68345	0.17	0.38	0	1
Firm characteristics					
Stressed	68796	0.41	0.49	0	1
Stand-alone firm	68739	0.84	0.37	0	1
Individual- or family-owned	63153	0.74	0.44	0	1
Listed	63153	0.06	0.24	0	1
Female owner	62044	0.12	0.33	0	1
Size_1	68796	0.34	0.47	0	1
Size_2	68796	0.33	0.47	0	1
Size_3	68796	0.25	0.43	0	1
Size_4	68796	0.08	0.27	0	1
Age_1	66118	0.02	0.13	0	1
Age_2	66118	0.07	0.25	0	1
Age_3	66118	0.13	0.34	0	1
Age_4	66118	0.78	0.41	0	1
Turnover_1	66853	0.41	0.49	0	1
Turnover_2	66853	0.19	0.39	0	1
Turnover_3	66853	0.18	0.39	0	1
Turnover_4	66853	0.22	0.41	0	1
Outlook better	65210	0.22	0.42	0	1
Capital better	67748	0.27	0.45	0	1
Credit history better	65392	0.23	0.42	0	1
Country characteristics					
Cost of lending	68796	3.39	1.13	1.90	6.85
Credit standards	68796	11.57	21.82	-40.00	100.00
GDP growth	61276	-0.76	2.89	-9.62	5.47
Unemployment rate	68796	11.34	6.24	3.36	27.49
General economic outlook	68796	21.13	26.36	-30.00	100.00
Private debt / GDP	68796	65.47	18.63	39.10	104.48

Note: This table presents weighted summary statistics for the variables used in the empirical tests. The weights restore the proportions of the economic weight (in terms of number of employees) of each size class, economic

activity and country and are applied to the variables derived from the survey. 'Credit constrained' is a dummy variable equal to 1 if the firm declared a positive demand for bank financing in the past 6 months, but it was discouraged from applying because it believed it would be rejected, or it applied but its loan application was denied, or it applied and got less than 75% of the requested amount (i.e., quantity rationed), or it refused the loan because the cost was too high (i.e., price rationed). 'Loan application denied', 'Rationed', 'Refused due to high cost', and 'Discouraged from applying' are dummy variables for each individual component that are equal to 1 if in the past 6 months the firm was, respectively, denied an application, quantity rationed, price rationed, or discouraged from applying. 'Bank finance deteriorated' is a dummy variable equal to 1 if the firm declared that the willingness of banks to provide a loan deteriorated in the past 6 months. 'Equity' is a dummy variable equal to 1 if in the past 6 months the firm used equity financing to finance its day-to-day operations. 'Retained earnings' is a dummy variable equal to 1 if in the past 6 months the firm used retained earnings to finance its day-to-day operations. 'Debt securities' is a dummy variable equal to 1 if in the past 6 months the firm used debt securities to finance its day-to-day operations. 'Trade credit' is a dummy variable equal to 1 if in the past 6 months the firm used trade credit to finance its day-to-day operations. 'Grants or subsidies' is a dummy variable equal to 1 if in the past 6 months the firm used government grants or subsidized bank loans to finance its day-to-day operations. 'Other loans' is a dummy variable equal to 1 if in the past 6 months the firm used loans from a related company or shareholders or from family and friends. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Stand-alone firm' is a dummy variable equal to 1 if the firm is an autonomous profit-oriented enterprise. 'Individual- or family-owned' is a dummy variable equal to 1 if the firm's owner is an individual or a family. 'Listed' is a dummy variable equal to 1 if the firm is listed on the stock market. 'Female owner' is a dummy variable equal to 1 if the primary owner is a female. 'Size_1' is a dummy variable equal to 1 if the firm has between 1 and 9 employees. 'Size_2' is a dummy variable equal to 1 if the firm has between 10 and 49 employees. 'Size_3' is a dummy variable equal to 1 if the firm has between 50 and 249 employees. 'Size_4' is a dummy variable equal to 1 if the firm has 250+ employees. 'Age_1' is a dummy variable equal to 1 if the firm is less than 2 years old. 'Age_2' is a dummy variable equal to 1 if the firm is between 2 and 5 years old. 'Age_3' is a dummy variable equal to 1 if the firm is between 5 and 10 years old. 'Age_4' is a dummy variable equal to 1 if the firm is 10+ years old. 'Turnover_1' is a dummy variable equal to 1 if the firm's annual turnover is less than €2 mln. 'Turnover_2' is a dummy variable equal to 1 if the firm's annual turnover is between €2 mln. and €5 mln. 'Turnover_3' is a dummy variable equal to 1 if the firm's annual turnover is between €5 mln. and €10 mln. 'Turnover_4' is a dummy variable equal to 1 if the firm's annual turnover is €10+ mln. 'Outlook better' is a dummy variable equal to 1 if the firm's outlook, with respect to sales, profitability, and business plan, improved in the past 6 months. 'Capital better' is a dummy variable equal to 1 if the firm's capital improved in the past 6 months. 'Credit history better' is a dummy variable equal to 1 if the firm's credit history improved in the past 6 months. 'Cost of lending' is calculated by aggregating short and long-term bank interest rates for loans to non-financial corporations using a 24-month moving average of new business volumes. The figures are averages of monthly data for each survey round. 'Credit standards' summarize the internal guidelines or criteria that reflect a bank's lending policy. They are defined as the difference between the sum of the percentages of banks responding "tightened considerably" and "tightened somewhat" and the sum of the percentages of banks responding "eased somewhat" and "eased considerably". 'GDP growth' is the annual growth rate of real GDP based on averages of quarterly data for each survey round. 'Unemployment rate' is the annual unemployment rate based on averages of quarterly data for each survey round. 'General economic outlook' summarises banks' perceptions of risk related to the general economic activity as a factor affecting their decisions when setting the credit standards. It is defined as the difference between the sum of the percentage of banks responding "contributed considerably" and "contributed somewhat" and the sum of the percentage of banks responding "contributed somewhat" and "contributed considerably". 'Private debt / GDP' is the ratio of debt securities and bank loans of the private sector to GDP, based on averages of quarterly data.

Table 2. Credit constraints, by country and time period

Country	Credit constrained		
	1st January 2009 – 31st December 2010 (waves 1-3)	1st October 2011 – 31st March 2012 (waves 4-6)	1st October 2012 – 31st March 2014 (waves 8-10)
Stressed			
Spain	0.52	0.48	0.44
Greece	0.52	0.65	0.70
Ireland	0.47	0.57	0.53
Italy	0.39	0.39	0.40
Portugal	0.43	0.45	0.44
Total	0.46	0.48	0.44
Non-stressed			
Austria	0.23	0.19	0.15
Belgium	0.39	0.29	0.31
Germany	0.32	0.21	0.12
Finland	0.22	0.23	0.30
France	0.25	0.30	0.31
Netherlands	0.65	0.56	0.55
Total	0.33	0.27	0.23

Note: This table presents summary statistics, by country and time period, of the probability of the firm's loan application being rejected by the bank. Summary statistics are weighted means. 'Credit constrained' is a dummy variable equal to 1 if the firm declared a positive demand for bank financing in the past 6 months, but it was discouraged from applying because it believed it would be rejected, or it applied but its loan application was denied, or it applied and got less than 75% of the requested amount, or it refused the loan because the cost was too high.

Table 3. Country characteristics, by country and time period

Country	Cost of lending			Credit standards		
	1st January 2009 – 31st December 2009 (waves 1-2)	1st October 2011 – 31st March 2012 (waves 4-6)	1st October 2012 – 31st March 2014 (waves 8-10)	1st January 2009 – 31st December 2009 (waves 1-2)	1st October 2011 – 31st March 2012 (waves 4-6)	1st October 2012 – 31st March 2014 (waves 8-10)
Stressed						
Spain	2.8	3.6	3.6	15.0	1.7	0.0
Greece	2.6	6.4	6.3	45.0	33.3	10.8
Ireland	3.6	4.0	3.6	c.d.	c.d.	c.d.
Italy	2.4	3.7	4.0	18.8	18.8	12.5
Portugal	2.9	6.0	5.6	45.0	86.7	-30.0
Non-stressed						
Austria	2.8	2.7	2.0	c.d.	c.d.	c.d.
Belgium	2.6	2.7	2.3	12.5	0.0	-8.3
Germany	3.6	3.4	2.5	14.4	-4.4	-1.7
Finland	2.4	2.6	2.1	c.d.	c.d.	c.d.
France	2.9	3.0	2.2	10.1	7.6	1.3
Netherlands	3.0	3.0	2.4	55.0	8.3	27.8

Country	GDP growth			Unemployment rate		
	1st January 2009 – 31st December 2009 (waves 1-2)	1st October 2011 – 31st March 2012 (waves 4-6)	1st October 2012 – 31st March 2014 (waves 8-10)	1st January 2009 – 31st December 2009 (waves 1-2)	1st October 2011 – 31st March 2012 (waves 4-6)	1st October 2012 – 31st March 2014 (waves 8-10)
Stressed						
Spain	-3.8	-0.1	-1.1	17.9	21.6	25.9
Greece	-3.2	-7.6	-3.6	9.6	18.0	27.3
Ireland	-6.4	1.7	-0.5	12.0	14.8	13.1
Italy	-5.5	0.5	-1.8	7.8	8.7	12.1
Portugal	-2.9	-1.0	-1.3	10.5	13.1	16.3
Non-stressed						
Austria	-3.4	2.5	0.5	4.8	4.1	4.9
Belgium	-2.8	1.6	0.3	7.9	7.3	8.4
Germany	-5.1	3.2	0.8	7.8	6.0	5.3

Country						
Finland	-8.5	3.0	-1.3	8.2	7.8	8.2
France	-2.9	1.9	0.4	9.1	9.2	10.2
Netherlands	-3.6	0.8	-0.8	3.7	4.5	6.6

Country	General economic outlook			Private debt / GDP		
	1st January 2009 – 31st December 2009 (waves 1-2)	1st October 2011 – 31st March 2012 (waves 4-6)	1st October 2012 – 31st March 2014 (waves 8-10)	1st January 2009 – 31st December 2009 (waves 1-2)	1st October 2011 – 31st March 2012 (waves 4-6)	1st October 2012 – 31st March 2014 (waves 8-10)
Stressed						
Spain	32.0	16.7	0.0	90.5	87.5	79.2
Greece	65.0	73.3	17.5	47.1	41.6	44.3
Ireland	65.0	46.7	0.0	98.7	100.7	91.9
Italy	31.3	31.3	14.6	61.1	63.3	62.7
Portugal	75.0	96.7	10.0	93.9	95.4	96.3
Non-stressed						
Austria	30.0	13.3	9.0	71.1	71.5	72.5
Belgium	18.8	8.3	12.5	40.7	41.6	45.7
Germany	23.3	-4.5	0.0	44.3	40.8	39.3
Finland	43.8	25.0	25.0	45.9	46.8	53.2
France	31.7	10.0	13.3	61.2	63.7	66.5
Netherlands	54.2	2.1	20.8	73.0	76.7	81.8

Note: This table presents summary statistics, by country and time period. 'Cost of lending' is calculated by aggregating short and long-term bank interest rates for loans to non-financial corporations using a 24-month moving average of new business volumes. The figures are averages of monthly data for each survey round. 'Credit standards' summarize the internal guidelines or criteria that reflect a bank's lending policy. They are defined as the difference between the sum of the percentages of banks responding "tightened considerably" and "tightened somewhat" and the sum of the percentages of banks responding "eased somewhat" and "eased considerably". Data are confidential (c.d.) for Austria, Finland and Ireland. 'GDP growth' is the annual growth rate of real GDP based on averages of quarterly data for each survey round. 'Unemployment rate' is the annual unemployment rate based on averages of quarterly data for each survey round. 'General economic outlook' summarises banks' perceptions of risk related to the general economic activity as a factor affecting their decisions when setting the credit standards. It is defined as the difference between the sum of the percentages of banks responding "contributed considerably" and "contributed somewhat" and the sum of the percentages of banks responding "contributed somewhat" and "contributed considerably". 'Private debt / GDP' is the ratio of debt securities and bank loans of the private sector to GDP, based on averages of quarterly data.

Table 4. Sovereign stress and credit access

	Credit constrained	
	(1)	(2)
Stressed×Post	0.0785**	0.1234**
	(0.0396)	(0.0599)
Stand-alone firm	-0.0230	-0.0182
	(0.0165)	(0.0211)
Individual- or family-owned	0.0071	0.0072
	(0.0162)	(0.0176)
Female owner	0.0233	0.0286
	(0.0279)	(0.0283)
Size_1	0.1408***	0.1503***
	(0.0150)	(0.0148)
Size_2	0.0067	0.0029
	(0.0091)	(0.0080)
Size_4	0.0003	-0.0040
	(0.0321)	(0.0280)
Age_1	-0.0006	-0.0080
	(0.0571)	(0.0531)
Age_2	0.0608***	0.0644***
	(0.0125)	(0.0155)
Age_4	-0.0363	-0.0405
	(0.0369)	(0.0369)
Turnover_1	0.0956***	0.1068***
	(0.0324)	(0.0339)
Turnover_2	0.0479**	0.0489**
	(0.0219)	(0.0227)
Turnover_4	-0.0718*	-0.0609
	(0.0405)	(0.0378)
Outlook better	-0.0287*	-0.0261*
	(0.0152)	(0.0153)
Capital better	-0.0320	-0.0313
	(0.0224)	(0.0240)
Credit history better	-0.0762***	-0.0689***
	(0.0203)	(0.0239)
Country×Industry FEs	No	Yes
Time FEs	No	Yes
No. Observations	8916	8907
R-squared	0.08	0.11

Note: This table presents difference-in-differences estimates of the probability of the firm having been credit constrained in the past 6 months. The estimation period is 1st January 2009 – 31st March 2012. 'Credit constrained' is a dummy variable equal to 1 if in the past 6 months the firm was denied credit, quantity rationed, price rationed or discouraged from applying. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post' is a dummy variable equal to 0 if the time period is between 1st January 2009 and 31st December 2009 (waves 1–2), and to 1 if the time period is between 1st October 2010 and 31st March 2012 (waves 4–6). See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 5. Sovereign stress and credit access: Components of credit constraint

	Loan application denied	Rationed	Refused due to high cost	Discouraged from applying
	(1)	(2)	(3)	(4)
Stressed×Post	-0.0102	0.0857***	0.0505***	0.0525
	(0.0411)	(0.0107)	(0.0138)	(0.0486)
Firm-specific controls	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes
No. Observations	7292	6434	7281	8905
R-squared	0.14	0.07	0.08	0.11

Note: This table presents difference-in-differences estimates where the dependent variable is a dummy variable equal to 1 if the firm was in the past 6 months denied credit (column (1)); quantity rationed (column (2)); price rationed (column (3)); or discouraged from applying (column (4)). 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post' is a dummy variable equal to 0 if the time period is between 1st January 2009 and 31st December 2009 (waves 1–2), and to 1 if the time period is between 1st October 2010 and 31st March 2012 (waves 4–6). All firm-specific control variables from Table 4 are included in the regressions. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 6. Sovereign stress and credit access: Robustness

	Credit constrained					
	(1)	(2)	(3)	(4)	(5)	(6)
Stressed×Post	0.2523***	0.0785***		0.1057***		0.3167*
	(0.0086)	(0.0338)		(0.0541)		(0.1953)
Stressed×Post (Pre-Crisis)			-0.1233***			
			(0.0287)			
Cost of lending					0.1108***	
					(0.0341)	
Credit standards					0.0008	
					(0.0006)	
GDP growth					0.0203***	
					(0.0105)	
Unemployment rate					0.0223***	
					(0.0060)	
General economic outlook					0.0007	
					(0.0007)	
Private debt / GDP					0.0080**	
					(0.0034)	
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls×Post	No	Yes	No	No	No	No
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	No	Yes	Yes	Yes	Yes	Yes
Country×Time FEs	Yes	No	No	No	No	No
Industry×Time FEs	Yes	No	No	No	No	No
No. Observations	8907	8907	2626	8261	18510	648
R-squared	0.13	0.12	0.19	0.10	0.12	0.15

Note: This table presents difference-in-differences estimates where the dependent variable is a dummy variable equal to 1 if in the past 6 months was denied credit, quantity rationed, price rationed or discouraged from applying. In column (4), all firms domiciled in Greece are excluded from the analysis. In column (6), only the firms whose outlook and capital and credit history improved in the past 6 months are included in the regression. The estimation period is 1st January 2009 -- 31st March 2012. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post' is a dummy variable equal to 0 if the time period is between 1st January 2009 and 31st December 2009 (waves 1–2), and to 1 if the time period is between 1st October 2010 and 31st March 2012 (waves 4–6). 'Post (Pre-crisis)' is a dummy variable equal to 0 if the time period is between 1st January 2009 and 30th June 2009 (wave 1), and to 1 if the time period is between 1st July and 31st December 2009 (wave 2). All firm-specific control variables from Table 4 are included in the regressions. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 7. Sovereign stress and credit access: Exploiting cross-sectional heterogeneity

	Credit constrained	Loan application denied	Rationed	Refused due to high cost	Discouraged from applying
	(1)	(2)	(3)	(4)	(5)
Stressed×Post×Size_4	0.1473**	-0.0036	0.0454*	0.0258	-0.0188
	(0.0751)	(0.0428)	(0.0290)	(0.0332)	(0.0721)
Stressed×Post×Outlook better	0.0585	0.0264	-0.0108	0.0707	0.0347
	(0.0506)	(0.0554)	(0.0322)	(0.0551)	(0.1111)
Stressed×Post×Capital better	-0.0054	0.0326	-0.0251	0.0869***	-0.0883
	(0.0633)	(0.0425)	(0.0263)	(0.0204)	(0.0545)
Stressed×Post×Credit history better	0.1878	-0.0479	0.0405	-0.0715**	0.2051*
	(0.1958)	(0.0372)	(0.0504)	(0.0300)	(0.1321)
Firm-level controls	Yes	Yes	Yes	Yes	Yes
Double interactions	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes
Time×Industry FEs	Yes	Yes	Yes	Yes	Yes
No. Observations	8907	7292	6434	7439	8905
R-squared	0.11	0.14	0.07	0.04	0.11

Note: This table presents difference-in-differences estimates where the dependent variable is a dummy variable equal to 1 if in the past 6 months the firm has been credit constrained (column (1)); denied credit (column (2)); quantity rationed (column (3)); price rationed (column (4)); and discouraged from applying (column (5)). 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post' is a dummy variable equal to 0 if the time period is between 1st January 2009 and 31st December 2009 (waves 1–2), and to 1 if the time period is between 1st October 2010 and 31st March 2012 (waves 4–6). 'Size_4' is a dummy variable equal to 1 if the firm has 250+ employees. 'Outlook better' is a dummy variable equal to 1 if the firm's own outlook, with respect to sales, profitability, and business plan, improved in the past 6 months. 'Capital better' is a dummy variable equal to 1 if the firm's capital improved in the past 6 months. 'Credit history better' is a dummy variable equal to 1 if the firm's credit history improved in the past 6 months. All firm-level control variables from Table 4 are included in the regressions. All double interactions are also included. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 8. Sovereign stress and alternative sources of firm financing

	Retained earnings	Equity	Debt securities	Trade credit	Grants or subsidies	Other loans
	(1)	(2)	(3)	(4)	(5)	(6)
Stressed×Post	0.1029	-0.0016	0.0142**	0.0082	0.0037	-0.0163
	(0.1265)	(0.0189)	(0.0083)	(0.0728)	(0.0570)	(0.0267)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time×Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	22498	22466	22408	22561	22525	22533
R-squared	0.13	0.08	0.08	0.10	0.06	0.09

Note: This table presents difference-in-differences estimates of the firm's use of different sourced of firm financing. 'Retained earnings' is a dummy variable equal to 1 if in the past 6 months the firm used retained earnings to finance its day-to-day operations. 'Equity' is a dummy variable equal to 1 if in the past 6 months the firm used equity financing to finance its day-to-day operations. 'Debt securities' is a dummy variable equal to 1 if in the past 6 months the firm used debt securities to finance its day-to-day operations. 'Trade credit' is a dummy variable equal to 1 if in the past 6 months the firm used trade credit to finance its day-to-day operations. 'Grants or subsidies' is a dummy variable equal to 1 if in the past 6 months the firm used government grants or subsidized bank loans to finance its day-to-day operations. 'Other loans' is a dummy variable equal to 1 if in the past 6 months the firm used loans from a related company or shareholders or from family and friends. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post' is a dummy variable equal to 0 if the time period is between 1st January 2009 and 31st December 2009 (waves 1–2), and to 1 if the time period is between 1st October 2010 and 31st March 2012 (waves 4–6). All firm-level control variables from Table 4 are included in the regressions. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 9. The Outright Monetary Transactions Program and credit access

Panel A. All firms

	Credit constrained	Loan application denied	Rationed	Refused due to high cost	Discouraged from applying
	(1)	(2)	(3)	(4)	(5)
Stressed×Post_OMT	-0.0170	0.0033	-0.0098	-0.0019	-0.0217
	(0.0435)	(0.0147)	(0.0308)	(0.0046)	(0.0222)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes
No. Observations	5136	4215	4231	3955	5142
R-squared	0.15	0.13	0.10	0.11	0.15

Panel B. Excluding firms in Germany

	Credit constrained	Loan application denied	Rationed	Refused due to high cost	Discouraged from applying
	(1)	(2)	(3)	(4)	(5)
Stressed×Post_OMT	-0.0635**	-0.0045	-0.0483**	-0.0030	-0.0466**
	(0.0279)	(0.0188)	(0.0220)	(0.0058)	(0.0235)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes
No. Observations	4610	3724	3740	3580	4616
R-squared	0.10	0.09	0.06	0.11	0.13

Note: This table presents difference-in-differences estimates of the probability of the firm having been credit constrained in the past 6 months. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. In Panels A and B, 'Post_OMT' is a dummy variable equal to 0 if the time period is between 1st October 2011 and 31st March 2012 (wave 6), and to 1 if the time period is between 1st October 2012 and 31st March 2013 (wave 8). Panel B excludes all firms domiciled in Germany. All firm-level control variables from Table 4 are included in the regressions. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 10. The Outright Monetary Transactions Program and credit access: Exploiting cross-sectional heterogeneity

Panel A. All firms

	Credit constrained	Loan application denied	Rationed	Refused due to high cost	Discouraged from applying
	(1)	(2)	(3)	(4)	(5)
Stressed×Post_OMT×Size_4	0.1875***	0.1471**	0.0621	0.9989***	-0.0654
	(0.0561)	(0.0914)	(0.0588)	(0.0004)	(0.0476)
Stressed×Post_OMT ×Outlook better	-0.1792***	-0.0070	-0.0569**	-0.0037**	-0.0642**
	(0.0331)	(0.0182)	(0.0185)	(0.0005)	(0.0246)
Stressed×Post_OMT ×Capital better	0.2527***	0.1833	0.2044***	-0.0039	0.0216
	(0.0617)	(0.0569)	(0.0723)	(0.0010)	(0.0350)
Stressed×Post_OMT ×Credit history better	-0.1554***	-0.0154	-0.0617***	-0.0030	0.0138
	(0.0373)	(0.0317)	(0.0093)	(0.0017)	(0.0896)
Firm-level controls	Yes	Yes	Yes	Yes	Yes
Double interactions	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes
Time×Industry FEs	Yes	Yes	Yes	Yes	Yes
No. Observations	5136	4215	4231	3955	5142
R-squared	0.15	0.14	0.12	0.17	0.16

Panel B. Excluding firms in Germany

	Credit constrained	Loan application denied	Rationed	Refused due to high cost	Discouraged from applying
	(1)	(2)	(3)	(4)	(5)
Stressed×Post_OMT×Size_4	0.1616***	0.2244**	0.0823	0.9982***	-0.1025
	(0.0508)	(0.1294)	(0.0819)	(0.0004)	(0.0588)
Stressed×Post_OMT ×Outlook better	-0.2517***	-0.0307*	-0.1117***	-0.0066***	-0.1037***
	(0.0391)	(0.0134)	(0.0107)	(0.0013)	(0.0254)
Stressed×Post_OMT ×Capital better	0.2219***	0.1496***	0.1675***	-0.0054	0.0276
	(0.0600)	(0.0478)	(0.0562)	(0.0042)	(0.0472)
Stressed×Post_OMT ×Credit history better	-0.1899**	0.0241	-0.0915***	-0.0059	0.0342
	(0.0651)	(0.0369)	(0.0165)	(0.0026)	(0.0911)
Firm-level controls	Yes	Yes	Yes	Yes	Yes
Double interactions	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes
Time×Industry FEs	Yes	Yes	Yes	Yes	Yes
No. Observations	4610	3724	3740	3580	4616
R-squared	0.10	0.10	0.10	0.15	0.14

Note: This table presents difference-in-differences estimates where the dependent variable is a dummy variable equal to 1 if in the past 6 months the firm has been credit constrained (column (1)); denied credit (column (2)); quantity rationed (column (3)); price rationed (column (4)); and discouraged from applying (column (5)). 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post_OMT' is a dummy variable equal to 0 if the time period is between 1st October 2011 and 31st March 2012 (wave 6), and to 1 if the time period is between 1st October 2012 and 31st March 2013 (wave 8). 'Size_4' is a dummy variable equal to 1 if the firm has 250+ employees. 'Own outlook better' is a dummy variable equal to 1 if the firm's own outlook, with respect to sales, profitability, and business plan, improved in the past 6 months. 'Capital better' is a dummy variable equal to 1 if the firm's capital improved in the past 6 months. 'Credit history better' is a dummy variable equal to 1 if

the firm's credit history improved in the past 6 months. Panel B excludes all firms domiciled in Germany. All firm-level control variables from Table 4 are included in the regressions. All double interactions are also included. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 11. The Outright Monetary Transactions Program and alternative sources of firm financing

Panel A. All firms

	Retained earnings	Equity	Debt securities	Trade credit	Grants or subsidies	Other loans
	(1)	(2)	(3)	(4)	(5)	(6)
Stressed×Post_OMT	0.0223	0.0129	-0.0098*	-0.0592	-0.0247	0.0203
	(0.0629)	(0.0141)	(0.0044)	(0.0677)	(0.0206)	(0.0158)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time×Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	12223	12197	10636	12270	12276	12270
R-squared	0.14	0.07	0.14	0.11	0.06	0.08

Panel B. Excluding firms in Germany

	Retained earnings	Equity	Debt securities	Trade credit	Grants or subsidies	Other loans
	(1)	(2)	(3)	(4)	(5)	(6)
Stressed×Post_OMT	0.0463	0.0231**	-0.0158**	-0.1373***	-0.0377*	0.0372***
	(0.0576)	(0.0120)	(0.0055)	(0.0495)	(0.0204)	(0.0132)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time×Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	10802	10770	9695	10844	10847	10839
R-squared	0.10	0.08	0.12	0.10	0.06	0.07

Note: This table presents difference-in-differences estimates of the firm's use of different sourced of firm financing. 'Retained earnings' is a dummy variable equal to 1 if in the past 6 months the firm used retained earnings to finance its day-to-day operations. 'Equity' is a dummy variable equal to 1 if in the past 6 months the firm used equity financing to finance its day-to-day operations. 'Debt securities' is a dummy variable equal to 1 if in the past 6 months the firm used debt securities to finance its day-to-day operations. 'Trade credit' is a dummy variable equal to 1 if in the past 6 months the firm used trade credit to finance its day-to-day operations. 'Grants or subsidies' is a dummy variable equal to 1 if in the past 6 months the firm used government grants or subsidized bank loans to finance its day-to-day operations. 'Other loans' is a dummy variable equal to 1 if in the past 6 months the firm used loans from a related company or shareholders or from family and friends. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post_OMT' is a dummy variable equal to 0 if the time period is between 1st October 2011 and 31st March 2012 (wave 6), and to 1 if the time period is between 1st October 2012 and 31st March 2013 (wave 8). Panel B excludes all firms domiciled in Germany. All firm-level control variables from Table 4 are included in the regressions. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Appendix Table 1: Variable definitions

Variables	Definition	Sources
Credit constrained	Dummy variable equal to 1 if the firm declared a positive demand for bank financing in the past 6 months, but it did not apply because of possible rejection, it applied and its loan application was rejected, it applied and got less than 75% of the requested amount, or it refused the loan because the cost was too high	ECB/EC SAFE
Loan application denied	Dummy variable equal to 1 if in the past 6 months the firm applied for a loan and its loan application was rejected	ECB/EC SAFE
Rationed	Dummy variable equal to 1 if in the past 6 months the firm applied for a loan and it got less than 75% of the requested amount	ECB/EC SAFE
Refused due to high cost	Dummy variable equal to 1 if in the past 6 months the firm applied for a loan and it refused the loan because the cost was too high	ECB/EC SAFE
Discouraged from applying	Dummy variable equal to 1 if the firm declared a positive demand for bank financing in the past 6 months, but it did not apply because of possible rejection	ECB/EC SAFE
Equity	Dummy variable equal to 1 if in the past 6 months the firm used equity financing to finance its day-to-day operations	ECB/EC SAFE
Retained earnings	Dummy variable equal to 1 if in the past 6 months the firm used retained earnings to finance its day-to-day operations	ECB/EC SAFE
Debt securities	Dummy variable equal to 1 if in the past 6 months the firm used debt securities to finance its day-to-day operations	ECB/EC SAFE
Trade credit	Dummy variable equal to 1 if in the past 6 months the firm used trade credit to finance its day-to-day operations	ECB/EC SAFE
Grants or subsidies	Dummy variable equal to 1 if in the past 6 months the firm used government grants or subsidized bank loans to finance its day-to-day operations	ECB/EC SAFE
Other loans	Dummy variable equal to 1 if in the past 6 months the firm used loans from a related company or shareholders or from family and friends	ECB/EC SAFE
Stand-alone firm	Dummy variable equal to 1 if the firm is an autonomous profit-oriented enterprise	ECB/EC SAFE
Individual- or family-owned	Dummy variable equal to 1 if the firm's owner is an individual or a family	ECB/EC SAFE
Female owner	Dummy variable equal to 1 if the primary owner is a female	ECB/EC SAFE
Size	'Size_1' is a dummy variable equal to 1 if the firm has between 1 and 9 employees. 'Size_2' is a dummy variable equal to 1 if the firm has between 10 and 49 employees. 'Size_3' is a dummy variable equal to 1 if the firm has between 50 and 249 employees. 'Size_4' is a dummy variable equal to 1 if the firm has 250+ employees.	ECB/EC SAFE
Age	'Age_1' is a dummy variable equal to 1 if the firm is less than 2 years old. 'Age_2' is a dummy variable equal to 1 if the firm is between 2 and 5 years old. 'Age_3' is a dummy variable equal to 1 if the firm is between 5 and 10 years old. 'Age_4' is a dummy variable equal to 1 if the firm is 10+ years old.	ECB/EC SAFE

Turnover	'Turnover_1' is a dummy variable equal to 1 if the firm's annual turnover is less than €2 mln. 'Turnover_2' is a dummy variable equal to 1 if the firm's annual turnover is between €2 mln. and €5 mln. 'Turnover_3' is a dummy variable equal to 1 if the firm's annual turnover is between €5 mln. and €10 mln. 'Turnover_4' is a dummy variable equal to 1 if the firm's annual turnover is €10+ mln.	ECB/EC SAFE
Outlook better	Dummy variable equal to 1 if the firm's outlook, with respect to sales, profitability, and business plan, improved in the past 6 months.	ECB/EC SAFE
Capital better	Dummy variable equal to 1 if the firm's capital improved in the past 6 months.	ECB/EC SAFE
Credit history better	Dummy variable equal to 1 if the firm's credit history improved in the past 6 months.	ECB/EC SAFE
Overall situation improved	Dummy variable equal to 1 if the firm's outlook and the firm's capital and the firm's credit history improved in the past 6 months.	ECB/EC SAFE
Competition	Variable capturing responses to the question "How pressing is competition as a problem your firm is facing on a scale of 1 to 10, where 10 means it is extremely pressing and 1 means it is not at all pressing?"	ECB/EC SAFE
Cost of lending	The variable is calculated by aggregating short and long-term bank interest rates for loans to non-financial corporations using a 24-month moving average of new business volumes.	ECB
Credit standards	The variable is defined as the difference between the sum of the percentages of banks responding "tightened considerably" and "tightened somewhat" and the sum of the percentages of banks responding "eased somewhat" and "eased considerably" in the Bank lending survey.	ECB BLS
GDP growth	The annual growth rate of real GDP based on averages of quarterly data for each survey round.	Eurostat
Unemployment rate	The annual unemployment rate based on averages of quarterly data for each survey round	Eurostat
General economic outlook	The variable is defined as the difference between the sum of the percentages of banks responding "contributed considerably" and "contributed somewhat" and the sum of the percentages of banks responding "contributed somewhat" and "contributed considerably" in the Bank lending survey.	ECB BLS
Private debt / GDP	The variable is defined as the ratio of debt securities and bank loans of the private sector to GDP, based on averages of quarterly data	ECB and Eurostat
Stressed	Dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain	
Post	Dummy variable equal to 0 if the time period is between 1st January 2009 and 31st December 2009 (waves 1-2), and to 1 if the time period is between 1st October 2010 and 31st March 2012 (waves 4-6).	
Post (Pre-crisis)	Dummy variable equal to 0 if the time period is between 1st January 2009 and 30th June 2009 (wave 1), and to 1 if the time period is between 1st July and 31st December 2009 (wave 2).	
Post_OMT	Dummy variable equal to 0 if the time period is between 1st October 2011 and 31st March 2012 (wave 6), and to 1 if the time period is between 1st October 2012 and 31st March 2013 (wave 8)	
Post_OMT (long-run)	Dummy variable equal to 0 if the time period is between 1st October 2010 and 31st March 2012 (waves 4-6), and to 1 if the time period is between 31st March 2013 and 31st March 2014 (waves 9-10).	

Appendix Table 2. Sovereign stress, the Outright Monetary Transactions Program, and credit access: Heckman correction

	Credit constrained		
	Sovereign debt crisis	OMT Program	OMT Program, excluding Germany
	(1)	(2)	(3)
Stressed×Post	0.0995*		
	(0.0640)		
Stressed×Post_OMT		-0.0309	-0.0864**
		(0.0474)	(0.0432)
Competition (*excluded from second stage*)	0.0177**	0.0123*	0.0096*
	(0.0076)	(0.0070)	(0.0060)
Firm-specific controls	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes
No. Observations	8907	5136	4610
R-squared	0.11	0.15	0.10

Note: This table presents difference-in-differences estimates of the probability of the firm having been credit constrained in the past 6 months. 'Credit constrained' is a dummy variable equal to 1 if in the past 6 months the firm was denied credit, quantity rationed, price rationed or discouraged from applying. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post' is a dummy variable equal to 0 if the time period is between 1st January 2009 and 31st December 2009 (waves 1–2), and to 1 if the time period is between 1st October 2010 and 31st March 2012 (waves 4–6). 'Post_OMT' is a dummy variable equal to 0 if the time period is between 1st October 2011 and 31st March 2012 (wave 6), and to 1 if the time period is between 1st October 2012 and 31st March 2013 (wave 8). 'Competition' measures the severity of product competition that the firm faces, on a scale of 1 to 10. The variable is included in the first stage to capture the probability of a firm exhibiting a positive demand for credit, and excluded from the second stage. Column (3) excludes all firms domiciled in Germany. All firm-level control variables from Table 4 are included in the regressions. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Appendix Table 3. The Outright Monetary Transactions Program and credit access: Long-run

	Credit constrained	Loan application denied	Rationed	Refused due to high cost	Discouraged from applying
	(1)	(2)	(3)	(4)	(5)
Stressed×Post_OMT	0.0956*	0.0117	-0.0072	0.0010	0.0967**
	(0.0603)	(0.0144)	(0.0176)	(0.0059)	(0.0541)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes
Country×Industry FEs	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes
No. Observations	12905	10810	10814	10593	12888
R-squared	0.12	0.14	0.06	0.09	0.12

Note: This table presents difference-in-differences estimates of the probability of the firm having been credit constrained in the past 6 months. 'Stressed' is a dummy variable equal to 1 if the firm is domiciled in Greece, Ireland, Italy, Portugal, or Spain. 'Post_OMT' is a dummy variable equal to 0 if the time period is between 1st October 2010 and 31st March 2012 (waves 4–6), and to 1 if the time period is between 31st March 2013 and 31st March 2014 (waves 9–10). All firm-level control variables from Table 4 are included in the regressions. See Appendix Table 1 for all variable definitions and sources. All regressions use sampling weights that adjust the sample to be representative of the population. All regressions include fixed effects as specified. Standard errors clustered at the country level appear in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.