Sharing the Pain? Credit Supply and Real Effects of Bank Bail-ins*

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Abstract

We analyze the credit supply and real sector effects of bank bail-ins by exploiting the unexpected failure of a major Portuguese bank and subsequent resolution. Using a matched firm-bank dataset on credit exposures and interest rates, we show that while banks more exposed to the bail-in significantly reduced credit supply at the intensive margin, affected firms compensated the tightening of overall credit with other sources of funding. Nevertheless, SMEs were subject to a binding contraction of funds available through credit lines and reduced investment and employment. These dampening effects are explained by the pre-shock internal liquidity position of smaller firms. (JEL E22, E24, E58, G01, G21, G28, G32)

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1 Introduction

The recent financial crisis highlighted the pressing need for a robust and consistent mechanism to resolve banks in distress. Absent a viable alternative to bankruptcy that could lead to contagion and a credit crunch, policymakers around the world opted to bail-out financial intermediaries using public funding. In Europe, for instance, taxpayers have covered more than two-thirds of the cost of recapitalizing and resolving banks (Philippon and Salord, 2017). These interventions were often accompanied by significant government losses and austerity programs associated with political frictions and distributional problems. To counter this pervasive issue, most developed economies have recently introduced formal bail-in regimes that involve the participation of bank creditors in bearing the costs of restoring a distressed bank and include severe restrictions on taxpayer support.

An effective bank resolution framework should minimize the trade-off between imposing market discipline and reducing the external costs of a potential bank failure (Beck, 2011). In fact, previous evidence has shown both the detrimental impact of public guarantees on bank risk-taking (e.g., Gropp, Hakenes, and Schnabel, 2011; Dam and Koetter, 2012) and the negative effects of bank failures on real outcomes (e.g., Bernanke, 1983; Calomiris and Mason, 2003; Ashcraft, 2005). The recently introduced bail-in regime reduces moral-hazard due to creditors' expectation of being bailed-in in case of distress (Schäfer, Schnabel, and Weder, 2016), and should in principle also minimize the negative economic effects since the healthy part of the bank can continue functioning. However, there is little to no empirical evidence on the effects this new resolution mechanism may have on credit provision or the real economy. Our study fills this gap in the literature by examining the credit supply and real effects of bank bail-ins using a unique dataset combining firm-bank matched data on credit exposures and interest rates from the Portuguese credit register with balance-sheet information for the firms and their lenders.

In detail, we exploit the unexpected collapse of a major bank in Portugal (Banco Espírito Santo - BES) in August 2014 that was coined "one of Europe's biggest financial failures" (FT, 2014). The institution was resolved through a bail-in and split into a "good" and "bad" bank, protecting taxpayers and depositors but leaving shareholders and junior bondholders holding the toxic assets. The costs of this intervention fell not only on the bank's creditors, but also indirectly on other resident banks that had to provide additional funding to the Bank Resolution Fund. Importantly, the bank failure was unrelated to fundamental risks in a generalized group of borrowers or in the Portuguese banking sector. Instead, the collapse was due to large risky exposures to a limited number of firms that were also owned by the Espírito Santo family (Economist, 2014). These reflected the "practice of management acts seriously detrimental" to the bank and non-compliance with determinations issued by the Portuguese central bank "prohibiting an increase in its exposure to other entities of the Group" (Banco de Portugal, 2014a). From an identification perspective, exploiting this (exogenous) shock is therefore particularly attractive since the bank's failure was purely idiosyncratic.

We start the analysis by examining over 115,000 bank-firm lending relationships and running a within-firm difference-in-differences specification comparing changes in credit supply to the same borrower across banks exposed differently to the bail-in i.e., the bailed-in bank itself, other banks that provided ad-hoc financing to the Resolution Fund, and banks that were exempt from making additional contributions. By exploiting the widespread presence of Portuguese firms with multiple bank relationships, this approach allows us to control for changes in observable and unobservable firm characteristics such as credit demand, quality, and risk (Khwaja and Mian, 2008). In this regard, we show that the supply of credit from banks more exposed to the bail-in declined significantly to existing borrowers as a result of the shock. In detail, comparing lending to the same firm by banks one standard deviation apart in terms of exposure to the bail-in, we find that more exposed banks reduced total credit and granted credit lines by 3.0 and 5.7 percent more than banks exposed less. This credit supply contraction was concentrated in firms that had the bailed-in bank as their

main lender prior to the shock and was less pronounced for SMEs as well as firms with lower profitability and non-performing loans in the pre-period.[1]

A fundamental follow-up question is whether more exposed firms could compensate the credit supply tightening by accessing funds from other banks less affected by the shock, and if there were any real effects associated with the intervention.[2] Importantly, following Abowd, Kramarz, and Margolis (1999) and Cingano, Manaresi, and Sette (2016), we are also able to control for loan demand when looking at the cross-section of firms by including in the regressions the vector of estimated firm-level fixed effects from the within-firm specification. We find at the cross-sectional level that firms more exposed to the bail-in did not suffer a reduction of overall credit after the intervention when compared to firms exposed less. However, when isolating granted credit lines from total committed credit and focusing on firms with credit lines at multiple banks, we show that SMEs more exposed to the resolution were subject to a binding contraction in quantity of funds available through lines of credit, an essential component for corporate liquidity management (Sufi, 2009; Jiménez, Lopez, and Saurina, 2009). Specifically, a one standard deviation increase in firm exposure to the bail-in is associated with a 2.2 percent binding decrease in granted credit lines to SMEs.

Our results show that the resolution also came at the cost of moderately higher interest rates for more exposed firms. In detail, a one standard deviation increase in firm exposure to the shock is associated with a relative increase of 20 basis points in the interest rate charged on credit lines for the average firm. We also observe a relative increase in interest rates on new credit operations (though only for large firms more exposed to the shock), as well as a moderate relative decrease in the maturity of new credit and increase in the share of collateralized credit after the shock across both firm types.

[1] We confirm our findings when using the complete sample of borrowing firms in Portugal (i.e., including single-bank-relationship firms) in a model that replaces firm fixed-effects with location-size-sector fixed-effects as in De Jonghe, Dewachter, Mulier, Ongena, and Schepens (2018).

[2] This issue is particularly important in the context of SMEs which usually find it difficult to substitute credit from other sources because they are more opaque and thus mainly rely on existing banking relationships. This is still a source of great concern among academics, regulators and policy-makers, particularly in Europe (Giovannini, Mayer, Micossi, Di Noia, Onado, Pagano, and Polo, 2015)

Finally, regarding the effect of the bank failure and subsequent bail-in on real sector outcomes, we find evidence of a negative adjustment of investment and employment policies at SMEs borrowing from more exposed banks prior to the resolution. This effect is economically significant: a one standard deviation increase in firm exposure to the shock leads to a relative drop in investment and employment of up to 2.0 and 1.5 percent, respectively. These dampening effects of the bank resolution are driven by a response to increased liquidity risk by firms with lower ex-ante internal liquidity. Consistent with the argument that the option for firms to access liquidity from credit lines should be more valuable when internal liquidity is scarce (e.g., Campello, Giambona, Graham, and Harvey, 2011), we find that the negative real effects are concentrated on illiquid SMEs more exposed to the resolution that responded to the funding shock by increasing cash holdings while decreasing investment and employment.[3] Instead, in line with precautionary cash savings being important in times of dislocation in markets for external finance (e.g., Duchin, Ozbas, and Sensoy, 2010), more exposed SMEs with high liquidity before the bail-in were able to use their available internal cash holdings to compensate for the binding contraction in granted credit lines and thus maintain employment and investment.[4]

This paper contributes to the literature examining how distressed banks should be resolved. Kahn and Winton (2004) suggest that a "good-bank-bad-bank" split may be beneficial as it reduces risk-shifting incentives in the healthy bank and increases its incentive to screen and monitor the "good" loans. More recent work, however, has mostly focused in describing the potential benefits and costs of the different bank resolution mechanisms (e.g., Dewatripont, 2014; Conlon and Cotter, 2014; Avgouleas and Goodhart, 2015; Philippon and Salord, 2017) and examining the interaction between bail-ins and bail-outs from a theoretical perspective

[3]This result is not explained by differences in anticipated growth opportunities across SMEs with low and high levels of internal liquidity prior to the bank resolution.

[4]In a separate but related exercise, we gauge whether the bail-out of four Portuguese banks in 2012 resulted in similar negative effects. We find no significant differences between borrowers of bailed-out and non-bailed-out banks in terms of credit supply, investment or employment. This points to rather sharp differences between different bank resolution policies, although we caution that the macroeconomic situation was considerably different during these two episodes and that the public intervention in 2012 was more systemic in nature.

(e.g., Klimek, Poledna, Farmer, and Thurner, 2015; Colliard and Gromb, 2017; Keister and Mitkov, 2017; Walther and White, 2017; Bernard, Capponi, and Stiglitz, 2017). Our paper contributes to this literature by assessing the effects of a bank bail-in on credit supply and real sector outcomes using detailed bank-, firm- and loan-level data. To the best of our knowledge, this is the first empirical study examining this issue.

We also contribute to the literature analyzing bank failures and the associated negative real effects. Bernanke (1983) and Calomiris and Mason (2003) highlight the economic repercussions of bank failures in the 1920s and 1930s, while Ashcraft (2005) links the decrease in lending following the closure of a large (solvent) affiliate in a regional bank holding company in Texas in the 1990s to a decline in local GDP. Slovin, Sushka, and Polonchek (1993) show that firms that were the main customers of Continental Illinois in the US saw their share prices negatively affected by its bankruptcy. Our paper shows that even when a bank partly continues operating because of a more efficient bank resolution mechanism, there are still negative repercussions for certain borrower groups.

Finally, our paper also contributes to the empirical corporate finance literature on firm's liquidity management and its importance for the transmission of credit supply shocks to the real economy. Under the precautionary demand for cash theory, firms hold cash as a buffer as protection against adverse cash flow shocks. This is particularly valuable for firms that are financially constrained (Almeida, Campello, and Weisbach, 2004), and following a credit crunch (Duchin, Ozbas, and Sensoy, 2010). Directly relevant for our work, Berg (2018) shows that while liquid SMEs are able to absorb credit supply shocks by using existing cash buffers, their illiquid counterparts increase cash holdings when a loan application is rejected, cutting non-cash assets by more than the requested loan amount, and thus investment and employment. While Berg (2018) uses discontinuities in credit scores comparing accepted and rejected loan applicants at a single German bank, we use an exogenous bank shock for identification and the entire set of banks operating in Portugal.[5]

[5]This paper is also part of an expanding literature using loan-level data to explore the effect of regulatory, liquidity and solvency shocks on credit supply and real outcomes. Khwaja and Mian (2008) and Schnabl

2 Background

After a rapid series of events including the disclosure of hefty losses of €3.6 billion in the first-half of 2014 arising from exposures to the parent family-controlled group of companies, the Portuguese central bank decided to apply a resolution measure to Banco Espírito Santo (BES) on August 3, 2014. The bank was classified as a significant credit institution by the European Central Bank (World Bank, 2016) and was the third largest bank in Portugal with a market share of 19 percent of credit granted to non-financial corporations (Banco de Portugal, 2014a). The scale of the losses came as a surprise to the Bank of Portugal, which suggested that these "reflected the practice of management acts seriously detrimental" and "noncompliance with the determinations issued prohibiting an increase in its exposure to other entities of the Group" (Banco de Portugal, 2014a).

The resolution of the bank involved the transfer of sound activities and assets to a bridge bank or "good bank" designated as Novo Banco (New Bank). In contrast, shareholders and junior bondholders were left with the toxic assets that remained in a "bad bank" which is in the process of liquidation.[6] The €4.9 billion of capital of the newly-created bank was fully provided by Portugal's Bank Resolution Fund established in 2012 and financed by contributions of all the country's lenders.[7] Since the Fund did not yet have sufficient enough

(2012) gauge the effect of exogenous liquidity shocks on banks' lending behavior in Pakistan and Peru, respectively. Jiménez, Ongena, Peydró, and Saurina (2012, 2014b) use Spanish credit register data to explore the effect of monetary policy on credit supply and banks' risk-taking. Cingano, Manaresi, and Sette (2016) analyze the transmission of bank balance sheet shocks to credit and its effects on investment and employment in Italy. Ivashina and Scharfstein (2010) and Chodorow-Reich (2014) examine the effects of the crisis in the US. Iyer, Peydró, Da-Rocha-Lopes, and Schoar (2014), Alves, Bonfim, and Soares (2016) and Blattner, Farinha, and Rebelo (2018) use the same credit register data from Portugal as we do to investigate the effect of the liquidity freeze in European interbank markets on credit supply, the role of the ECB as lender of last resort in avoiding the collapse of the Portuguese financial system during the European sovereign debt crisis, and the impact of bank capital adequacy on productivity, respectively.

[6]The firms part of the Espírito Santo Group that drove the collapse of the bank are not part of our estimations since (i) these firms were mostly based abroad and our dataset only captures firms headquartered in Portugal, and (ii) their credit claims were transferred to the "bad bank" and therefore do not appear in the post-shock period even if a firm is based in Portugal – see the detailed list of assets transferred to "bad bank" in subparagraph (a) of Annex 2 in Banco de Portugal (2014a).

[7]The CET1 ratio of the "good bank" immediately after the resolution was 10.3 percent, above the regulatory minimum (Novo Banco, 2014).

resources to fully finance such a large operation, it had to take a loan from a group of eight of its (largest) member banks (€0.7 billion) and another from the Portuguese government (€3.9 billion). The government ensured the deal would have no direct or indirect costs for taxpayers since the loan was made to the Bank Resolution Fund (i.e., not to the distressed bank), and given that the country lenders who bear the risks will have several years to recoup the shortfall with their ordinary contributions (FT, 2017).[8]

Figure 1 shows the unexpected and idiosyncratic nature of the bank failure. CDS spreads of the bailed-in bank moved in line with the rest of the sector until late June 2014 when the degree of exposures to the Group's entities owned by the same family started to be revealed. Within a month, the spreads moved from less than 2 percent to almost 7 percent. The event came after a long period of increasing stability in the banking sector, with CDS spreads for Portuguese banks having declined from its crisis peak of around 16 percent in late 2011.[9] The figure also shows the limited contagion from the bailed-in bank to the remainder of the banking system, with the average CDS spread for all other resident banks considered significant credit institutions by the ECB increasing only slightly in the weeks leading up to the intervention and remaining below 3.5 percent until December 2015. This is consistent with the simulation results of Hüser, Halaj, Kok, Perales, and van der Kraaij (2018) that, using granular data on the securities cross-holdings among the largest euro area banking groups, show that bail-ins lead to limited spillovers due to low levels of securities cross-holdings in the interbank network and no direct contagion to creditor banks. Nevertheless, in our analysis

[8]The Portuguese central bank decided to move even further towards a bail-in type of intervention with a re-resolution in the last days of 2015 - 16 months after the original intervention. In detail, a limited number of bonds were transferred to the "bad bank", imposing losses on almost €2 billion of senior bondholders (Banco de Portugal, 2015; FT, 2016). In October 2017, Lone Star Funds (a US private-equity fund) acquired 75 percent of the "good bank" in return for a capital injection of €1 billion, with the remaining 25 percent held by the Bank Resolution Fund (Banco de Portugal, 2017). Given that we only have loan and firm-level data available until 2015, our analysis does not consider these two shocks and is instead solely focused on the effects of the original resolution in August 2014.

[9]Following demanding requirements imposed by the European Banking Authority and the Bank of Portugal, the Core Tier 1 ratio in the Portuguese banking sector reached 12.3 percent at the end of 2013 (Banco de Portugal, 2014b). At the country-level, by the end of EC/ECB/IMF Economic Adjustment Program in June 2014, Portugal was growing 0.3 percent faster than the EU, excluding Germany (Reis, 2015).

we still take into account the exposure of other banks to the bail-in, even if small, through the institution-specific amount of financing to the ad-hoc loan granted to the Resolution Fund.

[Figure 1 here]

In short, even when being conservative and considering this resolution a "hybrid of bail-in and bail-out" (Economist, 2014), this intervention differs markedly from the bail-outs of most distressed banks during the financial crisis as all losses were ultimately imposed on shareholders and (junior and later senior) bondholders. This resolution was therefore also distinctly different from the bail-out and recapitalization of several large Portuguese banks in 2012, a difference we also explore in our empirical analysis. Finally, while this resolution occurred before transposition of the EU Bank Recovery and Resolution Directive (BRRD) into national legislation, the Portuguese resolution regime introduced in 2012 and then in force was already, in substance, very similar to the final European directive (World Bank, 2016). Although this new framework hypothetically lets banks fail without resorting to taxpayer funding (Avgouleas and Goodhart, 2015), it also allows for extraordinary public support under specific conditions (Schoenmaker, 2017).[10] As a result, this shock provides a unique laboratory to study the potential effects of future (similar) interventions.

3 Identification Strategy

We investigate the credit supply and real effects of a bank bail-in in two steps. First, we assess whether the resolution induced significant changes in the supply of credit to firms that were differently exposed to the bail-in (within-firm analysis). Second, assuming that the tightening of credit did occur, we investigate whether these firms were able to substitute

[10]The EU and the US strengthened their bank resolution regimes and introduced bail-in powers via the Bank Recovery and Resolution Directive (BRRD) and the Dodd-Frank Act, respectively. Despite many similarities between the EU and US resolution schemes, there are still some important differences such the lack of a restructuring option in the US (Philippon and Salord, 2017).

funding from other (less exposed) banks, if they were able to maintain their average interest rates on credit, as well as the consequences of this shock for firm real outcomes such as investment and employment (cross-sectional analysis). The first part of the analysis uses firm-bank matched data to exploit variation within firms that have more than one lending relationship, while the second makes use of variation across firms with different pre-shock exposures to the bail-in.

Within-Firm Analysis. The main challenge of our empirical analysis is to identify the causal impact of bail-ins on loan supply, price conditions and real outcomes. In fact, this shock may be correlated with underlying changes in the overall economic situation that may affect both credit provision and firms' loan demand and risk. To address this identification problem, we exploit an exogenous shock in August 2014 corresponding to an unexpected bank failure and subsequent resolution as discussed above, and use a difference-in-differences approach to compare lending before and after the bank collapse across banks more and less exposed to the resolution.

In detail, following the novel approach of Khwaja and Mian (2008), we exploit our panel of matched bank-firm data and account for unobserved heterogeneity in firms' loan demand, quality and risk by saturating our model with firm fixed effects. As a result, our identification comes entirely from firms that were borrowing from at least two different banks before and after the resolution program. This strategy isolates the causal impact of the bail-in shock on the change in credit supply by comparing the within-firm variation in the change in lending from banks differently exposed by the intervention. The baseline specification is defined as:

$$\Delta log(Credit)_{bi} = \beta(BankExposure_b) + \delta' X_b + \alpha_i + \varepsilon_{bi} \tag{1}$$

where the main dependent variable $\Delta log(Credit)_{bi}$ is the log change in granted credit from bank b to firm i from the pre to the post-period.[11] We also consider the change in granted credit credit lines from bank b to firm i from the pre to the post-period as an alternative dependent variable. In this case, our identification comes from the sub-set of firms (35 percent) with credit lines from at least two different banks before and after the resolution program.[12]

As in Khwaja and Mian (2008), the quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. This adjustment has the advantage that our standard errors are robust to auto-correlation (Bertrand, Duflo, and Mullainathan, 2004). The main independent variable, $BankExposure_b$ is the percentage of assets of each bank exposed to the bail-in: the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc €0.7 billion loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. We do not include in this measure the ordinary contributions to the Fund that each bank made in 2013 as these were already priced in before the resolution.[13] α_i are firm fixed effects that capture firm-specific determinants of credit flows and can be interpreted as a measure of credit demand (e.g., Cingano, Manaresi, and Sette, 2016).

X_b refers to a set of bank-level controls measured in the pre-period, including bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to

[11] Since we want to ensure that changes in credit are not driven by sudden draw-downs of credit lines by certain firms, we consider throughout the paper the total amount of committed credit i.e., the total amount of credit that is available to a borrower, not only the portion that was taken up.

[12] While our identification strategy relies on within-firm variation in credit supply, we test the robustness of our findings by using the sample of all borrowers (i.e., including firms with only one bank relationship) and replacing bank-fixed effects with location-size-sector fixed-effects to partially control for demand side factors (De Jonghe, Dewachter, Mulier, Ongena, and Schepens, 2018).

[13] These bank-specific figures were manually collected from each of the banks publicly-available 2014 Annual Reports. The percentage of assets that was effectively bailed-in for the resolved bank amounts to 6.8 percent, while the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks ranges from 0.04 to 0.37 percent of assets.

total gross loans). These controls are particularly relevant in our setting since bank-specific exposures to the bail-in are not randomly assigned but a function of bank characteristics (e.g., the contribution to the resolution fund is determined by each bank's amount of liabilities), which may be correlated with changes in their willingness to lend. Finally, since the shock is bank-specific, changes in the credit granted from the same bank may be correlated. As a result, we use robust standard errors clustered at the bank level in all within-firm regressions.

Cross-Sectional Analysis. Although the above specification allows us to examine whether there was indeed a credit contraction and which type of firms were more likely to be affected by the shock, it is not appropriate to assess aggregate effects. This is because the within-firm analysis is not able to capture credit flows from new lending relationships and also ignores all terminated lending relationships between the pre and post-shock period. Given the importance of the extensive margin for credit adjustment, we also estimate the related between-firm (cross-sectional) effect of firm exposure to the shock as:

$$\Delta log(Y)_i = \beta(FirmExposure_i) + \tau' F_i + \delta' \bar{X}_i + \hat{\alpha}_i + \varepsilon_i \tag{2}$$

where $\Delta log(Y)_i$ is the log change in total bank credit or in granted credit lines between 2013:Q4 to 2015:Q4 from all banks to firm i. We use the same model to examine the effects on other credit conditions and analyze potential real effects.

$FirmExposure_i$ is the exposure of each firm to the bail-in computed as the weighted average of *Bank Exposure* across all banks lending to a firm, using as weights the pre-period share of total credit of each bank. F_i are firm characteristics including firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital (equity to total assets) and firm liquidity (current assets to current liabilities) - all measured in 2013:Q4. We also include industry and district fixed effects in the model. Bank controls $\bar{X}_i$ include the same variables as in specification (1) but are averaged at the firm-level according to the share of total credit granted to the firm by each bank prior to the shock.

Finally, given that in the between-firm model (2) the firm-specific demand shock α_i cannot be absorbed, a OLS estimate of β would be biased if $FirmExposure_i$ is correlated with credit demand (Jiménez, Mian, Peydró, and Saurina, 2014a; Cingano, Manaresi, and Sette, 2016). To control for loan demand when looking at the cross-section of firms, we follow the method developed by Abowd, Kramarz, and Margolis (1999) and recently applied by Bonaccorsi di Patti and Sette (2016) and Cingano, Manaresi, and Sette (2016), and include in (2) the vector of firm-level fixed effects $\hat{\alpha}_i$ estimated from the within-firm specification (1).[14] Standard errors are clustered at the main bank and industry levels, where the main bank is the institution that a certain firm has the highest percentage of borrowing with before the shock.

4 Data and Descriptive Statistics

The dataset we use throughout this study merges four unique databases held and managed by the Bank of Portugal: (i) Central Credit Register (Central de Responsabilidades de Crédito); (ii) Individual Information on Interest Rates (Informação Individual de Taxas de Juro); (iii) Central Balance Sheet Database (Central de Balanços); and (iv) Bank Supervisory Database.

The Central Credit Register provides confidential information on all credit exposures above 50 euros in Portugal.[15] It covers loans granted to non-financial companies by all banks operating in the country as reporting to the central bank is mandatory. Besides recording the outstanding debt of every firm with each bank at the end of every quarter, each claim also specifies the amount that each borrower owes the bank in the short and long-term, and the amount that is past due. The database also provides information on other loan characteristics

[14] Jiménez, Mian, Peydró, and Saurina (2014a) propose an alternative method to correct for the bias that arises if the firm exposure to the shock is correlated with credit demand in the firm-level regressions. They use a numerical correction exploiting the difference between OLS and FE estimates of β in the Khwaja and Mian (2008) within-firm regression. Cingano, Manaresi, and Sette (2016) show that the approach of Jiménez, Mian, Peydró, and Saurina (2014a) and the one we use in this paper are equivalent.

[15] This threshold alleviates any concerns on unobserved changes in bank credit to SMEs. In addition, it has significant advantages when studying credit supply restrictions of smaller firms when compared to other widely-used datasets e.g., US Survey of Small Business Finances or the LPC Dealscan which have incomplete coverage of entrepreneurial firms.

e.g., if the loan is an off-balance sheet item such as the undrawn amount of a credit line or credit card.

The database on Individual Information on Interest Rates reports matched firm-bank interest rate information on new loans. While only banks with an annual volume of new corporate loans of more than €50 million were required to report between June 2012 and December 2014, this requirement was extended to all resident banks in January 2015. For consistency, we restrict the analysis to banks that reported interest rate information before and after this reporting change. Besides interest rates, we have loan-level information on the amount, maturity, date of origination, if the loan is collateralized or not, and loan type.

The Central Balance Sheet Database provides detailed financial information with an annual frequency for virtually all Portuguese firms e.g., total assets, year of incorporation, equity, net income, number of employees, total debt, cash holdings. Finally, we also match the above datasets with bank balance-sheet data from the Bank Supervisory Database e.g., bank size, profits, capital, liquidity and non-performing loans. Given the very low threshold to capture credit exposures in the credit register, the zero minimum loan size of the interest rate database and the compulsory reporting of balance sheet information by all firms and banks operating in Portugal, the combined dataset we use is arguably one of the most comprehensive loan-bank-firm matched databases available worldwide.

Table 1 presents firm-level descriptive statistics computed using the bank-firm matched sample. Specifically, we present the mean, median and standard deviation of the dependent variables, firm and bank characteristics across the 40,927 firms in our sample that have more than one lending relationship. On average, firms' total credit and granted credit lines increased by 1.1 and 0.3 percent from the pre-shock (2013:Q4-2014:Q2) to the post-shock period (2014:Q3-2015:Q3), respectively. Over the same period, firm investment shrank on average by 2.6 percent, employment increased by 3.2 percent, while cash holdings increased by 10.8 percent. Finally, there was an average decrease in interest rates from the pre- to the post-resolution period of 88 and 69 basis points on total credit and credit lines, respectively,

an increase in loan maturity of 1.9 months, and a decrease in the share of collateralized credit of 2.9 percentage points.

[Table 1 here]

Turning to firm characteristics, the average pre-failure firm exposure to the bail-in was 0.008, with a standard deviation of 0.013. Firms in our sample have on average 4 lending relationships and 32 percent started a new lending relationship within a year after the resolution. SMEs constitute 98 percent of all firms.

Before the shock, the average firm had €0.75 million in assets, was operating for 13.6 years, had a capital ratio of 26 percent, suffered losses of 0.6 percent of total assets and had a current ratio of 2.2. Finally, we present bank characteristics, which are averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank. These are also measured in 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans).

5 Results

In this section, we first present results examining the effect of the bank failure and subsequent resolution through a bail-in on credit supply and firms' borrowing conditions. We then trace these effects to real sector outcomes and examine the role of firms' internal liquidity position in explaining our findings.

5.1 Bank resolution and credit supply

5.1.1 Within-Firm Analysis

The results in Table 2 show a significant reduction in credit supply, including granted credit lines, from banks more exposed to the bail-in. Columns (1) and (2) present the results without and with firm fixed-effects, while column (3) adds bank-level controls measured at 2013:Q4 – bank size, ROA, capital ratio, liquidity ratio and NPLs. Column (4) differentiates the main effect of interest across SMEs and large firms. The unit of observation is the change in the log level of total committed credit between each of the 116,245 firm-bank pairs, corresponding to 40,927 firms. As in Khwaja and Mian (2008), the quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. *Bank Exposure*, the main explanatory variable, is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan granted to the Bank Resolution Fund for the 8 participating banks (as a percentage of assets), and 0 otherwise. All specifications focus on borrowers with more than one bank relationship. This ensures that any observed changes in lending are due to the bank supply shock which is orthogonal to idiosyncratic firm-level shocks such as changes in credit demand or borrowers' risk profile.

[Table 2 here]

The relative credit contraction from banks more exposed to the shock is both statistically and economically significant. The coefficient of interest in column (3) indicates that a one standard deviation increase in bank exposure to the bail-in (0.020) is associated with a supply-driven decrease in credit for the average firm of 3.0 percent. Importantly, while the effect is significant across different firm size groups, the results in column (4) show that it

is more than twice as strong for large firms than small and mid-sized firms – 6.3 vs. 2.9 percent, respectively.

In columns (5) to (6) of Table 2 we focus on firms with multiple credit lines simultaneously held at different banks. This corresponds to 14,320 out of 40,927 firms, for a total of 39,573 firm-bank relationships. In line with Ippolito, Peydró, Polo, and Sette (2016) who find that following the 2007 freeze of the European interbank market Italian banks managed liquidity risks by extending fewer and smaller credit lines, the coefficient estimates show that granted credit lines were the main channel through which banks more exposed to the bail-in reduced credit supply – a decrease of 5.7 percent to the average firm for a one standard deviation increase in bank exposure to the bail-in.

Identifying Assumptions. The validity of our identification strategy relies on two main assumptions. First, our quasi-experimental research design requires that in the absence of treatment (i.e., the bank failure and subsequent resolution), banks more exposed to the shock would have displayed a similar trend in terms of credit supply to that of other less exposed banks. While the parallel trends assumption cannot be tested explicitly due to the absence of a counterfactual, Figure 2 shows it is likely to be satisfied in our setting.

In specific, we use a modified version of the within-firm specification (1), regressing for each quarter the change in the log level of total committed credit between each firm-bank pair in that quarter relative to 2014:Q2 (the last period before the shock) on $BankExposure_b$ and firm fixed-effects. *Bank Exposure* is here standardized to have mean 0 and standard deviation of 1, and the dashed lines indicate the 5%–95% confidence interval using standard errors clustered at the bank level. Before the shock, there is no significant variation in credit provision across banks more or less exposed to the resolution. Starting from 2014:Q3, however, credit supply from banks more exposed to the bail-in decreased significantly and deteriorated over time.

[Figure 2 here]

Second, the implicit assumption behind using firm fixed-effects to control for idiosyncratic demand shocks in the Khwaja and Mian (2008) within-firm specification is that firm-specific loan demand changes proportionally across all banks lending to the firm i.e., individual firms take their multiple banks as providers of a perfectly substitutable good. In our setting, this assumption could be violated if firms reduced credit demand from more exposed banks after the shock while increasing it from other (healthier) banks.[16] However, some factors suggest the effects we observe are indeed supply driven and unlikely to be explained by within-firm changes in demand. First, as clearly stated in both its 2014 and 2015 Annual Reports, after the resolution the bailed-in bank "conducted a very strict and selective lending policy, without ceasing to support the small and medium-sized enterprises" (Novo Banco, 2014, p. 100, 115; Novo Banco, 2015, p. 87, 97). The bank further reinforced that the contraction in corporate loans was achieved "mainly through the reduction in large exposures" (Novo Banco, 2015, p. 87) as well as through "the non-renewal of credit lines" (Novo Banco, 2014, p. 71). Given that the bailed-in bank is by far the most exposed bank to the resolution (i.e., it has the highest *Bank Exposure* value), this deleveraging plan following the intervention focused on reducing large exposures and credit lines is entirely consistent with the credit supply contraction at the intensive margin we show in Table 2.

Finally, in contrast with a shift in firm demand from the bailed-in bank to other banks explained by reputational damage or even liquidity and solvency concerns, the 13 percent contraction in corporate loans from August 2014 to December 2015 was accompanied by a 7.4 percent increase in customer deposits (Novo Banco, 2015, p. 97). This suggests that despite the challenges brought by the resolution measure, the bank was able to stabilize its funding sources and at least partially recover its customers' confidence.[17]

[16] Although we argue here against this demand explanation, it is important to note that even such borrower behavior would be a direct reaction to a supply-side shock and, therefore, would not constitute a demand-side shift per se. In other words, even if part of a possible credit reduction was driven by customers rather than the bank, we would argue that this is still a supply-side shock as caused by the bank failure rather than by changes in firms' credit demand.

[17] As highlighted by Paravisini, Rappoport, and Schnabl (2017), our identifying assumption may also be violated if more exposed banks were specialized in certain industries or sectors such as export markets. In such segments where some banks may have more expertise than others, credit is no longer a homogeneous good

Robustness Tests. The within-firm results presented above are robust to a number of tests. First, we use an alternative bank exposure measure based on daily 5-year CDS spreads on senior unsecured debt. In this case, we consider the four banks operating in Portugal that are classified as significant institutions by the ECB and for which we have CDS spread data. In detail, we define bank exposure to the shock as the bank-specific increase in CDS spreads from one month before to the day before the resolution. Given that, as we show in Figure 1, CDS spreads of the bailed-in bank moved in line with the rest of the banking sector until late June 2014 when the exposures to the Group's entities owned by the family started to be revealed, this measure captures the market's perception of the increase in the default probability for the resolved bank as well as the magnitude of potential spillovers for the three other major Portuguese banks. Consistent with the estimates in the baseline regressions, the results in columns (1) to (3) of Table IA1 in the internet appendix show that a one standard deviation increase in bank exposure to the shock captured through the reaction of CDS spreads (0.014) leads to an decrease in the supply of credit of 2.93 percent for the average firm – 2.58 for SMEs and 8.60 for large firms.[18]

Second, to ensure that our results are not confined to firms with multiple bank relationships, we use the complete sample of borrowing firms in Portugal (including single-bank-relationship firms) in a model that replaces firm fixed-effects with location-size-sector fixed-effects as in De Jonghe, Dewachter, Mulier, Ongena, and Schepens (2018). In detail, the group contains only the firm itself in case the firm has multiple lending relationships, while firms with single

offered across different banks and, as a result, sector-level demand shocks may ultimately lead to firm-bank specific loan demand. Nevertheless, untabulated results (for confidentiality reasons) suggest that firm-bank specific demand due to sector specialization is not a source of great concern in our setting. In fact, the bailed-in bank was active in all the main industries and did not control the majority of the lending activity in any of them. Our results could also be biased if certain banks were targeting their lending to firms in industries experiencing particularly severe (and correlated) demand-side shocks. However, when we compare the relative importance of certain industries for the bailed-in bank vis-à-vis all other banks, we observe no discernible differences across industries between the two groups.

[18]Since there are only 4 banks with available CDS spread data, standard errors clustered at the bank-level would be biased (Bertrand, Duflo, and Mullainathan, 2004; Cameron, Gelbach, and Miller, 2008). Thus, in columns (1) to (3) of Table IA1 we use heteroskedasticity-consistent standard errors. The coefficients of interest are still significant at conventional levels when using either the wild cluster bootstrap method of Cameron, Gelbach, and Miller (2008) or clustering standard errors at the firm level.

bank relationships are grouped based on the district in which they are headquartered, their industry, and deciles of loan size. The results are reported in columns (4) to (6) of Table IA1. Despite the considerable increase in the number of firms (from 40,927 to 85,149), the coefficient estimates are remarkably similar to those in the smaller sample restricted to firms with multiple bank relationships, both in terms of magnitude and statistical significance.[19]

Third, we limit our sample to loan operations and thus disregard both used and unused credit lines (Table IA2, columns 1-3). Only the coefficient estimate for large firms enters significantly and is smaller in magnitude when compared to estimate for total credit. This confirms that banks more exposed to the shock reduced credit supply primarily by extending fewer and smaller credit lines, particularly for SMEs. Finally, in columns (4) to (6) of Table IA2 we follow Iyer, Peydró, Da-Rocha-Lopes, and Schoar (2014) and compare lending immediately before (2014:Q2) and one year after the shock (2015:Q3) instead of time-averaging the quarterly credit exposures into a pre (2013:Q4 - 2014:Q2) and post-resolution (2014:Q3 - 2015:Q3) period. Our results are the same, if not stronger, when compared to our baseline regressions.

Firm Heterogeneity. While we observe a credit supply reduction on average and particularly for larger firms, this contraction might vary across other firm characteristics, e.g., firm age, capital, profitability, liquidity or riskiness. In this respect, the results in Table 3 show further variation in the effect of the bank collapse and subsequent resolution across different firms by introducing an interaction term between *Bank Exposure* and a dummy variable splitting firms into two sub-groups: (i) firms with low and high values of a certain pre-shock firm characteristic; (ii) firms with and without NPLs with any bank before the resolution; and (iii) firms whose main lender in the pre-period was or was not the bailed-in bank.

[Table 3 here]

[19]Comparing the results across multiple relationship firms (Table 2) and all firms (Table IA1), the coefficients estimates are -1.339 vs. 1.520 for the average firm, -1.283 vs. -1.441 for SMEs, and -2.915 vs. -3.133 for large firms.

The results reported in columns (1) and (2) of Table 3 confirm our earlier findings that the credit reduction by banks more exposed to the bail-in was more pronounced for larger firms, here measured by either total assets or number of employees instead of the definition in the EU Recommendation 2003/361 that includes both a balance-sheet size and a staff headcount requirement. We also find that firms with lower profitability suffered a lower reduction in lending by more affected banks (column 5), while borrowers with a non-performing loan before the shock with any bank in Portugal did not suffer from a reduction in lending by banks more exposed to the bail-in (column 8). We do not find any significant interaction of *Bank Exposure* with borrowers' age, capital or liquidity situation. Riskier borrowers therefore suffered less of a credit supply shock by more exposed banks, which is suggestive of evergreening of bank loans by banks more exposed to the bail-in. This could point to a certain degree of moral hazard that may be explained by the need for the "good bank" to show promising bank's financials to potential buyers.[20]

Finally, the results in column (9) show a significant and negative interaction term of *Bank Exposure* with a dummy variable equal to one if the firm main lender before the shock was the bailed-in bank, and zero otherwise. This suggests that those firms likely to have stronger relationships with the resolved bank suffered relatively more from the failure. While this result contrasts the evidence on the insulating effect of relationship banking on the quantity of credit following negative bank shocks (Sette and Gobbi, 2015; Bolton, Freixas, Gambacorta, and Mistrulli, 2016; Liberti and Sturgess, 2018; Beck, Degryse, De Haas, and Van Horen, 2018), it highlights the disruptive effect that a bank failure can have on established firm-bank relationships, particularly for bank-dependent borrowers. In fact, consistent with the hypothesis that severely distressed banks may simply not have the resources to sustain such mutually beneficial relationships, Carvalho, Ferreira, and Matos (2015) find that bank

[20]This finding is consistent with Blattner, Farinha, and Rebelo (2018) who show that an unexpected increase in capital requirements for a subset of Portuguese banks in 2011 resulted in an increase in underreporting of loan losses and a reallocation of credit to firms in financial distress with prior underreported losses, with negative repercussions for aggregate productivity.

distress is associated with equity valuation losses and investment cuts to firms with the strongest lending relationships.

5.1.2 Cross-Sectional Analysis

So far we have gauged the effect of bank resolution on the supply of credit to firms borrowing from banks more and less exposed to the bail-in. However, the within-firm estimations ignore credit flows from new lending relationships as well as bank relationships that were terminated from the pre- to the post-bail-in period. Therefore, we now turn to the cross-sectional (between-firm) estimations that allow us to test for aggregate effects. Since we cannot use firm-fixed effects in the regressions analyzing the overall impact of bank shocks on credit supply, we control for omitted firm-level factors such as credit demand with a two-step estimation based on Abowd, Kramarz, and Margolis (1999). Specifically, we include in the estimations the vector of firm-level dummies estimated in column (2) of Table 2.[21] We also include industry and district fixed effects as additional controls for unobservable demand and risk-profile differences.

The results in Table 4 show there was no decrease in overall credit after the shock for firms more exposed to the bail-in when compared to firms exposed less, including when differentiating between firms of different size. However, we do observe a binding contraction in credit lines for SMEs more exposed to the resolution. In detail, the explanatory variable of interest, *Firm Exposure*, is computed as the weighted average of *Bank Exposure* across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Column (1) reports the results for the average firm, while column (2) differentiates between SMEs and large enterprises. None of the coefficients enters significantly at conventional levels. The results in columns (3) and (4), however, indicate that SMEs more exposed to the shock

[21] If biases due to endogenous matching between firms and banks were present in our data, we should observe a substantial correlation between exposure and $\hat{\alpha}_i$ (Jiménez, Mian, Peydró, and Saurina, 2014a; Cingano, Manaresi, and Sette, 2016). However, exploiting model (1), we find that the estimated vector of firm-level dummies is virtually uncorrelated with our main *Bank Exposure* measure (ρ=0.0014).

suffered a considerable decrease in the amount of credit lines available to them. Specifically, for a one standard deviation in firm exposure to the bail-in, SMEs experienced a 2.2 percent binding decrease in granted credit lines. As in columns (5) to (6) of Table 2, to ensure the effect is properly identified we restrict the sample to firms with credit lines from at least two different banks.

[Table 4 here]

Robustness Tests. The results above are robust to several tests. First, we consider an alternative firm exposure measure that, as in Table IA1, is based on reaction of CDS spreads on senior unsecured debt and considers the four banks operating in Portugal that are classified as significant institutions by the ECB. Specifically, in columns (1) to (4) of Table IA3 in the internet appendix *Firm Exposure* is computed as the weighted average of *Bank Exposure* across all banks lending to a firm (using as weights the pre-period share of total credit from each bank), but where bank exposure to the shock is defined as the bank-specific increase in CDS spreads from one month before to the day of the resolution. Second, in columns (5) to (8) of Table IA3 we follow the same procedure but define *Bank Exposure* as a dummy variable equal to one for the bailed-in bank and 0 otherwise i.e., we implicitly assume that only the bailed-in bank was affected by the resolution and there were no spillover effects to other banks in the system. In either case, our conclusions remain the same. Finally, we also confirm our findings when considering the change in total committed credit excluding credit lines (Table IA4, columns 1–3) or when comparing lending immediately before (2014:Q2) and one year after the shock (2015:Q3) instead of time-averaging the quarterly credit exposures into a pre and post-resolution period (Table IA4, columns 4–6).

The Role of New and Existing Lending Relationships. The results in columns (1) to (3) of Table 5 show that firms more exposed to the bail-in were not more likely to start a new lending relationship over our sample period. This result can be explained by the fact that the average firm already has 4 bank relationships – see 1. The set-up of the table is

identical to Table 4, but the dependent variable is now a dummy that takes value one if a firm takes out a loan from a bank with which it had no lending relationship before the shock, and zero otherwise. The coefficient estimated reported in columns (4) to (6) confirm that lenders other than the bailed-in bank (i.e., those banks that were less exposed to the resolution) were crucial for firms to maintain credit. Specifically, the dependent variable is now the change in the log level of total committed credit to each firm from all banks except the bailed-in bank from the pre (2013:Q4-2014:Q2) to the post-resolution period (2014:Q3-2015:Q3). The results show a significant and positive relationship between *Firm Exposure* and credit growth from banks other than the bailed-in bank. In economic terms, a one standard deviation increase in firm exposure to the bail-in is associated with a 5.9 percent increase in lending from other banks. This effect applies to both SMEs and large enterprises.

[Table 5 here]

Overall, our results show that both SMEs and large firms that were more exposed to the bail-in did not suffer an overall reduction in credit when compared to firms exposed less. In fact, these firms were able to compensate the reduction in credit with lending from other (less exposed) financial institutions they already had a relationship with. However, when isolating credit lines from total committed credit by focusing on firms with multiple credit lines, we show that SMEs more exposed to the resolution were subject to a binding contraction in quantity of funds available through lines of credit, a crucial component for corporate liquidity management (Sufi, 2009; Jiménez, Lopez, and Saurina, 2009) and the dominant source of liquidity for firms around the world (Duchin, Ozbas, and Sensoy, 2010).[22]

[22] According to Berger and Udell (1995), a credit line "is an attractive vehicle for studying the bank-borrower relationship because the line of credit itself represents a formalization of this relationship".

5.2 Bank resolution and credit conditions

We have mainly focused so far on the consequences of the supply shock for credit quantities. Nevertheless, the resolution may have also impacted the interest rates charged on new loans and credit lines, as well as other credit conditions such as loan maturities or the collateral required.[23] The disruption of established bank-firm relationships can ultimately have negative effects on real activity if borrowers are unable to replace these relationships with other lenders on equal terms (Bernanke, 1983; Ashcraft, 2005).

The results in columns (1) to (4) of Table 6 show that firms across all size groups that were more exposed to the bail-in saw a moderate increase in their interest rates on credit lines, while only more exposed large firms suffered a moderate increase in interest rates on all new credit operations. However, the economic effect is modest: a one standard deviation increase in firm exposure to the bail-in (0.013) is associated with a 20bp increase in the interest rates on credit lines for the average firm – for comparison, the average interest rate charged on credit lines is 11.05 percentage points. Since the interest rate dataset only captures new operations rather than outstanding amounts, here we consider all new loans and credit lines between a firm and a bank between 2013:M12 and 2014:M7 (pre-period) and 2014:M9 and 2015:M9 (post-period) when computing the loan-amount-weighted measures. Compared to Table 4, we now also control for loan characteristics such as the pre-shock, firm-specific, loan-amount-weighted maturity and share of collateralized credit for all new loans and credit lines. These results are consistent with the evidence in Khwaja and Mian (2008) and Cingano, Manaresi, and Sette (2016) who analyze a representative universe of firms in Pakistan and Italy and find that despite affecting the quantity of credit, bank-level shocks have no meaningful effects on the interest rates charged.

[Table 6 here]

[23] Santos (2011), for instance, finds that firms that had relationships with less healthy lenders before the subprime crisis paid relatively higher loan spreads afterwards.

In line with a moderate tightening of interest rates, the results in columns (5) and (6) of Table 6 show a reduction in loan maturity across all firms, with a one standard deviation in firm exposure resulting in a one month reduction in loan maturity. Finally, we also find a relative increase in the share of collateralized credit after the shock for firms more exposed to the bail-in – a 2.75 percentage point increase for a one standard deviation increase in firm exposure (columns 7 and 8), an effect that holds for both SMEs and large enterprises.

5.3 Bank resolution and real sector effects

Impact on investment and employment. What was the effect of changes in financing conditions on investment and employment decisions taken by the affected firms? On the one hand, it is not clear that we should find significant real effects given the continued access to the same level of external funding, though at somewhat worse conditions and with smaller granted credit lines. On the other hand, the results point towards higher uncertainty for more exposed firms as they had to compensate the lost funding at the intensive margin with credit from other banks and (re)-negotiate loan terms and conditions. We therefore turn to investment and employment growth as real sector outcome variables, and then focus on the role of firms' internal liquidity in driving the results.

The results in Table 7 show a relative reduction in investment for SMEs that were more exposed to the resolution. The dependent variable in columns (1) to (3) is the change in the log level of tangible assets for each firm between 2013:Q4 and 2015:Q4, with column (1) presenting a regression for the 14,320 firms with multiple credit lines at different banks, and columns (2) and (3) focusing on our main sample of 40,927 with more than one bank relationship. As before, all specifications include firm and bank controls, a proxy for credit demand, as well as industry and district fixed effects. In both cases, *Firm Exposure* enters negatively and significantly. This reduction in investment, however, is only significant for SMEs (column 3). We find that a one standard deviation increase in firm exposure to the bail-in is associated with a 2.0 percent relative reduction in investment for SMEs. Our

results remain the same when using as dependent variable the change in the log level of fixed assets (columns 4-6), our two alternative firm exposure measures as in Table IA3 (Table IA5, columns 1-4), or when normalizing the change in tangible assets or fixed assets the firms' pre-period total assets (Table IA5, columns 5-8).

[Table 7 here]

In line with the evidence for investment, columns 1 to 3 of Table 8 show a significant and negative relationship between firm exposure to the bail-in and the growth of the number of employees at firms. As before, this effect is concentrated in SMEs and is not significant for large enterprises. Controlling for firm and bank characteristics, we find a 1.3 percent relative drop in the number of employees at SMEs for a one standard deviation increase in exposure to the resolution. The economic effect is smaller than for investment, in line with stronger persistence in employment than in investment decisions. Our conclusion is therefore consistent with Chodorow-Reich (2014) and Berton, Mocetti, Presbitero, and Richiardi (2018) that find that smaller firms are particularly vulnerable to the negative impact of a credit crunch on employment. Bottero, Lenzu, and Mezzanotti (2017) also show that while the credit supply contraction in Italy following the European sovereign crisis was similar in magnitude for large and small firms, it led to a reduction in investment and employment only in smaller firms.

[Table 8 here]

To capture different margins of adjustment of employment, we also consider the log change in the total number of hours worked by all firm employees as an alternative outcome variable. The results are reported in columns 4 to 6. As before, the reduction in employment is only present in more exposed SMEs – a 1.5 percent relative decrease for a one standard deviation increase in firm exposure. Our findings also remain the same when considering our

two alternative firm exposure variables computed as the weighted average of *Bank Exposure* across all banks lending to a firm (using as weights the pre-period share of total credit from each bank), but where bank exposure to the shock is defined as the bank-specific increase in CDS spreads from one more before to the day of the resolution (Table IA6, columns 1 and 2), or as a dummy variable equal to one for the bailed-in bank and 0 otherwise (Table IA6, columns 3 and 4).

The role of firms' internal liquidity. The option for firms to access liquidity from credit lines should be more valuable when internal liquidity is scarce (e.g., Campello, Giambona, Graham, and Harvey, 2011). Thus, if the dampening effects of the bank resolution on real sector outcomes are indeed driven by a reduction in granted credit lines for SMEs, we should observe heterogeneous effects according to their pre-shock liquidity position i.e., if firms view cash and lines of credit as liquidity substitutes and given the tighter credit line limits, illiquid SMEs might respond to the funding shock by increasing cash holdings while decreasing investment and employment. Berg (2018), for instance, shows in a different setting that while liquid SMEs are able to absorb credit supply shocks by using the existing cash buffers, their illiquid counterparts increase cash holdings when a loan application is rejected, cutting non-cash assets by more than the requested loan amount, and thus investment and employment.

We analyze this channel explicitly by splitting firms according to their ex-ante liquidity position i.e., low liquidity (cash holdings-to-total assets ratio before the shock lower than the median) vs. high liquidity firms (cash holdings-to-total assets ratio before the shock higher than the median). Table 9 reports the results, with Panel A focusing on the sub-sample of SMEs and Panel B on large firms. The coefficient estimates in column (1) show a significant increase in cash holdings by low liquidity SMEs more exposed to the bail-in. This effect is not present across large firms. Conversely, in line with a precautionary savings motive where firms hold cash as a buffer to protect themselves against adverse shocks (e.g., Duchin, Ozbas,

and Sensoy, 2010), high liquidity firms more exposed to the bail-in decrease cash holdings considerably – a result that, in this case, holds for both SMEs and large firms. In economic terms, a one standard deviation increase in firm exposure to the bail-in leads to an increase in cash holdings for low liquidity SMEs of 17.5 percent, but a decrease for high liquidity SMEs of 17.7 percent. Low liquidity large firms do not change cash holdings as a result of the shock, but high liquidity large firms decrease cash holdings by 15.5 percent for a one standard deviation in firm exposure to the resolution.

Column (2) reports the coefficient estimates for investment, while column (3) focuses on employment. The results show that the negative real effects are concentrated in SMEs with low pre-period levels of internal liquidity, corresponding to those firms that increased cash holdings as a result of the shock. This suggests that more exposed SMEs and large firms with high liquidity before the bail-in were able to use their available internal liquidity buffers to compensate for the binding contraction in granted credit lines and thus maintain employment and investment. Instead, low liquidity SMEs more exposed to the bail-in responded by increasing cash holdings while decreasing investment and employment.

[Table 9 here]

A potential concern regarding these findings is that low levels of firm liquidity prior to the shock might reflect declining demand for investment given that cash holdings are chosen at least partially based on anticipated growth opportunities (e.g., Opler, Pinkowitz, Stulz, and Williamson, 1999). To help ruling out this possibility, in Table IA7 in the internet appendix we split high and low liquidity SMEs according to the firm-specific pre-shock asset growth before the shock i.e., below and above the median of the overall sample. Our results hold across the two sub-samples. Specifically, SMEs with both lower and higher growth opportunities before the resolution increase cash holdings and decrease investment

and employment if they had low levels of internal liquidity, and both decrease cash holdings and maintain employment and investment if they were highly liquid before the shock.[24]

In summary, the results in Tables 7, 8 and 9 show that although there was on average and across the different firm size groups no reduction in aggregate borrowing after the bank resolution, SMEs still decreased investment and employment. This is explained by smaller firms with low levels of internal liquidity before the shock reacting to the tightening of credit line limits by hoarding cash while at the same time cutting back on investment and employment. The negative impact of the bank resolution shock on investment and employment can thus be explained with heightened liquidity risk.

5.4 Bail-out vs. bail-in

Our evidence pointing towards negative real effects after a bank bail-in is particularly relevant given the growing evidence that, even if setting the stage for aggressive risk-taking and future fragility, bank bail-outs can be effective in supporting borrowers and the real economy in the short-term.[25] Giannetti and Simonov (2013), for instance, use loan-level data to explore the real effects of bank bail-outs during the Japanese crisis of the 1990s and find that listed firms had easier access to bank lending experienced positive abnormal returns and were able to invest more when the recapitalizations were large enough. Using a similar methodology, Augusto and Félix (2014) show that bank bail-outs in Portugal during the European sovereign debt crisis did not lead to a decrease in credit provision at the intensive margin. Laeven and Valencia (2013) examine financial sector interventions in 50 countries after the 2007-2009 financial crisis and show that these improved the value added growth of

[24] It is important to note that low prior liquidity may also reflect unobservably lower costs of external finance. If that is the case, this would imply we are actually underestimating the effect since we are treating liquidity differences as random.

[25] The implicit or explicit commitment to bail-out distressed banks not only increases idiosyncratic bank risk-taking (Dam and Koetter, 2012), but also give incentives for individual banks to engage in collective risk-taking strategies (Farhi and Tirole, 2012). The resulting common exposures aimed at exploiting a "too-many-to-fail" guarantee may ultimately increase systemic risk due to the higher correlation of defaults and amplification of the impact of liquidity shocks (Silva, 2017).

financially dependent firms. Berger, Makaew, and Roman (2017) show that TARP-funded bail-outs in the US resulted in an increase in credit supply for recipient banks' borrowers as well as more favorable loan conditions, while Berger and Roman (2017) find that TARP led to increased job creation and decreased business and personal bankruptcies.[26]

Therefore, a fundamental follow-up question is whether a bank bail-out would generate the same negative effects we show in the paper for a bail-in. While we cannot make this comparison directly due to the lack of a counterfactual (e.g., a bank that was bailed-out during the same period), we shed some light into this issue by exploiting the fact that the bail-in of shareholders and junior bondholders we analyze so far in this paper differed significantly from the approach taken by the Portuguese authorities during earlier bank failures during the crisis. Notably, in June 2012 3 of the largest 5 banks (CGD, BCP and BPI) received government-funded capital injections as well as the smaller Banif in December 2012. The bail-outs allowed banks to comply with stricter minimum capital requirements defined by the European Banking Authority (EBA) in the case of the former, and by the Bank of Portugal in the latter.[27]

To assess the effects of the bail-outs on credit supply and real outcomes, we use both within- and cross-firm regressions, with data averaged between the fourth quarter of 2011 and the second quarter of 2012 as pre-bail-out period and between the fourth quarter of 2012 and the fourth quarter of 2013 as post-bail-out period – see Figure 3. We have data on 45,062 firms who had relationships with at least two banks, including the four bailed-out banks, for a total of 122,749 firm-bank relationships. *Bank Exposure* is a dummy variable that takes on the value one for bailed-out banks and zero otherwise in the baseline case. Overall, 54 percent of all firms had a relationship with the bailed-out banks.

[26]By allowing the continuation of healthy lending relationships, either a bail-in or a bail-out should nonetheless affect borrowers less than a closure and liquidation of the bank. In fact, a decisive and effective intervention of either type may be able to reduce negative contagion effects and help off-set any negative credit supply effects by allowing other banks to provide additional credit to affected firms.

[27]The minimum Core Tier 1 ratio increased to 10 per cent in 2012 and banks had to comply until the end of that year. At the same time, banks subject to the stress tests of the EBA were also subject to stricter capital requirements. These additional capital requirements were one of the main factors contributing to the Portuguese bank bail-outs in 2012 (Augusto and Félix, 2014).

[Figure 3 here]

The results in column (1) of Table 10 show no significant difference in credit growth at the intensive margin between the bailed-out and other banks for the same borrower, suggesting that the recapitalization and bail-out of failing banks during the the crisis had no relative effect on credit supply.[28] The results in columns (2) to (4) present the cross-sectional results where, as before, the outcomes variables of interest are the log change in credit, investment and employment between the pre- and post-bail-out period. The coefficient estimates show no significant variation in firm-level credit supply, investment or employment with exposure to bailed-out banks, suggesting that the bail-outs fulfilled their objectives of protecting borrowers of failing banks.[29]

[Table 10 here]

In summary, we find no evidence of a negative impact of the bank bail-out in 2012 on the relative credit supply by bailed-out vs. non-bailed-out banks. Consequently, there was also no relative decline in investment or employment by firms more exposed to the bailed-in banks. Overall, this points to rather sharp differences between bail-out and bail-in of banks, with stronger negative effects of the latter for credit supply and real sector activity. However, we urge caution in interpreting this comparison directly since the macroeconomic situation was considerably different during these two episodes and that the public intervention in 2012 was more systemic in nature. Moreover, previous evidence has shown the detrimental impact on bank risk-taking generated by public guarantees such as bailouts (Dam and Koetter, 2012)

[28] In robustness tests available in Table IA8 in the Internet Appendix, we find no significant effect of the bail-out for either large firms or SMEs and show the robustness of our findings to an alternative measure of *Bank Exposure*, defined as a continuous treatment variable equal to the injection amount as a share of assets for each of the bailed-out banks and zero otherwise.

[29] Augusto and Félix (2014) also analyze the impact of the 2012 bail-outs in Portugal on credit supply but only examine intensive margin effects. Instead, we also investigate the extensive margin effects of the bank recapitalizations, including the associated real effects.

or even deposit insurance (Calomiris and Jaremski, 2018).[30] Instead, bank bail-ins should reduce moral-hazard due to creditors' expectation of bearing the losses in case of distress (Schäfer, Schnabel, and Weder, 2016).

6 Conclusion

Using loan-level data and exploiting within-firm and between-firm variation in exposure to different banks, including a failed and subsequently resolved bank, we show that banks more exposed to a bail-in significantly reduced credit supply after the shock but that affected firms were able to compensate this overall credit contraction with funding from other banks they already had relationships with. However, SMEs more exposed to the resolution were subject to a binding contraction in quantity of funds available through lines of credit. In addition, we find a moderate relative increase in lending costs for more exposed firms. In spite of the limited effects on credit supply, SMEs reduced both investment and employment, an effect that is concentrated among smaller firms with low pre-shock internal liquidity that increased cash holdings at the expense of investment and employment.

Our findings show that a well-designed bank resolution framework that includes a bail-in of shareholders and bondholders can mitigate the impact of bank failures on credit supply and thus provide supporting evidence for the move from bail-out to bail-ins. However, the negative real effects we find also suggest that such resolution mechanism is not a silver bullet. Instead, only the combination of a robust supervisory and resolution frameworks can ensure a sound banking system and minimize the adverse effects of bank distress on the real economy.

[30] Government interventions also reinforce the negative feedback loop between banks and sovereigns that characterized the euro area crisis (Brunnermeier, Langfield, Pagano, Reis, Van Nieuwerburgh, and Vayanos, 2017). Crosignani, Faria-e Castro, and Fonseca (2018), for instance, show that the ECB's three-year Long-Term Refinancing Operation incentivized Portuguese banks to purchase short-term domestic government bonds that could be pledged to obtain central bank liquidity, thus exacerbating the bank-sovereign negative feedback loop.

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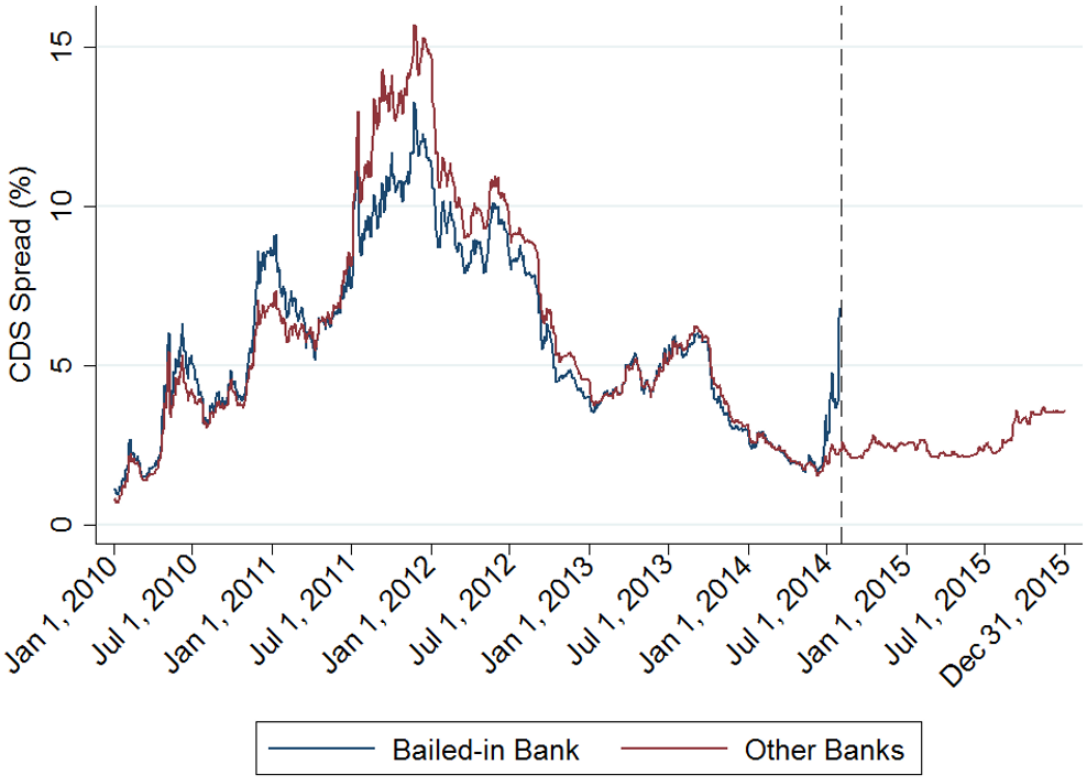

Figure 1: Evolution of bank CDS spreads over time. This figure plots daily 5-year CDS spreads on senior unsecured debt between January 1, 2010 and December 31, 2015. The resolution occurred in August 2014 (dashed vertical line). CDS spreads for the group "Other Banks" are computed as the equal-weighted average across banks headquartered in Portugal with available information (Caixa Geral de Depositos, Banco BPI, Banco Millennium BCP). The banks considered correspond to the four significant institutions (SIs) operating in Portugal as defined by the ECB. Source: Thomson Reuters Datastream.

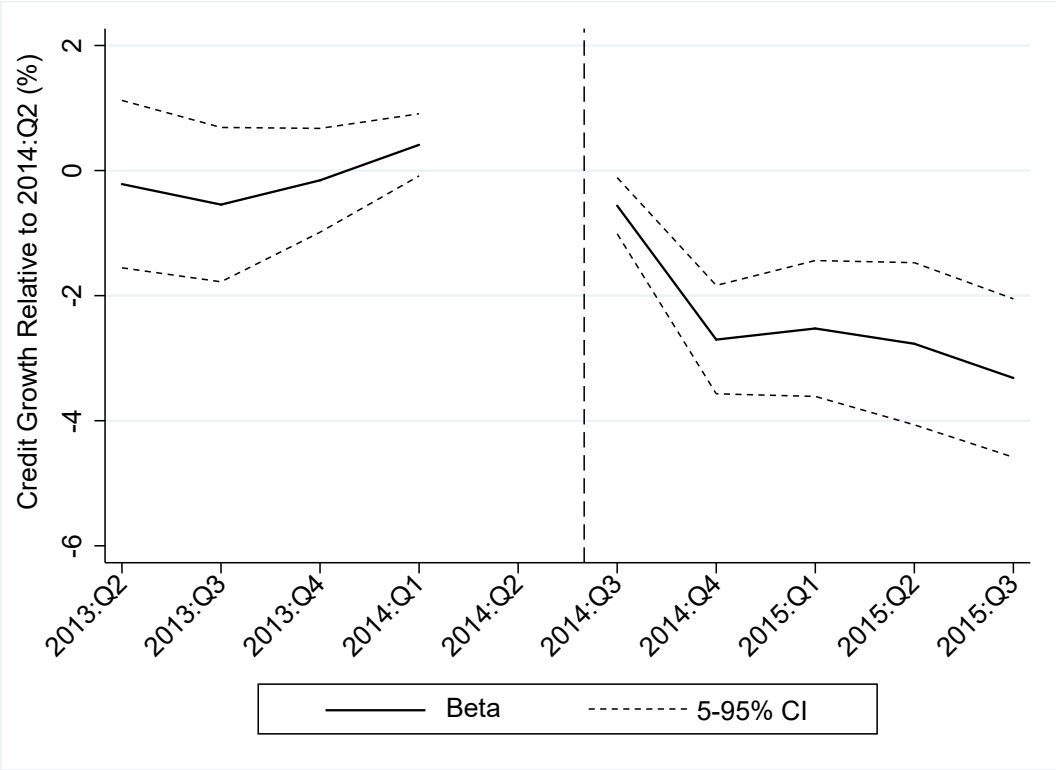

Figure 2: Impact of the bail-in on credit supply at the intensive margin. This figure presents coefficient estimates of a modified version of the within-firm specification (1) where the dependent variable ($\Delta log(Credit)_{bi}$) is regressed on $BankExposure_b$ and firm fixed-effects. Each coefficient estimate in each quarter corresponds to a different within-firm regression, where the outcome variable is the change in the log level of total committed credit between each firm-bank pair between the respective quarter and 2014:Q2. $BankExposure_b$ is standardized to have mean 0 and SD of 1. The dashed lines indicate the 5%–95% confidence interval using standard errors clustered at the bank level.

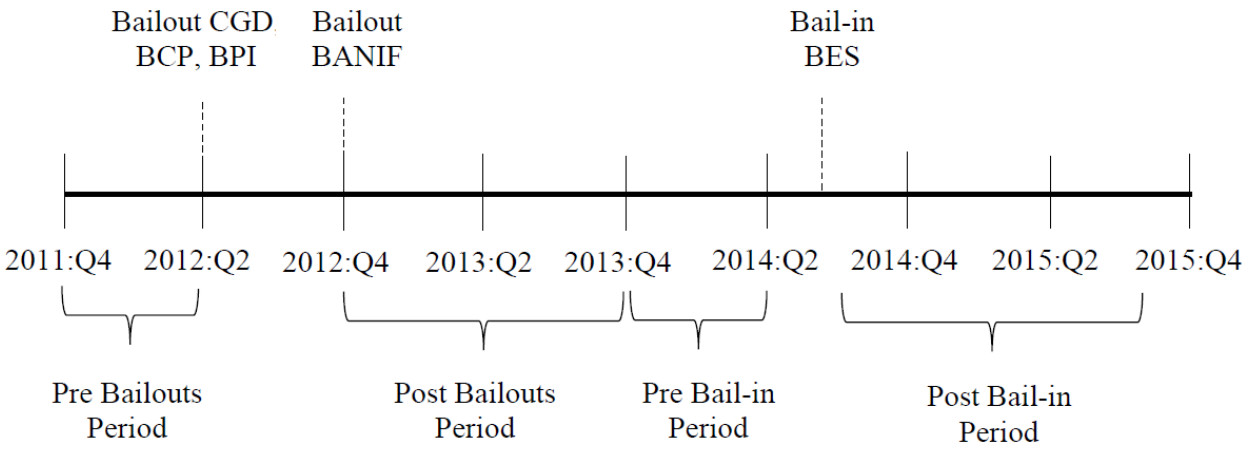

Figure 3: Timeline of events – bail-outs and bail-in. This figure shows the timeline of the different bank resolutions in Portugal: (i) June 2012 for Caixa Geral de Depositos, Banco BPI and Banco Millennium BCP; (ii) December 2012 for BANIF; and (iii) August 2014 for BES.

Table 1: Summary statistics

	N	Mean	Median	SD
Dependent Variables:				
Δ *log* Total Credit	40,927	0.011	-0.031	0.485
Δ *log* Granted Credit Lines	14,320	0.003	0.008	0.570
Δ *log* Investment	40,927	-0.026	-0.054	0.978
Δ *log* No. Employees	40,927	0.032	0.000	0.433
Δ *log* Cash Holdings	40,927	0.108	0.117	1.526
Δ Interest Rates - Total Credit	31,472	-0.875	-0.848	4.265
Δ Interest Rates - Credit Lines	12,429	-0.691	-0.578	3.321
Δ Maturity	31,472	1.912	0.000	27.35
Δ Collateral	31,472	-0.029	0.000	0.320
Firm Characteristics:				
Firm Exposure	40,927	0.008	0.002	0.013
No. Bank Relationships	40,927	4.106	3.000	2.280
New Lending Relationship	40,927	0.323	0.000	0.467
SME	40,927	0.983	1.000	0.129
Firm Size	40,927	13.53	13.40	1.516
Firm Age	40,927	2.679	2.773	0.752
Firm ROA	40,927	-0.006	0.008	0.143
Firm Capital Ratio	40,927	0.261	0.286	0.424
Firm Current Ratio	40,927	2.191	1.414	3.555
Bank Characteristics:				
Bank Size	40,927	23.90	24.36	1.349
Bank ROA	40,927	-0.010	-0.009	0.008
Bank Capital Ratio	40,927	0.054	0.053	0.021
Bank Liquidity Ratio	40,927	0.012	0.011	0.005
Bank NPLs	40,927	0.064	0.065	0.020

The table presents the relevant firm-level summary statistics computed using the bank-firm matched sample. The firm-specific change in the log level of total (committed) credit and the change in the log level of granted credit lines are constructed by collapsing (time-averaging) the quarterly data for each credit exposure into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. Log change in investment (i.e., tangible assets), no. employees, and cash holdings are the firm-specific changes in the log level of the each variable between 2013:Q4 and 2015:Q4. Change in interest rates on new credit operations and credit lines (in percentage points), maturity (in months) and share of collateralized credit (in percentage points) refer to the firm-level change in the loan-amount-weighted value of the respective variable. Since the interest rate dataset only captures new credit operations (rather than outstanding amounts), we consider all new credit operations for each firm between 2013:M12 and 2014:M7 (pre-period) and 2014:M9 and 2015:M9 (post period). Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. New lending relationship is a dummy variable taking the value of 1 if the firm has a new loan after the shock (2014:Q3-2015:Q3) with a bank that it had no loan before, and 0 otherwise. Firm size categories are defined according to the EU Recommendation 2003/361. Firm characteristics include size (log of total assets), age (ln(1+age)), ROA (net income to total assets), capital ratio (equity to total assets) and current ratio (current assets to current liabilities) - all measured as at 2013:Q4. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are also measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans).

Table 2: Credit supply and firm size – within-firm estimates

	$\Delta logTotalCredit_{bi}$				$\Delta logCreditLines_{bi}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Bank Exposure	-0.989***	-1.143***	-1.520*		-2.723***	
	(0.311)	(0.320)	(0.824)		(0.863)	
Bank Exposure × SMEs				-1.441*		-2.659***
				(0.829)		(0.881)
Bank Exposure × Large Firms				-3.133***		-4.048***
				(0.836)		(0.866)
No. Observations	116,245	116,245	116,245	116,245	39,573	39,573
No. Firms	40,927	40,927	40,927	40,927	14,320	14,320
Adj. R^2	0.001	0.047	0.049	0.050	0.103	0.103
Bank Controls	N	N	Y	Y	Y	Y
Firm FE	N	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y
Credit Lines with ≠ Banks	N	N	N	N	Y	Y

The table presents estimation results of the within-firm specification (1) where the dependent variables are the change in the log level of total (committed) credit and the change in granted credit lines between each firm-bank pair. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank Controls are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm size categories are defined according to the EU Recommendation 2003/361. Heteroskedasticity-consistent standard errors clustered at the bank level are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 3: Firm heterogeneity in credit supply – within-firm estimates

	$\Delta logTotalCredit_{bi}$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bank Exposure	-1.651**	-1.641*	-1.480*	-1.630**	-1.934**	-1.322	-1.842**	-1.605*	-0.439
	(0.827)	(0.834)	(0.811)	(0.800)	(0.817)	(0.808)	(0.837)	(0.821)	(0.830)
Bank Exposure × Firm Assets (D_i=Small)	0.650***								
	(0.213)								
Bank Exposure × Firm No. Employees (D_i=Small)		0.430**							
		(0.180)							
Bank Exposure × Firm Age (D_i=Young)			-0.117						
			(0.224)						
Bank Exposure × Firm Capital Ratio (D_i=Low)				0.230					
				(0.283)					
Bank Exposure × Firm ROA (D_i=Low)					0.817***				
					(0.292)				
Bank Exposure × Firm Current Ratio (D_i=Low)						-0.371			
						(0.278)			
Bank Exposure × Firm Interest Coverage Ratio (D_i=Low)							0.447		
							(0.335)		
Bank Exposure × Firm with a NPL in the Pre-Period								1.648**	
								(0.762)	
Bank Exposure × Firm Main Lender is the Bailed-in Bank									-3.132***
									(0.399)
No. Observations	116,245	116,246	116,247	116,248	116,249	116,250	116,251	116,252	116,253
No. Firms	40,927	40,927	40,927	40,927	40,927	40,927	40,927	40,927	40,927
Adj. R^2	0.049	0.049	0.049	0.049	0.050	0.049	0.049	0.050	0.051
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y	Y	Y	Y

The table presents estimation results of the within-firm specification (1) with Bank Exposure interacted with a dummy variable splitting firms into two sub-groups: (i) banks with low and high values of a certain pre-shock firm characteristic; (ii) banks with and without NPLs with any bank before the resolution; and (iii) banks firms whose main lender in the pre-period was or was not the bailed-in bank. The dependent variable is the change in the log level of total (committed) credit between each firm-bank pair. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank Controls are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets) and bank NPLs (non-performing loans to total gross loans). Firm assets, no. employees, age, capital ratio, ROA, current ratio and interest coverage (gross profit over interest expense on loans) are all measured as at 2013:Q4. Heteroskedasticity-consistent standard errors clustered at the bank level are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 4: Credit supply and firm size – cross-sectional estimates

	$\Delta logTotalCredit_i$		$\Delta logCreditLines_i$	
	(1)	(2)	(3)	(4)
Firm Exposure	-0.374		-1.785***	
	(0.352)		(0.485)	
Firm Exposure × SMEs		-0.378		-1.839***
		(0.355)		(0.572)
Firm Exposure × Large Firms		-0.267		-0.526
		(0.607)		(1.135)
Firm Size	-0.008***	-0.008***	-0.006	-0.007
	(0.001)	(0.002)	(0.008)	(0.009)
Firm Age	-0.058***	-0.058***	-0.042***	-0.042***
	(0.004)	(0.004)	(0.012)	(0.011)
Firm ROA	0.228***	0.228***	0.575***	0.575***
	(0.043)	(0.046)	(0.133)	(0.132)
Firm Capital Ratio	0.039***	0.039***	0.024	0.024
	(0.009)	(0.010)	(0.029)	(0.031)
Firm Current Ratio	-0.002**	-0.002**	0.003	0.003
	(0.001)	(0.001)	(0.004)	(0.004)
Credit Demand	0.530***	0.530***	0.510***	0.510***
	(0.013)	(0.018)	(0.020)	(0.017)
No. Observations / Firms	40,927	40,927	14,320	14,320
Adj. R^2	0.378	0.378	0.175	0.175
Bank Controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
District FE	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y
Credit Lines with ≠ Banks	N	N	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variables are the change in the log level of total (committed) credit and the change in granted credit lines for each firm. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm-level controls, defined in Table 1, are also measured in 2013:Q4. Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 5: New lending relationships and credit supply from less exposed banks

	$NewLending\ Relationship_i$			$\Delta logCredit_i$ (Except Bailed-in Bank)		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Exposure	0.535	-0.659		4.020***	4.566***	
	(0.352)	(0.423)		(0.518)	(0.558)	
Firm Exposure × SMEs			-0.674			4.540***
			(0.433)			(0.585)
Firm Exposure × Large Firms			-0.220			5.359***
			(0.809)			(1.042)
No. Observations / Firms	40,927	40,927	40,927	40,927	40,927	40,927
Adj. R^2	0.012	0.058	0.058	0.018	0.342	0.342
Firm Controls	N	Y	Y	N	Y	Y
Bank Controls	N	Y	Y	N	Y	Y
Credit Demand	N	Y	Y	N	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variables are either a dummy that takes value one if a firm takes out a loan from a bank with which it had no lending relationship before the shock, and zero otherwise, or the the change in the log level of total (committed) credit for each firm between 2013:Q4 and 2015:Q3 excluding the bailed-in bank. Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 6: Firm exposure to the bail-in and interest rates

	$\Delta InterestRates$ $AllNewCreditOperations_i$		$\Delta InterestRates$ $CreditLinesOnly_i$		$\Delta Maturity_i$		$\Delta Collateral_i$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	2.335		17.966***		-53.289***		2.125**	
	(3.027)		(4.306)		(12.003)		(0.793)	
Firm Exposure × SMEs		1.495		17.665***		-51.817***		2.130**
		(3.331)		(2.923)		(4.361)		(0.797)
Firm Exposure × Large Firms		24.470***		25.437**		-91.801**		1.984**
		(6.805)		(11.606)		(42.287)		(0.762)
No. Observations / Firms	31,472	31,472	12,429	12,429	31,472	31,472	31,472	31,472
Adj. R^2	0.097	0.097	0.082	0.082	0.031	0.031	0.076	0.076
Loan Characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variable is the firm-specific change in the loan-amount-weighted interest rates on new credit operations, interest rates on credit lines (i.e., automatic renewal of credit), maturity and share of collateralized credit. Since the interest rate dataset only captures new operations (rather than outstanding amounts), we consider all new credit operations between a firm and a bank between 2013:M12 and 2014:M7 (pre-period) and 2014:M9 and 2015:M9 (post-period) when computing these measures - the shock occurred in August 2014. Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Firm size categories are defined according to the EU Recommendation 2003/361. Loan characteristics are the pre-shock, firm-specific, loan-amount-weighted maturity and share of collateralized credit for all new loans or all new credit lines. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capitalization (regulatory capital ratio), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 7: Firm exposure to the bail-in and investment

	$\Delta logTangibleAssets_i$			$\Delta logFixedAssets_i$		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Exposure	-1.680***	-1.497***		-1.349***	-1.000**	
	(0.312)	(0.327)		(0.249)	(0.396)	
Firm Exposure × SMEs			-1.531***			-1.018**
			(0.337)			(0.394)
Firm Exposure × Large Firms			-0.489			-0.460
			(1.322)			(1.242)
No. Observations / Firms	14,320	40,927	40,927	14,320	40,927	40,927
Adj. R^2	0.045	0.041	0.041	0.043	0.039	0.039
Firm Controls	Y	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y
Credit Lines with ≠ Banks	Y	N	N	Y	N	N

The table presents estimation results of the between-firm specification (2) where the dependent variables are the change in the log level of tangible assets and in the log level of fixed assets for each firm between 2013:Q4 and 2015:Q4 (the shock occurred in August 2014). Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 8: Firm exposure to the bail-in and employment

	$\Delta logNo.Employees_i$			$\Delta logNo.WorkedHours_i$		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Exposure	-1.183**	-0.945***		-1.644***	-1.154***	
	(0.410)	(0.182)		(0.326)	(0.163)	
Firm Exposure × SMEs			-0.971***			-1.182***
			(0.180)			(0.169)
Firm Exposure × Large Firms			-0.190			-0.325
			(0.501)			(0.525)
No. Observations / Firms	14,320	40,927	40,927	14,320	40,927	40,927
Adj. R^2	0.080	0.041	0.041	0.054	0.047	0.047
Firm Controls	Y	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y
Credit Lines with ≠ Banks	Y	N	N	Y	N	N

The table presents estimation results of the between-firm specification (2) where the dependent variables are the change in the log level of no. employees and in the log level of total no. worked hours for each firm between 2013:Q4 and 2015:Q4 (the shock occurred in August 2014). Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 9: Firm exposure to the bail-in and liquidity

	Δlog $CashHoldings_i$	Δlog $TangibleAssets_i$	Δlog $No.Employees_i$
	(1)	(2)	(3)
Panel A: SMEs			
Firm Exposure × High Liquidity Firms	-13.579***	-0.093	-0.113
	(3.899)	(0.861)	(0.309)
Firm Exposure × Low Liquidity Firms	13.416***	-1.680***	-1.644***
	(4.249)	(0.420)	(0.135)
No. Observations / Firms	40,234	40,234	40,234
Adj. R^2	0.022	0.040	0.067
Panel B: Large Firms.			
Firm Exposure × High Liquidity Firms	-11.885**	-1.485	2.106
	(5.477)	(2.422)	(2.451)
Firm Exposure × Low Liquidity Firms	1.735	-3.870	-0.631
	(2.023)	(2.342)	(1.705)
No. Observations / Firms	689	689	689
Adj. R^2	0.075	0.083	0.094
Firm and Bank Controls	Y	Y	Y
Credit Demand	Y	Y	Y
Industry and District FE	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where firms are split according to their ex-ante liquidity position i.e., low liquidity (cash holdings-to-total assets ratio before the shock lower than the median) vs. high liquidity firms (cash holdings-to-total assets ratio before the shock higher than the median). The dependent variables are the change in the log level of cash holdings, investment (tangible assets) and employment (no. employees) for each firm between 2013:Q4 and 2015:Q4 (the shock occurred in August 2014). Panel A focuses on the sub-sample of SMEs and Panel B on large firms. Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table 10: Credit supply and real effects of the 2012 bail-outs

	Within-firm estimates	Cross-sectional estimates		
	$\Delta logCredit_{bi}$	$\Delta logCredit_i$	$\Delta logTangibleAssets_i$	$\Delta logNo.Employees_i$
	(1)	(2)	(3)	(4)
Bank Exposure	0.040			
	(0.054)			
Firm Exposure		-0.027	0.020	-0.009
		(0.023)	(0.025)	(0.014)
No. Observations	122,749	45,062	45,062	45,062
No. Firms	45,062	45,062	45,062	45,062
Adj. R^2	0.066	0.472	0.039	0.076
Bank Controls	Y	Y	Y	Y
Firm FE	Y	N	N	N
Credit Demand	N	Y	Y	Y
Firm Controls	N	Y	Y	Y
Industry FE	N	Y	Y	Y
District FE	N	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y

The table presents estimation results of the within-firm specifications (1) and (2) where Bank Exposure is a dummy variable that takes on the value one for the four Portuguese banks bailed-out in 2012 and zero otherwise. Firm Exposure captures the average exposure of each firm to the bail-outs and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2011:Q4-2012:Q2) and post-shock (2012:Q4-2013:Q4) period. Bank Controls are measured as at 2011:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2011:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression. We use heteroskedasticity-consistent standard errors clustered at the bank level in column (1) and clustered at the main bank and industry levels are in columns (2) to (4). Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Internet Appendix

Sharing the Pain? Credit Supply and Real Effects of Bank Bail-ins

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Table IA1: Credit supply and firm size – within-firm estimates

	$\Delta logTotalCredit_{bi}$					
	Alternative Bank Exposure Measure (CDS Spread Reaction)			Including Firms With Only One Bank Relationship		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank Exposure	-1.917***	-2.031***		-0.714***	-1.339**	
	(0.297)	(0.345)		(0.261)	(0.649)	
Bank Exposure × SMEs			-1.787***			-1.283*
			(0.350)			(0.652)
Bank Exposure × Large Firms			-5.956***			-2.915***
			(1.703)			(0.667)
No. Observations	40,783	40,783	40,783	160,457	160,457	160,457
No. Firms	17,445	17,445	17,445	85,139	85,139	85,139
Adj. R^2	0.001	0.054	0.054	0.053	0.055	0.055
No. Banks	4	4	4	98	98	98
Bank Controls	N	Y	Y	N	Y	Y
Firm FE	N	Y	Y	N	N	N
Location-Size-Sector FE	N	N	N	N	Y	Y
No. Bank Relationships > 1	Y	Y	Y	N	N	N

The table presents estimation results of the within-firm specification (1) where the dependent variables are the change in the log level of total (committed) credit between each firm-bank pair. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. Bank Exposure is defined as the bank-specific increase in CDS spreads from one more before to the day of the resolution in columns (1) to (3) and the percentage of assets of each bank exposed to the bail-in in columns (4) to (6) i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank Controls are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm size categories are defined according to the EU Recommendation 2003/361. In columns (4) to (6) we control for credit demand by replacing the firm fixed-effect in the within-firm regressions by a group (location-sector-size) fixed-effect. The group contains only the firm itself in case the firm has multiple lending relationships, while firms with single bank relationships are grouped based on the district in which they are headquartered, their industry, and deciles of loan size in the credit register. Heteroskedasticity-consistent standard errors clustered at the bank level are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table IA2: Credit supply and firm size – within-firm estimates

	$\Delta logCredit_{bi}$ (Excluding Credit Lines)			$\Delta logCredit_{bi}$ (2014:Q2-2015:Q3)		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank Exposure	-0.963***	-1.108		-1.430***	-2.000**	
	(0.366)	(0.808)		(0.303)	(0.826)	
Bank Exposure × SMEs			-1.063			-1.812**
			(0.806)			(0.832)
Bank Exposure × Large Firms			-1.925*			-5.460***
			(0.986)			(0.927)
No. Observations	96,584	96,584	96,584	97,130	97,130	97,130
No. Firms	35,365	35,365	35,365	34,861	34,861	34,861
Adj. R^2	0.001	0.015	0.015	0.001	0.029	0.030
Bank Controls	N	Y	Y	N	Y	Y
Firm FE	N	Y	Y	N	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y

The table presents estimation results of the within-firm specification (1) where the dependent variables are the change in the log level of total credit between each firm-bank pair without considering used and unused credit lines (columns 1-3), the change in the log level of total (committed) credit between each firm-bank pair (columns 4-6). Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank Controls are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm size categories are defined according to the EU Recommendation 2003/361. Heteroskedasticity-consistent standard errors clustered at the bank level are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table IA3: Credit supply and firm size – cross-sectional estimates

	$\Delta logTotalCredit_i$		$\Delta logCreditLines_i$		$\Delta logTotalCredit_i$		$\Delta logCreditLines_i$	
	Alternative Firm Exposure Measure (Bank Exposure: CDS Spread Reaction)				Alternative Firm Exposure Measure (Bank Exposure: Dummy = 1 for Bailed-in Bank)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-0.520		-2.747		-0.032		-0.114***	
	(0.446)		(1.585)		(0.021)		(0.034)	
Firm Exposure × SMEs		-0.605		-3.051*		-0.032		-0.117***
		(0.454)		(1.522)		(0.022)		(0.034)
Firm Exposure × Large Firms		0.888		3.291		-0.028		-0.033
		(1.103)		(2.275)		(0.039)		(0.116)
No. Observations / Firms	17,444	17,444	5,420	5,420	40,927	40,927	14,320	14,320
Adj. R^2	0.299	0.299	0.162	0.162	0.378	0.378	0.175	0.175
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variables are the change in the log level of total (committed) credit and the change in granted credit lines for each firm. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q4-2014:Q2) and post-shock (2014:Q3-2015:Q3) period. Bank Exposure is defined as the bank-specific increase in CDS spreads from one more before to the day of the resolution in columns (1) to (4) and a dummy variable equal to one for the bailed-in bank and 0 otherwise in columns (5) to (8). Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table IA4: Credit supply and firm size – cross-sectional estimates

	$\Delta logCredit_i$ (Excluding Credit Lines)		$\Delta logCredit_i$ (2014:Q2-2015:Q3)	
	(1)	(2)	(3)	(4)
Firm Exposure	-0.279		-0.478	
	(0.396)		(0.494)	
Firm Exposure × SMEs		-0.294		-0.523
		(0.425)		(0.464)
Firm Exposure × Large Firms		-0.206		0.630
		(0.375)		(1.372)
No. Observations / Firms	35,365	35,365	34,861	34,861
Adj. R^2	0.280	0.279	0.419	0.419
Firm Controls	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
District FE	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2). Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table IA5: Firm exposure to the bail-in and investment

	$\Delta logTangibleAssets_i$				$\Delta FixedAssets$ $/TotalAssets_i$		$\Delta TangibleAssets$ $/TotalAssets_i$	
	Alternative Firm Exposure Measure (Bank Exposure: CDS Spread Reaction)		Alternative Firm Exposure Measure (Bank Exposure: Dummy = 1 for) for Bailed-in Bank)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-4.422***		-0.101***		-0.234***		-0.219***	
	(0.756)		(0.027)		(0.061)		(0.059)	
Firm Exposure × SMEs		-4.518***		-0.104***		-0.240***		-0.226***
		(0.787)		(0.029)		(0.064)		(0.063)
Firm Exposure × Large Firms		-2.841		-0.034		-0.078		-0.023
		(2.428)		(0.093)		(0.154)		(0.161)
No. Observations / Firms	17,445	17,445	40,927	40,927	40,927	40,927	40,927	40,927
Adj. R^2	0.038	0.038	0.041	0.041	0.072	0.072	0.075	0.075
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2). Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is defined as the bank-specific increase in CDS spreads from one more before to the day of the resolution in columns (1) and (2), a dummy variable equal to one for the bailed-in bank and 0 otherwise in columns (3) and (4), and the percentage of assets of each bank exposed to the bail-in in columns (5) to (8) i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table IA6: Firm exposure to the bail-in and employment

	$\Delta logNo.Employees_i$			
	Alternative Firm Exposure Measure (Bank Exposure: CDS Spread Reaction)		Alternative Firm Exposure Measure (Bank Exposure: Dummy = 1 for Bailed-in Bank)	
	(1)	(2)	(3)	(4)
Firm Exposure	-2.346***		-0.061***	
	(0.291)		(0.017)	
Firm Exposure × SMEs		-2.420***		-0.062***
		(0.366)		(0.014)
Firm Exposure × Large Firms		-1.120		-0.002
		(1.059)		(0.050)
No. Observations / Firms	17,445	17,445	40,927	40,927
Adj. R^2	0.065	0.065	0.066	0.066
Firm Controls	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
District FE	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2). Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is defined as the bank-specific increase in CDS spreads from one more before to the day of the resolution in columns (1) and (2) and a dummy variable equal to one for the bailed-in bank and 0 otherwise in columns (3) and (4). Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table IA7: Firm exposure to the bail-in and liquidity

	$\Delta logCashHoldings_i$		$\Delta logTangibleAssets_i$		$\Delta logNo.Employees_i$	
	Low Asset Growth Firms	High Asset Growth Firms	Low Asset Growth Firms	High Asset Growth Firms	Low Asset Growth Firms	High Asset Growth Firms
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Exposure × High Liquidity Firms	-14.732***	-14.302***	0.358	-0.991	-0.155	-0.509
	(3.798)	(4.599)	(0.904)	(0.954)	(0.372)	(0.340)
Firm Exposure × Low Liquidity Firms	8.162***	13.523***	-1.907***	-1.902***	-1.327***	-0.983***
	(2.604)	(4.616)	(0.494)	(0.619)	(0.280)	(0.269)
No. Observations / Firms	19,331	20,030	19,331	20,030	19,331	20,030
Adj. R^2	0.017	0.023	0.031	0.036	0.044	0.058
Firm and Bank Controls	Y	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y	Y
Industry and District FE	Y	Y	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where SMEs are split according to their ex-ante asset growth and liquidity (cash holdings-to-total assets) positions i.e., below and above the median. The dependent variables are the change in the log level of cash holdings, investment (tangible assets) and employment (no. employees) for each firm between 2013:Q4 and 2015:Q4 (the shock occurred in August 2014). Firm Exposure captures the average exposure of each firm to the bail-in and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. Bank Exposure is the percentage of assets of each bank exposed to the bail-in i.e., the percentage of assets that was effectively bailed-in for the resolved bank, the specific contribution to the ad-hoc loan to the Resolution Fund granted as part of the resolution for the 8 participating banks (as a percentage of assets), and 0 otherwise. Bank controls, averaged at the firm-level according to the pre-period share of total credit granted to the firm by each bank, are measured as at 2013:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2013:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 2 of Table 2). Heteroskedasticity-consistent standard errors clustered at the main bank and industry levels are in parenthesis. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Table IA8: Credit supply and real effects of the 2012 bail-outs

	Within-firm estimates				Cross-sectional estimates			
	$\Delta logCredit_{bi}$				$\Delta logCredit_{i}$			
	Dummy Treatment Variable		Continuous Treatment Variable		Dummy Treatment Variable		Continuous Treatment Variable	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bank (col 1-6)/Firm (col 7-12) Exposure	0.040		2.067		-0.027		0.467	
	(0.054)		(1.492)		(0.023)		(0.765)	
Bank (col 1-6)/Firm (col 7-12) Exposure × SMEs		0.042		2.076		-0.027		0.469
		(0.054)		(1.500)		(0.024)		(0.771)
Bank (col 1-6)/Firm (col 7-12) Exposure × Large Firms		-0.022		1.873		-0.033		0.339
		(0.094)		(2.922)		(0.027)		(1.327)
No. Observations	122,749	122,749	122,749	122,749	45,062	45,062	45,062	45,062
No. Firms	45,062	45,062	45,062	45,062	45,062	45,062	45,062	45,062
Adj. R^2	0.066	0.066	0.066	0.066	0.472	0.472	0.472	0.472
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	N	N	N	N
Credit Demand	N	N	N	N	Y	Y	Y	Y
Firm Controls	N	N	N	N	Y	Y	Y	Y
Industry and District FE	N	N	N	N	Y	Y	Y	Y
No. Bank Relationships > 1	Y	Y	Y	Y	Y	Y	Y	Y

The table presents estimation results of the within-firm specifications (1) and (2) where Bank Exposure is a dummy variable that takes on the value one for the four Portuguese banks bailed-out in 2012 and zero otherwise in columns (1)–(2) and (5)–(6), and a continuous variable equal to the injection amount as a share of assets for each of the bailed-out banks, as zero otherwise in columns (3)–(4) and (7)–(8). Firm Exposure captures the average exposure of each firm to the bail-outs and is computed as the weighted average of Bank Exposure across all banks lending to a firm, using as weights the pre-period share of total credit from each bank. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2011:Q4-2012:Q2) and post-shock (2012:Q4-2013:Q4) period. Bank Controls are measured as at 2011:Q4 and include bank size (log of total assets), bank ROA (return-on-assets), bank capital ratio (equity to total assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to total gross loans). Firm controls are also measured before the shock (2011:Q4) and include firm size (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital ratio (equity to total assets) and firm current ratio (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression. We use heteroskedasticity-consistent standard errors clustered at the bank level in columns (1) to (4) and clustered at the main bank and industry levels are in columns (5) to (8). Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.