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 bank in Portugal and its subsequent resolution. Using a unique dataset of matched firm-bank data on credit exposures and interest rates from the Portuguese credit register, we show that while banks more exposed to the bail-in significantly reduced credit supply after the shock, affected firms were able to compensate this credit contraction with other sources of funding, including new lending relationships. Although there was no loss of external funding, we observe a moderate tightening of credit conditions as well as lower investment and employment at firms more exposed to the intervention, particularly SMEs. We explain the latter real effects by higher precautionary cash holdings due to increased uncertainty.

Keywords: Bail-ins, bank failures, credit supply, investment, employment

JEL Classifications: E22, E24, E58, G01, G21, G28, G32

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1 Introduction

The recent global financial crisis highlighted the pressing need for a robust and consistent mechanism to resolve distressed financial institutions. Absent a viable alternative to bankruptcy that could lead to contagion and a credit crunch, policymakers around the world opted to bail-out banks using public funding. In Europe, for instance, taxpayers have covered more than two-thirds of such recapitalization costs (Philippon and Salord, 2017).[1] This interventions were often accompanied by significant government losses and austerity programs associated with political frictions and considerable distributional problems. To counter this pervasive issue, most developed economies have recently introduced formal bank resolution and bail-in regimes that involve the participation of bank creditors in bearing the costs of restoring a distressed bank and include heavy restrictions on taxpayer support.[2]

An effective bank resolution framework should solve the trade-off between imposing market discipline and minimizing the effects of a bank failure on the rest of the financial system and the real economy (Beck, 2011). In fact, previous evidence has shown both the negative effects of bank failures on real outcomes (e.g., Bernanke, 1983; Calomiris and Mason, 2003; Ashcraft, 2005) and the negative impact of bail-outs and public guarantees on bank risk-taking (e.g., Gropp, Hakenes, and Schnabel, 2011; Dam and Koetter, 2012; Gropp, Gruendl, and Guettler, 2014). In addition, government interventions incentivize banks to grow even larger and more complex (Bolton and Oehmke, 2016) and reinforce the negative feedback loop between banks and sovereigns that characterized the euro

[1] According to ECB (2015), accumulated gross financial sector assistance in the euro area reached 8 percent of GDP between 2008 and 2014, of which only 3.3 percent had been recovered by the end of 2014. Similarly, Enria (2016) indicates that the European Commission took more than 450 state aid decisions to support the financial sector during the crisis, including €4 trillion in guarantees for bank liabilities, €600 billion in asset relief measures and more than €800 billion in recapitalizations.

[2] The EU adopted a directive (BRRD) and a regulation (SRR) establishing uniform rules for bank resolution. Although the new European bail-in regime hypothetically lets banks fail without resorting to taxpayers (Avgouleas and Goodhart, 2015), it also allows for extraordinary public support under certain conditions (Schoenmaker, 2017). While these decisions do not foresee bail-in of non-insured creditors before 2018, recent idiosyncratic (SNS Reaal in the Netherlands; BES in Portugal; Andelskassen in Denmark) and systemic resolutions (Cyprus) suggest that this regime is, at least partially, already in place. Despite many similarities between EU and US resolutions frameworks, some significant differences still exist e.g., lack of a restructuring option in the US (Philippon and Salord, 2017).

area crisis (Brunnermeier, Langfield, Pagano, Reis, Van Nieuwerburgh, and Vayanos, 2017).[3] Bank bail-ins are supposed to minimize this trade-off since part of the bank continues functioning while moral hazard is reduced due to the increase in creditors' expectations of being bailed-in in case of distress (Schäfer, Schnabel, and Weder, 2016; Neuberg, Glasserman, Kay, and Rajan, 2016; Giuliana, 2017). However, despite the long list of hypothetical advantages attached to bank bail-ins when compared to bail-outs and liquidations (e.g., Conlon and Cotter, 2014; Klimek, Poledna, Farmer, and Thurner, 2015), there is little to no empirical evidence on the effects of this new resolution mechanism on the real economy. Our study fills this gap in the literature by examining the credit supply and real effects of a bank bail-in using a unique dataset combining firm-bank matched data on credit exposure and interest rates from the Portuguese credit register with balance-sheet information available for virtually all firms and their lenders.

In detail, we exploit the unexpected collapse of a major bank in Portugal (Banco Espírito Santo) in August 2014 that was coined "one of Europe's biggest financial failures" (FT, 2014). The institution was resolved with a bail-in and split into "good" bridge bank and a "bad" bank, protecting taxpayers and depositors but leaving shareholders and junior bondholders holding toxic assets in an entity that is in the process of liquidation. The costs of this intervention fell not only on the bank's creditors, but also indirectly on other resident banks that financed the Bank Resolution Fund via their ordinary contributions and an ad-hoc loan from eight of its (largest) members. 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. These reflected the "practice of management acts seriously detrimental" to the bank and noncompliance 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

[3] Crosignani, Faria-e Castro, and Fonseca (2016), 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.

identification perspective, using this (exogenous) shock is therefore particularly attractive since the bank's failure was purely idiosyncratic.

We start the analysis by examining over 140,000 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 financed the resolution fund, and banks that were exempt from making contributions. By exploiting the widespread presence of Portuguese firms with multiple bank relationships, this approach allow 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 as a consequence 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 credit supply 5.78 percent more than banks exposed less. The reduction in credit is more pronounced for firms that are larger and, consistent with findings in De Jonghe, Dewachter, Mulier, Ongena, and Schepens (2016), for riskier firms with less capital, lower interest coverage ratios, less collateralized lending and shorter maturity loans.

Our evidence of a credit supply contraction at the intensive margin 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. 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 contributed to an increase in the supply of credit.[4] Berger, Makaew, and Roman (2016) show that TARP-funded bail-outs in the US resulted in an increase in credit supply

[4]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 financially dependent firms.

at the intensive margin 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.[5] Therefore, a fundamental follow-up question is whether more exposed firms could compensate this credit supply tightening by accessing funds from other banks less affected by the shock (both in terms of quantities and credit conditions) and if there were any real effects associated with the intervention.[6]

We find at the cross-sectional level that firms more exposed to the bail-in did not suffer a credit supply reduction after the intervention when compared to firms exposed less. This finding holds for both large firms and SMEs. Importantly, following Bonaccorsi di Patti and Sette (2016) and Cingano, Manaresi, and Sette (2016), we are 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 Khwaja and Mian (2008) within-firm specification. We also show that more exposed firms were more likely to establish new lending relationships with banks they were not borrowing from before the shock. Together, our findings suggest that the reduction in credit supply after the bail-in was not binding since the affected firms were able to substitute any lost funding from other banks.

While this bank resolution mechanism was effective in sustaining lending activity, our results also show that it 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 30 basis points in the interest rates 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 relative decrease in the maturity of new credit for medium-sized firms and an increase in the share of collateralized credit after the shock across all firm types.

[5]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.

[6]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 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 2.3 and 0.6 percent relative drop in investment and employment for the average firm, respectively. We explain this apparent contradiction between credit supply and real sector behavior with higher liquid asset holdings by SMEs borrowing from banks more exposed to the bail-in due to the uncertainty following the shock. Unlike smaller enterprises, large firms were able to keep the same relative rate of investment, employment and cash holdings, at least partially by increasing the amount of funding from their suppliers.

This paper contributes to the recent and still expanding literature analyzing bail-ins as a bank resolution tool. Recent work, however, has mostly focused on describing and contrasting the potential benefits and costs of bail-ins vs. bail-outs.[7] Advocates of the former resolution tool often emphasize the moral-hazard problem of the latter when taxpayers would have to bear the losses (e.g., Zhou, Rutledge, Moore, Dobler, Bossu, and Jassaud, 2012; Conlon and Cotter, 2014; Chennells and Wingfield, 2015).[8] Avgouleas and Goodhart (2015) argue that the bail-in approach may be superior to bail-outs when dealing with smaller banks or domestic SIFIs if the institution has failed due to its own actions and omissions (e.g., fraud), while a public injection of funds might still be necessary in the case of resolution of a large complex cross-border bank. Dewatripont (2014) maintains that financial instability can be costlier than bank bail-outs and these should be seen as an alternative/complement to bail-ins in the presence of macroeconomic shocks. Philippon and Salord (2017) argue that the systematic application of bail-ins will lead to

[7] Bolton and Oehmke (2016) and Faia and Weder (2016) examine theoretically the impact of the two main resolution models (single and multiple point of entry) on the organization form of global banks. Schoenmaker (2017) highlights the challenges that smaller countries may face when resolving these large, global banks and suggests different policy alternatives. Walther and White (2017) show that when bail-in policies are discretionary, regulators will conduct weak interventions in order to avoid triggering bank runs. They suggest supplementing bail-in tools with contingent capital instruments.

[8] The implicit or explicit commitment to bail-out distressed banks may not only increase 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 (Allen, Babus, and Carletti, 2012; Silva, 2016).

a more efficient equilibrium in the long run, with financial risks priced and allocated more effectively in capital markets. Using an agent-based model, Klimek, Poledna, Farmer, and Thurner (2015) find that a bail-in is the most efficient resolution tool for economies in recession and with high unemployment. They also show that bail-out schemes do not outperform bail-ins under any circumstances. Our paper contributes to this literature by assessing the effect of bank resolution with a bail-in of creditors on credit supply and real sector outcomes. To the best of our knowledge, this is the first study that uses detailed bank-, firm- and loan-level data to analyze such issue.

This paper also contributes to the literature examining 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.

Finally, 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. Using variation in the impact of exogenous shocks across different banks, credit register data allows exploiting within-firm variation in borrowings from different banks to control for differences in demand and risk profiles across firms. Khwaja and Mian (2008) and Schnabl (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. Chodorow-Reich (2014) and Paravisini, Rappoport, Schnabl, and Wolfenzon (2015b) emphasize the negative impact of these shocks on employment and firm exports, respectively. Iyer, Peydró, Da-Rocha-Lopes, and Schoar (2014) use the same credit register data as we do to investigate the effect of the liquidity freeze in European interbank markets on credit supply in Portugal, while Alves, Bonfim, and Soares (2016)

highlight that role of the ECB as lender of last resort in avoiding the collapse of the Portuguese financial system during the European sovereign debt crisis.

The remainder of this paper is organized as follows. Section 2 describes the institutional background of the bank resolution we investigate and Section 3 presents our identification strategy. Section 4 describes the data and descriptive statistics. Section 5 discusses the results. Section 6 concludes.

2 Background

After a rapid series of events including the disclosure of hefty losses of €3.6bn 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 (Banco de Portugal, 2014a, recital 19). The bank was by then considered a significant credit institution by the European Central Bank under the Single Supervisory Mechanism (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, recital 9). 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, recital 1).

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. The €4.9bn 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. Since the Fund did not yet have sufficient resources to fully finance the operation, it took a loan from a group of eight of its (largest) member banks (€0.7bn) and another from the Portuguese State (€3.9b).

As a result, this resolution was at the time coined as a "hybrid of bail-in and bail-out" (Economist, 2014).[9]

Figure 1 shows the unexpected 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 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. 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 (2017) suggesting 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, to be conservative in our analysis we take into account the exposure of these other banks to the bail-in through the institution-specific amount of financing of the Bank Resolution Fund.

[Figure 1 here]

In short, even if a hybrid resolution with bail-in and bail-out elements, this intervention differs markedly from the bail-outs of most distressed banks during the recent financial

[9]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 transfered to the "bad bank", imposing losses on almost €2bn of senior bondholders (Banco de Portugal, 2015; FT, 2016). A deal to sell the "good bank" was recently reached in March 2017. According to the agreement, a US private-equity fund would acquire 75 percent of the bank in return for a capital injection of €1bn, while the remaining 25 percent would still be held by the Bank Resolution Fund (Banco de Portugal, 2017). The Portuguese government ensured that the deal would have no direct or indirect costs for taxpayers. Instead, the country lenders would have several decades to recoup the shortfall with their ordinary contributions to the Bank Resolution Fund, and the Fund would also later be able to sell its stake in order to recover some of the loss (FT, 2017). Given that we only have loan and firm-level data available until 2015, our analysis does not consider the above mentioned two shocks and is instead solely focused on the original resolution in August 2014.

crisis as all the losses were ultimately imposed on shareholders and (junior and later senior) bondholders. Furthermore, 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). 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 by either having loans from the bailed-in bank or from banks that had to contribute to the resolution fund (within-firm analysis). Second, assuming the tightening of credit conditions did occur, we investigate whether these firms were able to substitute funding from other (less exposed) banks operating in Portugal, if they were able to maintain their average interest rates on credit, and the consequences of this shock for firm real outcomes such as investment and employment (cross-sectional analysis). While the first part of the analysis uses firm-bank matched data to exploit variation within firms that have more than one lending relationship, the second part uses 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 supply, real outcomes and firms' loan demand and risk. To address this identification problem, we exploit the exogenous shock in August 2014 corresponding to the bank failure discussed above and subsequent resolution, and use a difference-in-differences approach to compare lending before and one year after the bank collapse in August 2014 across the 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 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 as follows:

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

where the 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. As in Khwaja and Mian (2008), the quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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: (i) the percentage of assets that was effectively bailed-in for the resolved bank; and (ii) the bank-specific contribution to the Bank Resolution Fund as of August 2014 (as a percentage of assets) for all other banks. The latter includes both the ordinary contributions that each bank made in 2013, and the amount each of the eight (largest) banks contributed to the ad-hoc €0.7bn loan to the Fund as part of the resolution.[10] 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_{bi} is 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

[10]These bank-specific figures were manually collected from each of the banks publicly-available Annual Reports for 2013 and 2014.

assets), bank liquidity ratio (liquid to total assets), and bank NPLs (non-performing loans to 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, all our within-firm regressions use robust standard errors clustered at the bank level.

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 shock, it is not appropriate to assess any 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.[11] Given the importance of the extensive margin for credit adjustment, we then 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 from the pre to the post period from all banks to firm i. We use the same model to study the likelihood of establishing new lending relationships, examine the effects on interest rates, and analyze potential real effects i.e., the dependent variable is also defined as a dummy variable equal to one if the firm has a new loan after August 2014 with a bank that it had no loan before, as the change in average interest rates from the pre to the post period, or as the change in real outcomes (e.g., investment, employment) from 2013:Q4 to 2015:Q4, respectively.

$FirmExposure_i$ 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

[11] The latter point is addressed in robustness tests in which the dependent variable is defined as the percentage change in the level of total credit volume for each firm-bank pair from the pre to the post period. This alternative dependent variable accounts for terminated relationships i.e., when the credit volume for a certain firm-bank relationship after the shock is equal to 0.

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 specification (1) but are averaged at the firm-level according to the share of total credit granted to the firm by each bank.

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 thus 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).[12] Heteroskedasticity consistent standard errors clustered at the main bank and industry levels are used throughout.[13]

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 this assumption is likely to be satisfied. In detail, we compare the trend in total credit by the bailed-in back (who is by far the most exposed bank to the resolution) with that all other resident banks considered significant credit institutions by the ECB. As the figure shows, the trend in credit for the treatment and control groups prior to shock is very similar. In addition, the supply of credit by

[12] 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) shows that the approach of Jiménez, Mian, Peydró, and Saurina (2014a) and the one we use in this paper are equivalent.

[13] Main bank is defined as the bank that a certain firm has the highest percentage of borrowing with before the shock.

the resolved bank decreased sharply relative to the other Portuguese banks starting in August 2014. These differential trends support our assumption that this shock was purely idiosyncratic and thus unrelated to fundamental risks in the Portuguese banking sector.[14]

[Figure 2 here]

Second, the implicit assumption behind applying 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 operating.[15] However, some factors suggest any effects we may 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). Finally, in contrast with a shift in firm demand from the bailed-in bank to other banks explained by reputational damage or 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

[14]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).

[15]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.

challenges brought by the resolution measure, the bank was not only able to stabilize its funding sources, but also recover its customers' confidence.[16]

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.[17] 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 month, each claim specifies the amount that each borrower owes the bank in the short and long-term, and the amount that is past due. In addition to loan volumes, the database also provides information on other loan characteristics 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

[16] As highlighted by Paravisini, Rappoport, and Schnabl (2015a), 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 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.

[17] This threshold alleviates any concerns on unobserved changes in bank credit to SMEs (Iyer, Peydró, Da-Rocha-Lopes, and Schoar, 2014). 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.

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 those banks that reported interest rate information both before and after this reporting change. Besides interest rates, we have loan-level information on the amount, maturity and date of origination, whether the loan is collateralized, and the loan type i.e., completely new loan, automatic renewal of credit.

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, as well as the compulsory reporting of balance sheet information by all firms and banks operating in Portugal, the combined dataset we use in this paper is arguably one of the most comprehensive loan-bank-firm matched databases worldwide.[18]

Table 1 presents firm-level descriptive statistics computed using the bank-firm matched sample. Specifically, we present the mean, standard deviation, minimum and maximum values of the dependent variables, firm and bank characteristics across the 48,858 firms in our sample. We find that, on average, firms' credit exposures reduced by 0.6 percent from the pre-shock (2013:Q2-2014:Q2) to the post-shock period (2014:Q3-2015:Q3). 23.5 percent of firms started a new lending relationship within a year after the resolution. Firm investment shrank on average by 4.2 percent between 2013:Q4 and 2015:Q4. Over the same period, employment increased by 3.4 percent in number of employees and 2.8 percent in total number of hours worked, while the share of cash holdings in total assets increased from 10.8 to 11.3 percent (a 0.5 percent change). Finally, there was an average decrease in interest rates from the pre- to the post-resolution period of 50 basis points, both on loans and credit lines.

[18]See Matos (2016) for a detailed description of the Portuguese credit register. Other papers using some of these databases held and managed by the Bank of Portugal include Iyer, Peydró, Da-Rocha-Lopes, and Schoar (2014), Bonfim, Nogueira, and Ongena (2016) and Alves, Bonfim, and Soares (2016).

[Table 1 here]

Turning to firm characteristics, the average pre-failure firm exposure to the bail-in was 0.008, with minimum and maximum values of 0 and 0.068, respectively. Firms in our sample have on average 4 lending relationships. SMEs constitute 98.6 percent of all firms. Before the shock (i.e., 2013:Q4), the average firm was operating for 2.6 years, had a capital ratio of 24 percent, suffered losses of 1 percent of total assets and had a current ratio of 2.3. 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 on credit supply before turning to the effects on firms' borrowing costs. Finally, we will trace these effects to real sector outcomes, including investment and employment.

5.1 Bank resolution and credit supply

Within-Firm Analysis. The results in Table 2 show a significant reduction in credit supply from banks more exposed to the bail-in, a result significant across all firm size groups. The unit of observation is the change in the log level of total committed credit between each of the 142,469 firm-bank pairs, corresponding to 48,858 firms. As in Khwaja and Mian (2008), the quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. *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, and the bank-specific contribution to the Bank Resolution Fund as

of August 2014 as a percentage of assets for all other banks. Columns (1) and (2) present the average results across all firms without and with bank-level controls, respectively, while columns (3) to (5) differentiate the main effect of interest across firms of different sizes. All specifications include firm fixed-effects and 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 is not only statistically, but also economically significant. The coefficient of interest in column (2) indicates that a one standard deviation increase in bank exposure to the bail-in (0.019) is associated with a 5.78 percent decrease in credit for the average firm.[19] Finally, the results in columns (3) to (5) show that while the effect was significant across all firm size groups, it was economically strongest for the largest firms. Given that the bailed-in bank is by far the most exposed bank to the resolution (i.e., it has a higher *Bank Exposure* value), the latter result is consistent with its deleveraging plan following the intervention (Novo Banco, 2014, 2015) as discussed in Section 3.

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, profitability, capital, 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 interaction effects between *Bank Exposure* and various pre-shock borrower-level characteristics.

[Table 3 here]

Specifically, the results in column (1) confirm our earlier findings that the credit reduction by banks more exposed to the bail-in was more pronounced for larger firms, here

[19] The coefficients on the bank-level controls in the within-firm regressions indicate that, as suggested by economic theory, pre-shock bank size and liquidity are positively associated with credit growth. Surprisingly, bank profitability measured as at 2013:Q4 has a negative association with bank lending growth. The coefficients on bank capital and NPL ratios are statistically insignificant.

measured by total assets instead of the definition in the EU Recommendation 2003/361 that also incorporates a staff headcount requirement. We also find that the effect was stronger for older firms (column 2). While we find no differential effects across firms with different degrees of profitability (column 3) and liquidity (column 5), we show that better capitalized firms faced a lower reduction in credit from banks more exposed to the bail-in shock (column 4). The results in columns (6) show a significant and negative interaction term of *Bank Exposure* with *Firm Main Bank*, a dummy equal to one if the bailed-in bank was the main bank of that firm, 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; Beck, Degryse, De Haas, and Van Horen, 2017), it highlights the disruptive effect that a bank failure can have on established firm-bank relationships, particularly for bank-dependent borrowers (Bernanke, 1983; Ashcraft, 2005). 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 distress is associated with equity valuation losses and investment cuts to firms with the strongest lending relationships. Finally, we also find that firms with higher pre-bail-in interest coverage ratios (defined as gross profits over interest expense on loans) suffered a lower reduction in credit (column 7), as did firms with longer maturity loans (column 9) and more collateral (column 10). This suggests that the credit reduction was less pronounced for firms in a better financial position and with more secured and longer outstanding loans, and that the credit reduction fell more on fragile firms that posed higher credit risks, consistent with with findings by De Jonghe, Dewachter, Mulier, Ongena, and Schepens (2016) and Liberti and Sturgess (2017) on the strategic lending decisions of banks facing a negative funding shock. This also points to a critical difference to bail-outs, where one would not necessarily observe such a differentiated credit reduction according to firm characteristics.

Robustness Tests. The within-firm results presented above are robust to a number of tests. First, to ensure that our results are not confined to firms with multiple bank

relationships, we follow De Jonghe, Dewachter, Mulier, Ongena, and Schepens (2016) and control for credit demand by replacing the firm fixed-effect in the within-firm regressions by a group (location-sector-size) fixed-effect. In detail, 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. The results are reported in columns (1) to (4) of Table IA1 in the internet appendix. Despite the considerable increase of in the number of firms (from 48,858 to 96,729), the coefficient estimates are remarkably similar to those in Table 2, both in terms of magnitude and statistically significance. Second, our results are also robust to defining credit growth as a percentage growth rate which, as argued by Cingano, Manaresi, and Sette (2016), has the advantage of accounting for terminated relationships. The results are reported in columns (5) to (8) of Table IA1 and are again very similar to those of Table 2, both in statistical and economic significance.

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. Nevertheless, the results in columns (9) to (12) of Table IA1 and columns (1) to (4) of Table IA2 in the internet appendix confirm that our conclusions do not change when excluding unused credit lines or limiting our sample to term loans, respectively. Columns (5) to (8) of Table IA2 show that the results also hold when considering only used and unused credit lines, though with a smaller economic effect. While consistent with the findings by Ippolito, Peydró, Polo, and Sette (2016) who show that Italian banks managed their liquidity risks by extending fewer and smaller credit lines following the 2007 freeze of the European interbank market, this result suggests that credit lines were not necessarily the main channel through which banks more exposed to the bail-in reduced credit. Finally, we show in columns (9) to (12) of Table IA2 that there was no reduction in the usage of credit lines after the shock, thus reinforcing that the effect was in fact supply rather than demand-driven.

Cross-Sectional Analysis. So far we have gauged the effect of the bank resolution on the supply of credit to firms borrowing from banks more and less exposed to the bail-in. However, these 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. As we cannot use firm-fixed effects in such 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 (1) of Table 2.[20] 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 lending after the shock for firms more exposed to the bail-in when compared to firms exposed less. 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. Across the various regressions in this table, including when differentiating between different firm sizes, we find no evidence of a significant relationship between firm exposure to the shock and credit growth.

[Table 4 here]

The results are robust to a number of additional tests. First, we focus exclusively on firms' exposure to the bailed-in bank rather than their average exposure across all banks affected by the bail-in. In detail, in columns (1) to (4) of Table IA3 in the internet appendix *Firm Exposure* is defined as the average firm-level credit volume with the bailed-in bank in the pre period weighted by the firm's total credit volume across all banks. We obtain similarly insignificant results. Second, we extend the sample to all firms, including those with only one lending relationship (Table IA3, columns 5-8). In

[20] 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 Bank Exposure (ρ=0.0014).

these specifications, credit demand is the vector of firm-level dummies estimated in the within-firm regression with group (LSS: Location-Sector-Size) fixed-effects as in Table IA1. Again, we obtain insignificant results, with the exception of a negative coefficient for micro-enterprises, significant at the 10 percent level. Third, we confirm our results when focusing on a more limited sample period by using as dependent variable the change in the log level of total committed credit for each firm between 2013:Q4 and 2015:Q3 (Table IA4, columns 1-4). Fourth, we confirm the insignificant findings when limiting our sample to loan operations and thus disregarding both used and unused credit lines (Table IA4, columns 5-8). Finally, while there is some evidence that exposed firms with higher capital and cash ratios were actually able to receive more credit after the shock, the above results hold no matter the pre-shock firm's current ratio, age, interest coverage and average loan interest rate, maturity and collateral (Table IA5).

Overall, our results suggest that firms that were more exposed to the bail-in did not suffer from an overall reduction in credit growth compared to firms exposed less. Combining these results with those in Table 2, our findings suggest that firms borrowing from banks more exposed to the bail-in were able to compensate the reduction in credit with lending from other (less exposed) financial institutions. We will explore this hypothesis in more detail in the following.

Role of New Lending Relationships. The results in Table 5 show that firms more exposed to the bail-in were more likely to start a new lending relationship over our sample period. 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 results in columns (1) and (2) - without and with firm-level controls, respectively - show that the probability of starting a new lending relationship increases in the exposure of firms to the bail-in. This result is confirmed in column (3) where we introduce two dummy variables: (i) *High Exposure*, equal to one if the bailed-in bank was the main lender of the firm before the shock, and zero otherwise; and (ii) *Low Firm Exposure*, equal to one if the firm had at least one loan with the bailed-in bank before the resolution but this was not the firm's

main bank, and zero otherwise. The results suggest that firms whose main lender was the bailed-in bank were significantly more likely to start a new lending relationship than other firms, including firms that had at least one loan with the bailed-in bank but for whom it was not the main bank pre-crisis. The results in columns (4) to (6) show that the effect of the bail-in on the probability of firms to start new lending relationships was concentrated in small and medium-sized enterprises.

[Table 5 here]

The results in Table 6 confirm that lenders other than the resolved 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:Q2-2014:Q2) to the post-resolution period (2014:Q3-2015:Q3). The results in columns (1) and (2) show a significantly 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 5.81 percent increase in lending from other banks. The results in columns (3) to (6) confirm our earlier findings that this effect is significant across all firm size groups but increases in firm size.

[Table 6 here]

In summary, firms borrowing from banks more exposed to the bail-in suffered a significant credit contraction from these banks, but were more likely to start a new lending relationship and were able to replace the reduced credit by borrowing from other (less exposed) banks.

5.2 Bank resolution and price effects

We have mainly focused so far on the consequences of the supply shock on credit quantities. Nevertheless, the resolution may have also impacted the interest rates charged on new

loans and credit lines. Santos (2011), for instance, finds that relatively large firms that had relationships with less healthy lenders before the subprime crisis paid relatively higher loan spreads afterwards, while Bord and Santos (2014) show that banks that were under more liquidity pressure during the financial crisis charged higher fees for granting credit lines. This issue is particularly relevant in our case given that more exposed firms started new lending relationships after the shock to compensate for the credit contraction. 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 Table 7 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 new loans. In detail, here we investigate the firm-specific change in the loan-amount-weighted interest rates for either new loans (i.e., completely new credit operations) or credit lines (i.e., automatic renewal of credit). Since the interest rate dataset only captures new operations (rather than outstanding amounts), we consider all new loans and credit lines between a firm and a bank between 2013:M4 and 2014:M7 (pre-period) and 2014:M9 and 2015:M9 (post-period) when computing these measures. Compared to Tables 4, 5 and 6, 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.

[Table 7 here]

The coefficient estimates for the regressions on interest rate changes in new credit operations (columns 1 to 4) do not show any statistically significant coefficient except for large enterprises. The results in columns (5) to (8), on the other hand, show a statistically significant increase in interest rates on credit lines across all firm-size groups. However, the economic effect is modest: a one standard deviation increase in firm exposure to the bail-in (0.013) is associated with a 30bp increase in the interest rates on credit lines for the average firm. This is consistent with the evidence in Khwaja and Mian (2008) and Cingano, Manaresi, and Sette (2016) which analyze a representative universe of firms in

Pakistan and Italy and find that despite affecting the quantity of credit, bank-level shocks may have no meaningful effects on the interest rates charged.

In line with a moderate tightening of interest rates, the results in Table IA6 in the internet appendix show a relative increase in the share of collateralized credit after the shock for firms more exposed to the bail-in - a 2 percent increase for a one standard deviation increase in firm exposure. For comparison, the share of collateralized credit in the pre-period was on average 60 percent. This effect is consistent across micro, small, medium and large firms. There is also evidence of a decrease in the maturity of new credit for medium-sized firms, but not for the other firm types. In line with higher interest rates, firms exposed to the bail-in thus experienced a tightening of their credit conditions after the shock.

5.3 Bank resolution and real sector effects

What was the impact 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 with somewhat worse conditions. On the other hand, the results also have shown higher uncertainty for the more exposed firms in terms of changing lending institutions as well as possibly (re)-negotiating loan terms and conditions. We therefore turn to investment and employment growth as real sector outcome variables, before finally focusing on firms' cash holdings and trade credit to close the circle.

The results in Table 8 show a relative reduction in investment for firms that were more exposed to the resolution. The dependent variable is the change in the log level of tangible assets for each firm between 2013:Q4 and 2015:Q4.[21] Once we control for firm and bank characteristics (and demand-side factors by including the estimated firm-fixed effects, as well as industry and district fixed effects), we find that a one standard deviation increase in firm exposure to the bail-in is associated with a 2.3 percent relative reduction

[21] Our conclusions do not change when using as dependent variable the change in the log level of fixed assets for each firm (e.g., Bottero, Lenzu, and Mezzanotti, 2017), or when normalizing investment by beginning-of-period assets (e.g., Cingano, Manaresi, and Sette, 2016).

in investment for the average firm. This reduction, however, is only significant for micro, small and mid-sized enterprises. The economic effect also decreases in firm size, with the micro-enterprises being affected more than small enterprises, which in turn were more affected than mid-sized enterprises. This differential effect across firms of different sizes is notable, as it were the medium and large firms that suffered most in terms of credit reduction by banks more exposed to the bail-in (though they were as likely as micro- and small firms to compensate by borrowing from other banks).

[Table 8 here]

The results in Table 9 show a significant and negative relationship between firm exposure to the bail-in and employment. To capture different margins of adjustment, we consider not only the firm-specific log change in the number of employees as outcome variable, but also the log change in the total number of hours worked by all firm employees. Controlling for firm and bank characteristics, we find a 0.6 percent relative drop in both number of employees and hours worked for a one standard deviation increase in exposure to the resolution (columns 1 and 2). This effect for employment, however, is concentrated in small and mid-sized firms and not significant for large enterprises. 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 (2017) 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 9 here]

These dampening effects of the bank resolution on real sector outcomes seem, prima facie, incompatible with the continued access to external funding by the affected firms together with a moderate tightening of credit conditions. A potential explanation for our

findings, however, is that the bank resolution may have undermined firms' confidence in the Portuguese banking sector which led them to increase cash holdings while decreasing investment and employment. We analyze this channel explicitly by looking at the change in cash holdings as a fraction of assets for each firm between 2013:Q4 and 2015:Q4. The results in Table 10 show a significant increase in the share of cash holdings by firms more exposed to the bail-in. This effect is significant for the average firm (column 1) as well as for micro-, small, and mid-sized enterprises (columns 2 to 4). In economic terms, a one standard deviation in firm exposure to the bail-in (0.014) results in a relative change in the share of cash to assets of 0.185 percent, which corresponds to a 35 percent increase in relation to the mean change.

Finally, in columns in columns (5) to (8) of Table 10 we investigate further why large firms were the only corporations among those more exposed to the resolution that were able to keep investment, employment and cash holdings levels. Specifically, we show that unlike SMEs, large firms were able to significantly increase funding from their suppliers. While this result is hard to reconcile with the important role of trade credit as an alternative source of external finance to SMEs during the crisis (Carbó-Valverde, Rodríguez-Fernández, and Udell, 2016), it is not uncommon to observe large firms with potential access to international capital markets funding themselves with trade credit from small, constrained suppliers (Giannetti, Burkart, and Ellingsen, 2011; Murfin and Njoroge, 2015). Klapper, Laeven, and Rajan (2012) also show that large, creditworthy firms not only borrow from but also receive the most favorable trade credit terms from smallest suppliers, while Murfin and Njoroge (2015) find that smaller, financially constrained firms reduce investment when forced to extend longer maturity trade credit.

Combining these findings with the previous results that credit supply was not reduced, our results suggest that the lower investment and employment at more exposed SMEs were indeed caused, at least partially, by shifts of external funding resources into cash holdings. Large firms borrowing from banks more exposed to the bail-in, on the other hand, kept the same share of liquid assets while increasing their (potentially cheaper) funding via trade credit from suppliers. This can explain why the latter firms were able to keep both investment and employment levels after the resolution.

[Table 10 here]

In summary, the results in Tables 8, 9 and 10 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 these enterprises using the existing loan resources for cash hoarding purposes while at the same time cutting back on investment and employment. Economic theory suggests this might have been higher precautionary cash holdings following an increase in uncertainty for the exposed firms, both in terms of funding sources and the broader economic repercussions of taking future funding.

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 the bail-in significantly reduced credit supply after the shock but that affected firms were able to compensate this credit contraction with other sources of funding, including new lending relationships. On the other hand, 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. We explain this disconnect between financial and real sector effects with higher uncertainty following the sudden failure and resolution of a major Portuguese bank, pushing borrowers to more precautionary cash holdings.

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. Our results thus confirm the critical importance of a sound banking system for the real economy.

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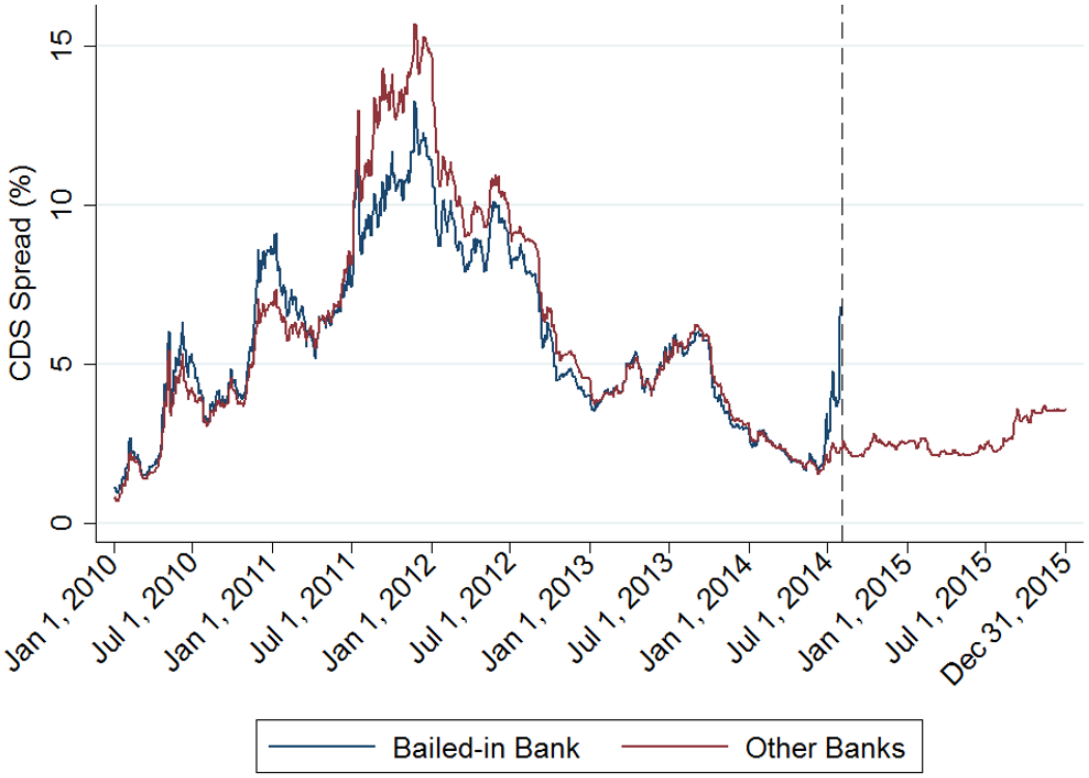

Figure 1: Evolution of bank CDS spreads over time. This figure plots daily 5-year CDS spreads on senior unsecured debt between January 1, 2010 and December 31, 2015. The resolution occurred in August 2014 (dashed vertical line). CDS spreads for the group "Other Banks" are computed as the equal-weighted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

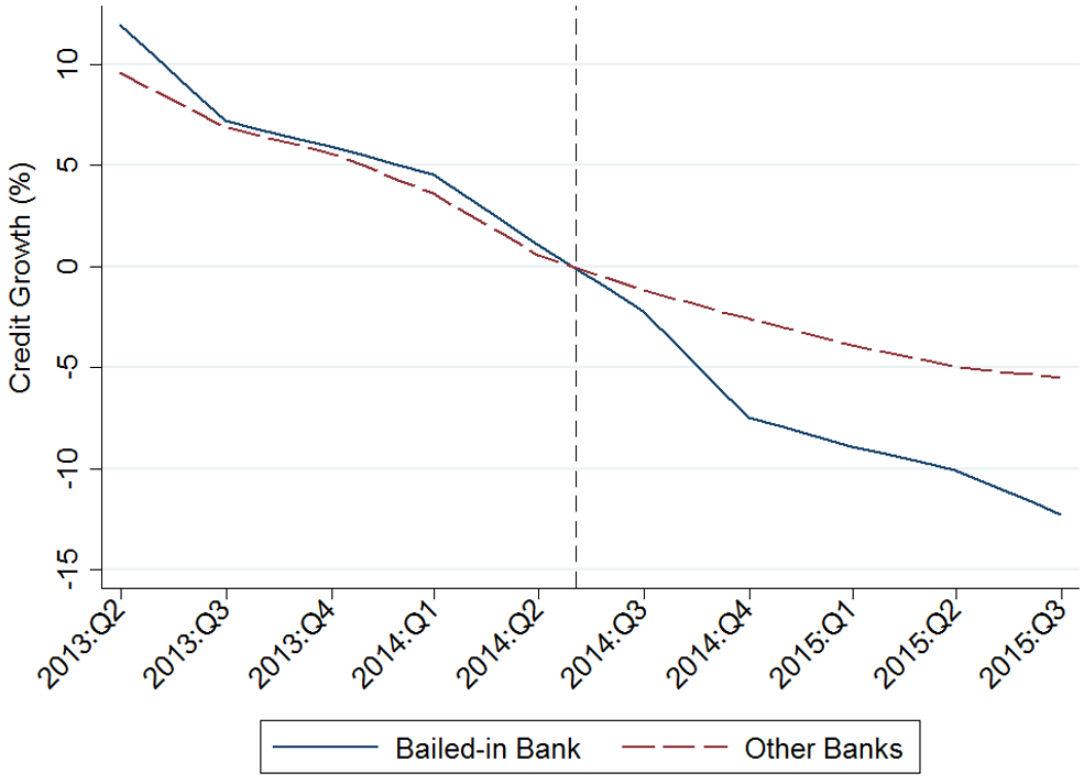

Figure 2: Evolution of credit over time. This figure plots the evolution of credit between 2013:Q2 and 2015:Q3. Growth rates are relative to August 2014 when the resolution occurred (dashed vertical line). Total credit for the group "Other Banks" is computed as the sum of the credit exposures of Caixa Geral de Depositos, Banco BPI and Banco Millennium BCP in each period. Therefore, the banks considered in the figure correspond to the four significant institutions (SIs) operating in Portugal as defined by the ECB under the Single Supervisory Mechanism. All figures are based on publicly-available, unconsolidated financial statements at a quarterly frequency. Source: Supervised institutions' official accounts (https://www.bportugal.pt/en/contas-oficiais-de-entidades-supervisionadas).

Table 1: Summary statistics

	N	Mean	SD	Min	Max
Dependent variables:					
Log Change in Credit	48,858	-0.006	0.526	-5.216	5.652
New Lending Relationship	48,858	0.235	0.424	0.000	1.000
Log Change in Investment	48,858	-0.042	1.012	-14.83	14.74
Log Change in No. Employees	48,858	0.034	0.441	-4.419	4.615
Log Change in Total Hours Worked	48,858	0.028	0.668	-10.07	9.559
Change in Cash Holdings to Assets	48,858	0.005	0.122	-0.969	0.952
Change in Interest Rates on New Loans	25,848	-0.005	0.048	-0.290	0.282
Change in Interest Rates on Credit Lines	22,673	-0.005	0.041	-0.283	0.298
Firm characteristics:					
Firm Exposure	48,858	0.008	0.014	0.000	0.068
Number of Bank Relationships	48,858	3.939	2.235	2.000	29.00
SMEs	48,858	0.986	0.119	0.000	1.000
Large Firms	48,858	0.014	0.119	0.000	1.000
Firm Size	48,858	13.33	1.548	9.158	17.10
Firm Age	48,858	2.611	0.786	0.000	4.143
Firm Capital	48,858	0.243	0.465	-3.765	0.962
Firm ROA	48,858	-0.010	0.158	-1.381	0.432
Firm Liquidity	48,858	2.272	3.846	0.057	44.28
Bank characteristics:					
Bank Size	48,858	16.74	1.501	10.47	18.55
Bank ROA	48,858	-0.003	0.009	-0.093	0.042
Bank Capital	48,858	0.074	0.031	-0.417	0.339
Bank Liquidity	48,858	0.118	0.074	0.004	0.823
Bank NPLs	48,858	0.067	0.034	0.010	0.470

The table presents the relevant firm-level summary statistics computed using the bank-firm matched sample. Change in credit is the change in the log level of total committed credit for each firm. To construct this measure, the quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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. Log change in investment (i.e., tangible assets) and in employment (i.e., no. employees and total hours worked) are the firm-specific changes in the log level of the respective variables between 2013:Q4 and 2015:Q4. Change in cash holdings to assets (cash holdings divided by total assets) is also computed between 2013:Q4 and 2015:Q4. Change in interest rates (in percentage) refer to the firm-level change in the loan-amount-weighted interest rates on new credit operations and credit lines. Since the interest rate dataset only captures new credit operations (rather than outstanding amounts), we consider all new loans and credit lines for each firm between 2013:M4 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, and the bank-specific contribution to the Bank Resolution Fund as of August 2014 (as a percentage of assets) for all other banks. 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 (equity to total assets) and liquidity (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

Dep Var: $\Delta logCredit_{bi}$	(1)	(2)	(3)	(4)	(5)
Bank Exposure	-0.425	-3.003***			
	(0.538)	(0.384)			
Bank Exposure × Micro Firms			-2.856***		
			(0.392)		
Bank Exposure × Small, Med. & Large Firms			-3.080***		
			(0.406)		
Bank Exposure × Micro & Small Firms				-2.823***	
				(0.396)	
Bank Exposure × Medium & Large Firms				-3.583***	
				(0.394)	
Bank Exposure × SMEs					-2.907***
					(0.385)
Bank Exposure × Large Firms					-5.101***
					(0.433)
Bank Size		0.049***	0.049***	0.049***	0.049***
		(0.013)	(0.013)	(0.013)	(0.013)
Bank ROA		-8.754***	-8.752***	-8.748***	-8.751***
		(2.148)	(2.148)	(2.149)	(2.149)
Bank Capital Ratio		0.750	0.750	0.751	0.752
		(0.774)	(0.774)	(0.774)	(0.774)
Bank Liquidity Ratio		0.973***	0.972***	0.972***	0.972***
		(0.254)	(0.254)	(0.254)	(0.254)
Bank NPLs		-0.632	-0.631	-0.631	-0.632
		(0.597)	(0.597)	(0.597)	(0.597)
No. Observations	142,469	142,469	142,469	142,469	142,469
No. Firms	48,858	48,858	48,858	48,858	48,858
No. Banks	114	114	114	114	114
Adj. R^2	0.035	0.063	0.063	0.063	0.063
No. Bank Relationships >1	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y

The table presents estimation results of the within-firm specification (1) where 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:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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, and the bank-specific contribution to the Bank Resolution Fund as of August 2014 (as a percentage of assets) for all other banks. 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

Dep Var: $\Delta logCredit_{bi}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bank Exposure	0.280	-1.869***	-3.006***	-3.178***	-3.020***	-2.320***	-3.028***	-2.738***	-3.228***	-4.334***
	(0.868)	(0.592)	(0.385)	(0.383)	(0.408)	(0.407)	(0.385)	(0.492)	(0.407)	(0.418)
Bank Exposure × Firm Assets	-0.228***									
	(0.060)									
Bank Exposure × Firm Age		-0.394***								
		(0.141)								
Bank Exposure × Firm ROA			-0.641							
			(0.979)							
Bank Exposure × Firm Capital				0.660**						
				(0.317)						
Bank Exposure × Firm Liquidity					0.008					
					(0.021)					
Bank Exposure × Firm Main Lender						-1.957***				
						(0.391)				
Bank Exposure × Firm Interest Coverage							0.073*			
							(0.037)			
Bank Exposure × Firm Loan Interest Rate								-0.037		
								(0.024)		
Bank Exposure × Firm Loan Maturity									0.024***	
									(0.008)	
Bank Exposure × Firm Loan Collateral										1.925***
										(0.349)
No. Observations	142,469	142,469	142,469	142,469	142,469	142,469	132,154	108,277	108,277	108,277
No. Firms	48,858	48,858	48,858	48,858	48,858	48,858	44,372	34,105	34,105	34,105
No. Banks	114	114	114	114	114	114	114	114	114	114
Adj. R^2	0.063	0.063	0.063	0.063	0.063	0.064	0.064	0.059	0.059	0.060
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
No. Bank Relationships >1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	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 several firm characteristics. 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:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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, and the bank-specific contribution to the Bank Resolution Fund as of August 2014 (as a percentage of assets) for all other banks. 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 (log of total assets), firm age (ln(1+age)), firm ROA (net income to total assets), firm capital (equity to total assets), firm liquidity (current assets to current liabilities) and firm interest coverage (gross profit over interest expense on loans) are all measured as at 2013:Q4. Firm Main Lender is a dummy variable equal to 1 if the bailed-in bank is the main lender of the firm in the pre period, and 0 otherwise. Firm loan interest rate, maturity and collateral refer to the loan-weighted respective amounts when considering all new loans to each firm by all banks between 2013:M4 and 2014:M7. 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

Dep Var: $\Delta logCredit_i$	(1)	(2)	(3)	(4)	(5)
Firm Exposure	-0.144	-0.052			
	(0.306)	(0.342)			
Firm Exposure × Micro Firms			-0.294		
			(0.298)		
Firm Exposure × Small, Med. & Large Firms			0.189		
			(0.411)		
Firm Exposure × Micro & Small Firms				-0.135	
				(0.371)	
Firm Exposure × Medium & Large Firms				0.448	
				(0.259)	
Firm Exposure × SMEs					-0.049
					(0.337)
Firm Exposure × Large Firms					-0.169
					(0.742)
Firm Size		0.000	-0.001	-0.001	0.000
		(0.003)	(0.003)	(0.004)	(0.003)
Firm Age		-0.062***	-0.062***	-0.062***	-0.062***
		(0.003)	(0.003)	(0.003)	(0.003)
Firm ROA		0.176***	0.177***	0.176***	0.176***
		(0.038)	(0.038)	(0.039)	(0.038)
Firm Capital		0.036***	0.036***	0.036***	0.036***
		(0.009)	(0.009)	(0.010)	(0.009)
Firm Liquidity		-0.003***	-0.003***	-0.003***	-0.003***
		(0.001)	(0.001)	(0.001)	(0.001)
Firm Credit Demand	0.616***	0.601***	0.601***	0.601***	0.601***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
No. Observations / Firms	48,858	48,858	48,858	48,858	48,858
Adj. R^2	0.407	0.419	0.419	0.419	0.419
Bank Controls	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variable is the change in the log level of total committed credit for each firm. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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 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 1 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: Extensive margin – new lending relationships

Dep Var: *New lending relationship*$_i$	(1)	(2)	(3)	(4)	(5)	(6)
Firm Exposure	0.992**	0.714**				
	(0.350)	(0.265)				
High Firm Exposure			0.037***			
			(0.007)			
Low Firm Exposure			0.024***			
			(0.008)			
Firm Exposure × Micro Firms				-0.153		
				(0.268)		
Firm Exposure × Small, Med. & Large Firms				1.577***		
				(0.388)		
Firm Exposure × Micro & Small Firms					0.548*	
					(0.308)	
Firm Exposure × Medium & Large Firms					1.716***	
					(0.375)	
Firm Exposure × SMEs						0.735**
						(0.284)
Firm Exposure × Large Firms						-0.066
						(1.199)
No. Observations / Firms	48,858	48,858	48,858	48,858	48,858	48,858
Adj. R^2	0.013	0.037	0.037	0.038	0.037	0.037
Firm Controls	N	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variable is a dummy 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 (2013:Q2-2014:Q2), and 0 otherwise. 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. High Firm Exposure is a dummy variable equal to 1 if the bailed-in bank was the main lender of the firm before the shock, and 0 otherwise. Low Firm Exposure is a dummy variable equal to 1 if the firm had at least one loan with the bailed-in bank before the resolution but this was not the firm's main bank, and 0 otherwise. Firm size categories are defined according to the EU Recommendation 2003/361. 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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: Credit supply from less exposed banks and firm size

Dep Var: $\Delta logCredit_i$ *(except the bailed-in bank)*	(1)	(2)	(3)	(4)	(5)
Firm Exposure	3.973***	4.060***			
	(0.449)	(0.410)			
Firm Exposure × Micro Firms			2.794***		
			(0.410)		
Firm Exposure × Small, Med. & Large Firms			5.318***		
			(0.457)		
Firm Exposure × Micro & Small Firms				3.688***	
				(0.408)	
Firm Exposure × Medium & Large Firms				6.298***	
				(0.545)	
Firm Exposure × SMEs					4.024***
					(0.414)
Firm Exposure × Large Firms					5.374***
					(0.871)
No. Observations / Firms	48,858	48,858	48,858	48,858	48,858
Adj. R^2	0.351	0.362	0.363	0.363	0.362
Firm Controls	N	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variable is the firm-level change in the log level of total committed credit from all banks except the bailed-in bank. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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 interest rates

	Δ Loan-amount-weighted Interest Rates on:							
	New loans				Credit lines			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-0.011				0.226***			
	(0.032)				(0.052)			
Firm Exposure × Micro Firms		0.008				0.244***		
		(0.034)				(0.065)		
Firm Exposure × Small, Med. & Large Firms		-0.026				0.214***		
		(0.038)				(0.045)		
Firm Exposure × Micro & Small Firms			-0.024				0.203***	
			(0.032)				(0.056)	
Firm Exposure × Medium & Large Firms			0.057				0.341***	
			(0.045)				(0.046)	
Firm Exposure × SMEs				-0.019				0.222***
				(0.032)				(0.052)
Firm Exposure × Large Firms				0.208***				0.366***
				(0.048)				(0.085)
No. Observations / Firms	25,848	25,848	25,848	25,848	22,673	22,673	22,673	22,673
Adj. R^2	0.079	0.079	0.079	0.079	0.110	0.110	0.110	0.110
Firm and Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan Characteristics	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

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 for either new loans (i.e., completely new credit operations) or credit lines (i.e., automatic renewal of credit). Since the interest rate dataset only captures new operations (rather than outstanding amounts), we consider all new loans and credit lines between a firm and a bank between 2013:M4 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. 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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 investment

Dep Var: $\Delta logInvestment_i$	(1)	(2)	(3)	(4)	(5)
Firm Exposure	-1.617***	-1.601***			
	(0.192)	(0.274)			
Firm Exposure × Micro Firms			-2.183***		
			(0.208)		
Firm Exposure × Small, Med. & Large Firms			-1.021***		
			(0.295)		
Firm Exposure × Micro & Small Firms				-1.744***	
				(0.249)	
Firm Exposure × Medium & Large Firms				-0.736*	
				(0.399)	
Firm Exposure × SMEs					-1.629***
					(0.278)
Firm Exposure × Large Firms					-0.539
					(1.238)
No. Observations / Firms	48,858	48,858	48,858	48,858	48,858
Adj. R^2	0.027	0.040	0.040	0.040	0.040
Firm Controls	N	Y	Y	Y	Y
Credit Demand	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y

The table presents estimation results of the between-firm specification (2) where the dependent variable is the change in the log level of tangible 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 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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 employment

	$\Delta logEmployees_i$				$\Delta logTotalHoursWorked_i$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-0.450***				-0.445**			
	(0.115)				(0.204)			
Firm Exposure × Micro Firms		0.201				0.175		
		(0.350)				(0.338)		
Firm Exposure × Small, Med. & Large Firms		-1.097***				-1.060***		
		(0.102)				(0.115)		
Firm Exposure × Micro & Small Firms			-0.451***				-0.432*	
			(0.129)				(0.223)	
Firm Exposure × Medium & Large Firms			-0.444***				-0.522	
			(0.152)				(0.407)	
Firm Exposure × SMEs				-0.469***				-0.468**
				(0.114)				(0.209)
Firm Exposure × Large Firms				0.259				0.428
				(0.380)				(0.452)
No. Observations / Firms	48,858	48,858	48,858	48,858	48,858	48,858	48,858	48,858
Adj. R^2	0.061	0.061	0.061	0.061	0.042	0.042	0.042	0.042
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

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 total no. hours worked 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 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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: Firm exposure to the bail-in, cash holdings and trade credit

	$\Delta CashHoldings/TA_i$				$\Delta logTradeCredit_i$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	0.129***				0.480			
	(0.028)				(0.296)			
Firm Exposure × Micro Firms		0.113***				-0.323		
		(0.025)				(0.302)		
Firm Exposure × Small, Med. & Large Firms		0.144***				1.220*		
		(0.046)				(0.657)		
Firm Exposure × Micro & Small Firms			0.117***				0.041	
			(0.027)				(0.257)	
Firm Exposure × Medium & Large Firms			0.200***				2.978***	
			(0.050)				(1.005)	
Firm Exposure × SMEs				0.134***				0.400
				(0.029)				(0.295)
Firm Exposure × Large Firms				-0.067				3.336***
				(0.073)				(1.073)
No. Observations / Firms	48,858	48,858	48,858	48,858	48,858	48,858	48,858	48,858
Adj. R^2	0.008	0.008	0.008	0.008	0.021	0.021	0.021	0.021
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

The table presents estimation results of the between-firm specification (2) where the dependent variable is the change in cash holdings to 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 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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.

Internet Appendix

Sharing the Pain? Credit Supply, Lending Relationship Dynamics and the Real Effects of Bank Bail-ins

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Table IA1: Credit supply and firm size – within-firm estimates (robustness tests)

	$\Delta logCredit_{bi}$				$\Delta \%Credit_{bi}$				$\Delta logCredit_{bi}$ *(without unused credit lines)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Bank Exposure	-2.821***				-2.812***				-2.455***			
	(0.351)				(0.359)				(0.427)			
Bank Exposure × Micro Firms		-2.893***				-3.130***				-2.298***		
		(0.353)				(0.367)				(0.440)		
Bank Exposure × S., M. & Large Firms		-2.756***				-2.619***				-2.539***		
		(0.386)				(0.385)				(0.460)		
Bank Exposure × Micro & Small Firms			-2.695***				-2.870***				-2.254***	
			(0.351)				(0.362)				(0.436)	
Bank Exposure × Med. & Large Firms			-3.407***				-2.600***				-3.152***	
			(0.376)				(0.399)				(0.505)	
Bank Exposure × SMEs				-2.757***				-2.822***				-2.399***
				(0.351)				(0.360)				(0.426)
Bank Exposure × Large Firms				-4.695***				-2.580***				-3.964***
				(0.412)				(0.473)				(0.994)
No. Observations	190,340	190,340	190,340	190,340	168,569	168,569	168,569	168,569	126,141	126,141	126,141	126,141
No. Firms	96,729	96,729	96,729	96,729	56,699	56,699	56,699	56,699	43,528	43,528	43,528	43,528
No. Banks	114	114	114	114	114	114	114	114	114	114	114	114
Adj. R^2	0.062	0.062	0.062	0.062	0.086	0.086	0.086	0.086	0.076	0.076	0.076	0.076
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
No. Bank Relationships >1	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
LSS (Location-Sector-Size) FE	Y	Y	Y	Y	Y	N	N	N	N	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 (columns 1-4), the growth in total committed credit between each firm-bank pair (columns 4-8), or the change in the log level of total credit (without considering unused credit lines) between each firm-bank pair (columns 9-12). The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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, and the bank-specific contribution to the Bank Resolution Fund as of August 2014 (as a percentage of assets) for all other banks. 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 (1) to (4) we control for credit demand by replacing the firm fixed-effect in the within-firm regressions by a group (LSS: 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 (loans vs. credit lines)

	$\Delta logCredit_{bi}$ *(without used and unused credit lines)*				$\Delta CreditLines_{bi}$ *(used and unused CL)*				$\Delta logCreditLines_{bi}$ *(used CL only)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Bank Exposure	-3.240***				-1.464**				-1.051			
	(0.463)				(0.664)				(0.870)			
Bank Exposure × Micro Firms		-3.642***				-0.537				-0.949		
		(0.499)				(0.664)				(0.831)		
Bank Exposure × S., M. & Large Firms		-3.063***				-1.798***				-1.092		
		(0.519)				(0.664)				(0.910)		
Bank Exposure × Micro & Small Firms			-3.096***				-1.189*				-1.123	
			(0.440)				(0.677)				(0.827)	
Bank Exposure × Med. & Large Firms			-3.637***				-2.134***				-0.842	
			(0.721)				(0.689)				(1.093)	
Bank Exposure × SMEs				-3.145***				-1.353**				-1.123
				(0.453)				(0.666)				(0.861)
Bank Exposure × Large Firms				-5.291***				-3.275***				0.846
				(1.055)				(0.800)				(1.480)
No. Observations	95,275	95,275	95,275	95,275	67,288	67,288	67,288	67,288	46,968	46,968	46,968	46,968
No. Firms	34,022	34,022	34,022	34,022	24,545	24,545	24,545	24,545	17,432	17,432	17,432	17,432
No. Banks	114	114	114	114	112	112	112	112	108	108	108	108
Adj. R^2	0.030	0.030	0.030	0.030	0.062	0.062	0.062	0.062	0.132	0.132	0.132	0.132
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
No. Bank Relationships >1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	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 1-4), the change in the log level of total committed credit lines between each firm-bank pair (columns 4-8), or the change in the log level of used credit lines between each firm-bank pair (columns 9-12). The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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, and the bank-specific contribution to the Bank Resolution Fund as of August 2014 (as a percentage of assets) for all other banks. 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 (robustness tests 1 and 2)

	Alternative Firm Exposure measure				*LSS sample with firms with only 1 bank*			
Dep Var: $\Delta logCredit_i$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-0.011				-0.264			
	(0.022)				(0.243)			
Firm Exposure × Micro Firms		-0.023				-0.399*		
		(0.021)				(0.195)		
Firm Exposure × Small, Med. & Large Firms		0.001				0.033		
		(0.023)				(0.461)		
Firm Exposure × Micro & Small Firms			-0.017				-0.240	
			(0.024)				(0.242)	
Firm Exposure × Medium & Large Firms			0.027				-0.578	
			(0.018)				(0.451)	
Firm Exposure × SMEs				-0.010				-0.262
				(0.021)				(0.244)
Firm Exposure × Large Firms				-0.015				-0.410
				(0.048)				(0.517)
No. Observations / Firms	48,858	48,858	48,858	48,858	96,729	96,729	96,729	96,729
Adj. R^2	0.419	0.419	0.419	0.419	0.164	0.164	0.164	0.164
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

The table presents estimation results of the between-firm specification (2) where the dependent variable is the change in the log level of total committed credit for each firm. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. In columns (1) to (4), Firm Exposure is defined as the average firm-level credit volume with the bailed-in bank in the pre period weighted by the firm's total credit volume across all banks. In columns (5) to (8), 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. 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand in columns (1) to (4) is the vector of firm-level dummies estimated in the within-firm regression with firm fixed-effects (Table 2), and in columns (5) to (8) is the vector of firm-level dummies estimated in the within-firm regression with group (LSS - location-sector-size) fixed-effects (Table IA1). 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 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 (robustness tests 3 and 4)

	$\Delta logCredit_i$ *(2013:Q4-2015:Q3)*				$\Delta logCredit_i$ *(without used and unused CL)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-0.396				-0.167			
	(0.822)				(0.493)			
Firm Exposure × Micro Firms		-0.817				-0.426		
		(0.711)				(0.525)		
Firm Exposure × Small, Med. & Large Firms		-0.057				0.094		
		(0.935)				(0.528)		
Firm Exposure × Micro & Small Firms			-0.347				-0.150	
			(0.832)				(0.525)	
Firm Exposure × Medium & Large Firms			-0.641				-0.278	
			(0.989)				(0.338)	
Firm Exposure × SMEs				-0.396				-0.195
				(0.825)				(0.487)
Firm Exposure × Large Firms				-0.415				0.973
				(1.192)				(1.776)
No. Observations / Firms	37,906	37,906	37,906	37,906	34,022	34,022	34,022	34,022
Adj. R^2	0.466	0.466	0.466	0.466	0.227	0.227	0.227	0.227
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

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 for each firm between 2013:Q4 and 2015:Q3 (columns 1-4) and the change in the log level of total credit without considering used and unused credit lines (columns 5-8). In columns (5) to (8), the quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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 heterogeneity in credit supply – cross-sectional estimates

Dep Var: $\Delta logCredit_i$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-0.112	-0.194	-0.043	0.166	0.078	-0.254	-0.854	-0.111
	(0.333)	(0.305)	(0.357)	(0.454)	(0.279)	(0.196)	(0.527)	(0.442)
Firm Exposure × Firm Capital	0.120**							
	(0.043)							
Firm Exposure × Firm Cash Holdings		0.379*						
		(0.189)						
Firm Exposure × Firm Current Ratio			-0.023					
			(0.187)					
Firm Exposure × Firm Age				-0.327				
				(0.280)				
Firm Exposure × Firm Interest Coverage					-0.249			
					(0.192)			
Firm Exposure × Firm Loan Interest Rate						-0.091		
						(0.364)		
Firm Exposure × Firm Loan Maturity							0.037	
							(0.487)	
Firm Exposure × Firm Loan Collateral								-0.444
								(0.452)
No. Observations / Firms	48,858	48,858	48,858	48,858	44,372	34,105	34,105	34,105
Adj. R^2	0.419	0.419	0.419	0.419	0.416	0.410	0.412	0.409
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

The table presents estimation results of the between-firm specification (2) but with Firm Exposure interacted with several firm-level characteristics. The dependent variable is the change in the log level of total committed credit for each firm. The quarterly data for each credit exposure is collapsed (time-averaged) into a single pre (2013:Q2-2014:Q2) and post-shock (2014:Q3-2015:Q3) period of equal duration. 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 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 1 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 credit conditions – maturity and collateral

	$\Delta CreditMaturity_i$				$\Delta ShareCollateralizedCredit_i$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Exposure	-17.053				1.461**			
	(11.595)				(0.623)			
Firm Exposure × Micro Firms		-0.206				1.371**		
		(19.065)				(0.608)		
Firm Exposure × Small, Med. & Large Firms		-31.733***				1.539**		
		(6.974)				(0.637)		
Firm Exposure × Micro & Small Firms			-11.925				1.527**	
			(11.702)				(0.606)	
Firm Exposure × Medium & Large Firms			-46.924*				1.073	
			(25.038)				(0.757)	
Firm Exposure × SMEs				-17.109				1.459**
				(11.628)				(0.628)
Firm Exposure × Large Firms				-15.089				1.536*
				(37.685)				(0.766)
No. Observations / Firms	34,104	34,104	34,104	34,104	34,104	34,104	34,104	34,104
Adj. R^2	0.003	0.003	0.003	0.003	0.017	0.017	0.017	0.017
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

The table presents estimation results of the between-firm specification (2) where the dependent variables are the firm-specific change in maturity (in months; columns 1 to 4) and change in the share of collateralized credit (columns 5 to 8) for all new credit operations i.e., completely new credit operations and automatic renewals of credit. Since the interest rate dataset only captures new credit operations (rather than outstanding amounts), we consider all new loans and credit lines between a firm and a bank between 2013:M4 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. Firm size categories are defined according to the EU Recommendation 2003/361. 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 (equity to total assets) and firm liquidity (current assets to current liabilities). Credit demand is the vector of firm-level dummies estimated in the within-firm regression (Column 1 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.