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Abstract

Using a unique proprietary dataset from a large European commercial bank containing granular loan-level information on credit lines to mid-corporate firms (annual turnover between €150mn and €1bn), we investigate the bank's decisions to allow firms to retain existing credit at a time of acute financial instability. Despite a severe shock to banks' funding, credit availability did not dry up during the Eurozone crisis, thus suggesting that credit rationing for mid-corporates was limited. Our results highlight the importance of bank-firm relationships during crisis times. Firms that did not use the credit facility, that is, with low drawdowns from existing lines of credit, were more likely to be rationed. These results hold even in terms of the actual credit amount. Existing borrowers who actively used their credit lines were not rationed unless they posed an increased credit risk. We do not find evidence of evergreening practices.

JEL Classification: G01; G21; G24.

Keywords: credit lines; liquidity risk; credit risk; sovereign debt crisis; credit rationing.

1. Introduction

Access to bank credit is an important source of external finance for mid-corporate firms, as they often have limited access to capital markets. Yet, during crisis periods, empirical evidence points to decreased loan supply (Kayshap and Stein, 2000; Jiménez *et al.*, 2014), which might disproportionately affect private, more informationally opaque firms (De Young *et al.*, 2015). This asymmetry can be, at least partially, offset in existing lending relationships whereby banks can exploit "soft" information about borrowers.[1] Indeed, relationship lending is not only considered an appropriate tool for bank lending to more opaque, smaller firms, but evidence suggests it could allow banks to continue lending to firms during crisis periods (Gobbi and Sette, 2014; Presbitero *et al.*, 2014; Bolton *et al.*, 2016; Beck *et al.*, 2018). While maintaining bank-firm relationships during periods of financial turbulence might be beneficial to both the bank and the borrowers, it can also generate inefficiencies as it may affect the allocation of credit and result in evergreening, that is the practice of extending credit to troubled borrowers (Caballero *et al.*, 2008; Giannetti, and Simonov, 2013). Emerging evidence indicates that this behaviour, also known as forbearance lending or zombie lending, became widespread in Europe following the financial crisis (Acharya *et al.*, 2019).

In this paper, we investigate the drivers of a bank's decision to renew credit availability to existing borrowers when market liquidity conditions worsen. We investigate two key propositions: (*i*) during crisis periods, the bank values close ties with the firms and aims to preserve existing bank-borrower relationships without compromising on lending standards (*relationship banking*); and (*ii*) during crisis periods, the bank supports otherwise insolvent existing borrowers, thus potentially leading to evergreening (*forbearance lending*).

We address these questions by studying how the bank managed the liquidity shock that occurred in late 2011 and how its subsequent lending decisions affected credit availability for existing

[1] There is a vast literature on relationship lending, which implies an implicit contract between banks and firms to ensure the availability of funds through the lifetime of a project (Boot, 2000; Berger and Udell, 2006). A recent review of this literature is presented by Kysucky and Norden (2016).

borrowers. For EU banks, the late summer of 2011 was a particularly difficult period; the intensification of the Eurozone crisis led international investors to reallocate their portfolios away from Euro area banks.[2] Interbank spreads increased dramatically (see Figure 1). In late August 2011, the 3-month interbank spread on euro markets (Euribor – Eurepo) increased by 33.5 basis points from 0.403% to 0.738%. This increase was sudden and represents a largely unexpected exogenous shock to EU banks, whose cost of funding increased, thereby placing additional stress on already constrained balance sheets.[3]

[Please insert Figure 1 about here]

We employ a unique proprietary dataset from a large European commercial bank containing granular loan-level information on commercial credit lines to mid-corporate firms (defined as firms with an annual turnover between €150mn and €1bn). Mid-corporates are an important market segment for many EU economies; nonetheless, in almost all EU countries these firms sustained greater losses during the crisis, compared to either large or small firms.[4] On the one hand, large corporates are on average less dependent on domestic bank lending and managed to partly compensate for the low growth in the Eurozone by boosting their exports. On the other hand, smaller firms are traditionally less susceptible to macroeconomic fluctuations, relying more on informal finance from family and friends (Lee and Persson, 2016). The mid-corporate segment is thus a perfect setting for our analysis, as it is highly dependent on bank credit and but also less transparent than large corporates, therefore increasing a bank's incentives to invest in the production proprietary "soft" information. Our data allow us to capture this "soft" information and are enhanced by detailed

[2] This sharp reduction in international funding was further exacerbated by a regulatory reform in the US which required money market funds to disclose their portfolios. This led to money market funds cutting their holdings of large time deposits issued by US subsidiaries of large Eurozone banks (Correa *et al.*, 2016).

[3] Because of the severity of the funding shock facing Eurozone banks, the ECB established two Long-Term Refinancing Operations (LTROs), in December 2011 and February 2012.

[4] Eurostat. Industry and Services Statistics. Available at http://ec.europa.eu/eurostat/statistics-explained/index.php/Industry_and_services_statistics_introduced#Small_businesses_and_entrepreneurship.

borrower specific information, including applicants' characteristics used by the bank when assessing the credit application.

The prevailing form of commercial lending is via credit lines, which are arrangements through which customers may borrow and repay at will, subject to a maximum amount granted. Firms pay a fee in exchange for the right to draw on funds when needed.[5] Credit lines can be of two typologies: fully committed (i.e. irrevocable) or uncommitted (i.e. revocable).[6] The existence of financial covenants and the periodic re-evaluation of borrowers' riskiness limit the liquidity insurance provided by credit lines and expose borrowers to the risk of credit rationing. Importantly, banks' revocation of credit lines tends to happen at times of tighter market liquidity, when firms need the credit lines most, as banks increase their monitoring efforts to preserve their financial health (Acharya *et al.*, 2014).

Our goal is to analyse the variation in a bank's lending decisions to a portfolio of existing borrowers following a shock to bank funding. Our analysis comprises several ingredients that help us mitigate identification issues. First, we exploit the shock to bank funding liquidity which took place in August 2011 and we consider credit decisions in the period September 2011 to August 2012. The assumption is that the shock in bank funding does not affect firms' performance independently of the bank during our time-period. To put it another way, we assume that supply-side effects dominate demand-side effects in the initial phase of the financial crisis.[7] Second, we rely on a very detailed loan-level dataset that includes information on the entire population of credit applications and renewals for our specific bank during the sample period. The richness of the database allows us to capture the "soft" information and to consider firm-specific credit rating and the probability of default, among other characteristics, improving our understanding of banks' credit decisions. Third,

[5] Credit lines are particularly important for corporations, as evidenced by Sufi (2009), who finds that 85% of the US firms he analysed had a line of credit, representing on average 16% of book assets. Consistently, Demiroglu and James (2011) provide evidence that, in the U.S., around 75% of aggregate bank lending to firms arises from credit line drawdowns. Concerning the European market, Campello *et al.*, (2012) show that credit lines accounted for 27% of the total assets of European firms in 2009

[6] Uncommitted credit lines are defined as "revocable" as they allow lenders the discretion to revoke access to further credit drawdowns in bad states of the world. Committed credit lines, on the other hand, can be revoked in case of breach of covenants.

[7] See Duchin *et al.* (2010) for a similar assumption in their analysis of the financial crisis of 2007-08.

one of the key challenges in the literature investigating bank lending is to disentangle the supply of credit from its demand. During crisis periods, both demand and supply of credit might decrease as the same shocks that affect banks can also adversely affect borrowers. Demand may fall because firms revise their investment decisions as the cost of financing increases. Supply may contract as banks face funding liquidity shocks and increase both their lending standards and monitoring efforts to preserve their financial health, as already indicated. The literature has used new loan applications as a tool for the identification of credit availability and has established that, during a crisis, the number of new applications for all types of loans decreases (Puri *et al.*, 2011) and that, for a given number of applications, the percentage of loan approvals decreases (Jiménez *et al.*, 2012). To avoid our results being driven by the decrease both in the number of applications and approvals, we focus on the mandatory annual renewal of credit lines of existing borrowers. This should also help us minimise the asymmetric information problems that are put forward to explain the increasing wedge between loan supply and demand during crisis times and allow us to identify the drivers of the lender's decision to extend, reduce or revoke credit lines. Finally, by focusing on all existing borrowers and by exploiting the mandatory internal annual credit monitoring process, we avoid self-selection problems resulting only in firms with specific characteristics applying for and receiving funding during a crisis.

Our results indicate that credit availability did not dry up for mid-corporate private borrowers during the Eurozone crisis, suggesting that credit rationing was limited. These results are in line with the evidence provided by Campello *et al.* (2012) and Ippolito *et al*. (2016), thus indicating that bank-firm relationships are particularly important during crisis times as banks tighten the supply of new loans rather than rationing existing facilities.

We document that credit lines' usage is a significant determinant of credit rationing, with borrowers that use more credit being less likely to be rationed by the bank at the time of credit lines' renewal process. These results hold even in terms of the actual amount rationed (measured as the change in the amount of credit granted to a borrower following the renewal of the credit line). We provide evidence that firms using their credit lines more experience a smaller reduction in the amount

of credit granted. Firms using their credit lines provide banks with valued soft information. This effect, however, is mitigated by rating decreases: the bank is more likely to cut credit to a borrower that is fully using its credit line when the latter experience a rating decrease. We explain this result as follows. When banks face an increased capital charge due to a riskier credit line and an increased probability of the loan becoming non-performing, their incentives to continue investing in the relationship with an existing borrower decrease. We conclude that, when lending to mid-corporates, banks value existing relationships as they have invested in the collection of soft proprietary information. They are therefore less likely to ration existing borrowers who actively use their credit line unless they pose an increased credit risk. In this respect, our results do not provide support to the hypothesis of forbearance lending that may encourage the evergreening of existing bad loans during periods of instability.

We contribute to the literature along several dimensions. First, we contribute to the literature on the role of relationship banking during times of economic and financial crises. This literature uses credit registry data to identify access to credit in a single country and finds that banks are more likely to continue to lend to long-term clients.[8] Our main contribution to this growing literature lies in the possibility to exploit a very detailed proprietary dataset which allows us to use direct measures of a bank's credit decisions. Our results suggest not only that banks are reluctant to reduce credit availability for existing borrowers, but also that the usage of credit lines allows banks to gather more "soft" information and monitor firms' liquidity choices. We build on the work of Ippolito *et al*. (2016) and provide evidence of bank risk management following a shock in bank funding liquidity. Departing from the previous literature that analysed credit line usage in the context of syndicated lending to large corporates (Ivashina and Scharfstein, 2010; Acharya *et al*., 2019), we focus on credit line renewals to mid-corporates. Subject to firm performance and credit line usage, banks do not credit ration existing borrowers during a crisis. This evidence is in line with Campello *et al*. (2012)

[8] See Puri *et al.* (2011) for Germany; Jiménez *et al.* (2012) for Spain; Iyer *et al*. (2014) for Portugal; Gobbi and Sette (2014) and Sette and Gobbi (2015) for Italy.

and Beck *et al*. (2018) and suggests that bank-firm relationships in Europe are valuable to firms as they help them to minimise the risk of having their credit rationed when it is needed the most.

The rest of the paper is organised as follows. Section 2 reviews the previous literature and derives the testable hypotheses; Section 3 describes the credit renewal process, as it is central to our investigation, together with a quick glance at the rating process. Section 4 illustrates the data at our disposal and Section 5 presents our empirical approach. In Section 6 we discuss our baseline results, while in Section 7 we provide robustness tests. Section 8 concludes.

2. Prior Literature and Hypotheses Development

2.1 Relationship Banking

The literature on relationship banking has provided extensive evidence on how credit relationships could benefit the bank's borrowers and, at least partially, insulate borrowers from the occurrence of a credit crunch (Berger and Udell, 1995; Presbitero *et al.,* 2014; Bolton *et al.,* 2016; Beck *et al.,* 2018). The literature also emphasises several factors in determining the importance of the credit relationship: for smaller, more informationally opaque firms the value of soft information is higher compared to larger and more transparent firms (Boot, 2000; Cornée, 2017). Ferri *et al*. (2019) find that firms' export prospects improve when their bank has access to soft information, particularly for informationally opaque firms. The authors provide support to the use of relationship banking technologies and conclude that, following an external shock, banks' ability to correctly establish borrowers' risk class – due to access to soft information – can mitigate the shock transmission to the real sector. Other studies show that the scope of relationship banking in terms of the number of products the firm has with the bank increases soft information production and therefore has a beneficial effect on rationing probabilities (Cahn *et al.*, 2018). Finally, Agarwal and Hauswald (2010) illustrate the impact of physical distance on the acquisition and use of private information in informationally opaque credit markets and show that borrower-bank proximity facilitates the

collection of soft information leading to greater availability of credit. Based on the relationship banking literature, we envisage that the bank will value the access to soft information in times of crisis, and therefore will be reluctant to curtail the flow of information as it allows them to better predict the company's future outcomes. On the other hand, the bank's access to soft information might make it more likely they will decrease access to funding to firms with poorer potential prospects, not yet reflected in the firms' accounts. Accordingly, we formulate the following hypothesis.

H1: The bank reduces credit availability less when it has a close lending relationship with the borrower.

2.2 Forbearance Lending

The second of our empirical predictions focuses on the role of borrowers' creditworthiness changes in the bank's decision to reduce credit availability. In this context, we assume that the worsening of the borrower's position is firm-specific. The literature on forbearance lending focuses on its negative economic consequences, as it distorts credit allocation by funding low productivity firms and limiting access to credit to new borrowers (Caballero *et al.*, 2008). Recent studies show that the practice of lending to zombie firms, defined as existing borrowers that have persistent problems, have hampered the post-crisis economic recovery in the Eurozone (Adalet McGowan *et al.*, 2018; Acharya *et al*., 2019). Nevertheless, forbearance lending could be beneficial if firms face temporary difficulties and can help them survive a period of weak demand. The intuition for this prediction is straightforward: banks actively manage credit risk and are likely to tighten credit standards during crises. Hence, banks are more likely to reduce credit availability when borrowers face a decrease in their credit rating evaluation. However, banks may choose not to credit ration existing borrowers, despite the worsening of credit standards, which may lead to the evergreening of

bad loans. Banks have fewer incentives to ration struggling firms as the latter may fail and the loan may not be repaid therefore leading to bank losses (Giannetti and Simonov, 2013). Based on this stream of the literature, we formulate the following hypothesis.

H2: The bank reduces credit availability less when it has a close lending relationship with the borrower, even when the borrower faces a decrease in rating.

3. The Credit Renewal Process and Internal ratings

The bank's existing borrowers undergo an annual process of credit monitoring aimed at assessing both their credit structure and their creditworthiness/needs. During this process, the bank can review its past credit decisions, either confirming the credit previously granted or revising it.
The key step in the credit renewal process is the rating attribution process, resulting in the production of a borrower's updated rating, which is then attached to the credit application. The bank uses a hybrid credit scoring process in which the borrower's final rating depends on quantitative as well as qualitative information. Quantitative information is obtained from the borrower's financial statements and future business plans, where available. This generates a *statistical rating* by the bank's credit scoring tool, which reflects the firm's financials and it is entirely based on hard information. In addition, through interviews and plant visits, the loan officer also collects soft information. The final output is represented by the generation and attribution of a *final rating* to a given borrower, composed of maximum fifteen rating notches (subdivided into three macro rating classes) defined according to the creditworthiness of the borrower, where the fifteenth notch represents the riskiest one and it is equivalent to an S&P's rating judgment of CCC.

If both quantitative and qualitative parameters are unvaried, the credit renewal process ends with a confirmation of the status quo in the current lines of credit. When one or more of such parameters mutate, among other possibilities, in terms of (i) creditworthiness deterioration/improvement; (ii) under/over usage of existing credit lines; (iii) pricing uncorrelated

with updated credit risk; (iv) new credit needs; the loan officer has the possibility to propose a modification of the current credit structure, by increasing or rationing borrower's credit lines, subject to approval by the bank officer with the proper loan approving authority.

4. Data, Sample, and Variables

4.1 Data & Sample

Data are consistently collected across a sample of credit folders reflecting mid-corporate loan applications managed by the Corporate and Investment Banking (CIB) Division of a major European banking group from September 2011 to September 2012, i.e. during the peak of the sovereign debt crisis. According to the bank policy rules, the mid-corporate segment is populated by those firms generating an annual turnover between €150 million and €1 billion. While the initial sample includes all (approved and non-approved) credit lines applications from both new and existing borrowers,[9] we restrict the dataset to include only those observations relevant to our analysis. Firstly, since we want to examine how the bank behaves at the time of the renewal of credit line applications of existing borrowers, we proceed to drop new borrowers from the sample of loan applications. Secondly, we exclude from our sample applications related to borrower's intragroup-mergers and to a change in the bank managing the credit relationship within our given banking group. Our final dataset is composed of 400 credit renewals applications. The definition of the variables used in our empirical analysis is provided in the Appendix.

4.2 Credit Line Variables

We present summary statistics for lines of credit in Table 1. At the time of the application for the renewal of the credit line, the average credit granted is €7.57 million (*Granted Amount t*). Even

[9] The approved credit facility includes short-, medium-, and long-term financing granted by the bank to a given borrower, including both uncommitted and committed lines of credit.

though the median amount is only €2.08 million, these values are considerably larger than those reported in studies on small firms in Europe (see, for example, Kirschenmann, 2016). Table 1 shows that the average (median) credit granted by the bank marginally decreases after the renewal process (*Granted Amount t+1)*. In fact, the average (median) credit is €7.52 million (€2 million). We measure the change in credit availability resulting from the credit renewal process as the revision (upwards or downwards) of the bank's past credit decisions (*ΔGranted Amount t+1*). The average (median) change in the credit extended by the bank is a negative €145 thousand (€0), corresponding to about 5.4% of the credit previously granted to the firm (*ΔGranted t+1*). Studying smaller firms, Kirschenmann (2016) finds that the granted loan amount is 92% of the requested loan amount. Overall, our data indicate that credit availability did not dry up during the sovereign debt crisis thus suggesting that credit rationing for mid-corporates was limited. However, several firms face a reduction in their credit lines: we find that about 37% of the sample firms are partially or totally rationed (*Credit Rationed t+1*). Interestingly, the percentage of rationed firms in our sample is comparable to the 35.8% found in Becchetti *et al*. (2011) that study credit rationing during the pre-crisis period, confirming a limited impact of the crisis on corporate outcomes.

In our sample, all credit lines include an uncommitted portion, which in 82.75% of the cases represent the entire line of credit. Indeed, committed credit lines are present in only 17.25% of the observations. It is, therefore, not surprising that the average share of uncommitted (committed) credit lines is 90.08% (9.92%). The average uncommitted granted amount is €5.57 million, while the average committed granted amount is about €1.57 million. So, despite not being very common, committed credit lines are not negligible when existing.

Panel B of Table 1 presents summary statistics for *Unused, Credit Rationed*, and *Binding Credit Rationing*. Contrary to the literature, the table suggests that the unused portion of the credit line is a decreasing function of the rating class. Not surprisingly, we observe more credit rationing for high-risk firms.

[Please insert Table 1 about here]

4.3 Relationship Banking Variables

We present summary statistics for the variables associated with relationship banking in Panel A of Table 2. Regarding the usage of the credit line, we define it as *Used Granted Amount* at time t divided by the *Granted Amount* at time t. We also calculate it as *Unused*, that is the unused portion of the credit line measured as *Granted Amount* at time t minus the *Used Granted Amount* at time t and divided by *Granted Amount* at time t. While the former gives us an indication of the usage of the credit line by the firm, the latter represents the bank exposure to the undrawn part of the commitment and can easily be interpreted as a loan-level liquidity risk indicator. In other words, it is the undrawn part of the credit line that represents the "real" commitment for the bank. Consistent with this view, Ivashina and Scharfstein (2010) document that the threat of drawdown is one of the reasons why banks reduced lending in the aftermath of the great financial crisis of 2007-08.

Looking at credit line usage by firms at the time of the renewal process, we find that borrowers are not financially constrained. Indeed, they are using about 40% (32%) of the credit granted by the bank the previous year on average (median). The drawdown of credit lines in our sample is slightly less than the 44% (50% median) reported by Campello *et al.* (2012) for a sample of private and public European firms in 2009. Looking at the usage of committed and uncommitted credit lines, we observe a substantial difference between the two types. The drawdown is, as expected, high in committed lines (average 80.7%; median 100%), while uncommitted credit lines remain for the most part untapped, with an average usage of 33.64% (median 21.18%).

Size is the log of total assets and proxies for the importance of the relationship for the bank. Lenders may be more reluctant to ration large borrowers either due to the strength of the relationship (Cenni *et al.*, 2015) or because the latter are more transparent, thus decreasing potential information asymmetry issues (Kirschenman, 2016). *Bank Market Share* is the fraction of the borrower's debt issued by the bank and captures the relative importance of the relationship with the bank for the

borrower. The bank issues, on average, about 36.60% of the total debt of the firm, suggesting that the relationship is of primary importance for the firms going through the renewal process. *Scope of relationship* captures the breadth of the bank-firm relationship (Filomeni *et al.*, 2017). In our sample, more than half of the borrowers buy at least one additional product from the bank beside the loan. A growing literature has shown the importance of the effects of geography on financial decisions. Degryse and Ongena (2005) document that distance matters in lending relationships. However, this effect is concentrated among transactional borrowers, for which the loan rates decreasing with the distance between the firm and the lending bank. Relationship borrowers are essentially unaffected by the lender–borrower distance. We compute the physical distance between the borrower's headquarters and the bank branch where the loan officer is located. The variable *Distance* is a binary variable that takes value one if the firm is within 50 kilometers, which corresponds to less than a 1-hour drive, from the bank branch. We find that 48% of the firms are within 50 kilometers of the bank branch.[10]

Finally, we control for group membership (*Group*), which can potentially impact the credit renewal decision in two ways. First, pyramidal structures create incentives for the controlling shareholder to expropriate minority investors through various tunnelling activities, especially during crises when returns from the firm's investments decrease (Johnson *et al.*, 2000; Bae *et al.*, 2002; Bertrand *et al.*, 2002; and Baek *et al*., 2006; Bae *et al*., 2012). Second, profitable companies within the business group can provide the financing the struggling units need to survive a crisis (Friedman *et al*. 2003; Bae *et al*. 2012; Lins *et al.*, 2013). The great majority of our sample companies belong to a business group (88%). This is not unusual in Europe, where pyramidal structures are relatively common (Faccio and Lang, 2002; Masulis *et al.*, 2011). Masulis *et al*. (2011) also observe that business groups throughout the world are in clear majority controlled by family firms, which in times

[10] To control for geographic factors, we divide our sample in five regions: North-West, where the headquarter of the bank is located, North-East, Centre, South, and a residual category for foreign borrowers. More than half of the firms in our sample are based in the North-West region, the most developed area of the country.

of crisis are known to prioritize the survival of the companies belonging to the group (Lins *et al.*, 2013).

[Please insert Table 2 about here]

4.4 Forbearance Lending Variables

We present summary statistics for variables associated with the forbearance lending hypothesis in Panel B of Table 2. Since we examine the renewal decisions of existing credit lines, rating changes, especially decreases, are more relevant than the rating levels. In fact, rating changes affect the capital requirements for credit risk increasing the capital charge associated with the credit line. For this reason, we focus our attention on the change in the final rating with respect to the final rating in force in December 2010. To capture the change in credit ratings, we use the difference between two types of internal rating: (i) *Downgrade,* that is, a decrease in final rating from the previous credit review, and (ii) *Soft Downgrade*, that is, the difference between the statistical rating, which summarises hard information, and the final rating, which incorporates both hard and soft information about the borrower's creditworthiness (Filomeni *et al.*, 2017).[11] We observe a downgrade in the borrower's final rating between the end of 2010 and the time of the renewal process in more than 40% of the observations (*Downgrade*). These downgrades result in a change of the credit rating class in 18.8% observations. When we focus on the ratings used in the credit renewal process, the statistical rating is slightly higher than the final rating used in the application decision. This implies that the soft information the bank incorporates in the rating leads to more downgrades than upgrades of the borrowing firms. In fact, we have a rating downgrade in 22% of the observations (*Soft Downgrade*), and there is a downward change in the rating class in 7% of the observations.

In addition to credit ratings, the bank also estimates the probability of default (PD) of the borrower (*PD Borrower*) and of its business group (*PD Group*). The probability of default of the

[11] These two internal ratings are organized over 15 levels, which are divided into three classes. For our analysis, we convert the 15 levels into numerical values, with higher values corresponding to worse ratings.

borrower is, on average, about 2.15% and in about 17.5% of the observations, the business group to which the firm belongs has a lower probability of default than the borrower's one. Cerqueiro *et al*. (2016) show that collateral plays an important and positive role in the provision of lending, concluding that collateral is an important contractual device that affects the behaviour of borrowers and lenders. Despite this importance, we find that borrowers in our sample are not likely to provide *Collateral* for their lines of credit. Indeed, only 38% of the loans offer this type of credit risk mitigation. A possible explanation for the low share of secured loans is the established relationship between the bank and the borrowers. Moreover, Canales and Nanda (2012) note that the liquidation value of collateral posted by small and medium-sized enterprises is often of negligible value to the banks. Finally, we use profitability as a further control. The average (median) firm profitability, measured by the return on assets (ROA), is a relatively healthy 7% (6.5%), especially given the crises that hit Europe.

5. Empirical Strategy

5.1 Identification Strategy

We examine the bank's decisions about the renewal of credit lines submitted by borrowers during September 2011-August 2012, a period characterised by increased interest rate spreads and by a sudden liquidity shock as the Eurozone sovereign debt crisis intensified (see Figure 1). Our challenge is to identify (credit) supply-side effects. The escalation of the sovereign debt crisis could also affect firms' growth rates and therefore impact negatively on the demand for credit. Our empirical strategy includes several steps to alleviate identification issues. First, we exploit the exogenous shock to bank funding liquidity in August 2011 and consider how it affected credit decisions in the following one-year period (September 2011 to August 2012). The assumption is that the shock in bank funding does not affect firms' performance independently of the bank during our time-period. We consider the period September 2011-August 2012 as the crucial financial phase of the crisis, after which the demand-side effects become more relevant. This type of assumption is

similar in spirit to Duchin *et al.* (2010), which study supply effects in the first year of the financial crisis of 2007-08 (July 2007-June 2008). Second, we rely on a very detailed loan-level dataset that includes information on the entire population of existing mid-corporate borrowers for our bank. Third, we focus on credit line renewals to avoid selection biases. While the application for a new line of credit is a firm's choice and firms may not apply if they expect their application to be rejected, the renewal process we examine is not. This annual renewal process is mandatory for the borrowers if they want to maintain the credit line with the bank. As all borrowers in our sample are considered for renewal, we can infer that the bank does not experience a decrease in demand for credit from exiting borrowers.

To test our hypothesis about the role of relationship lending, our key variable of interest is the borrower's unused portion of the credit line (*Unused*). We posit that if the bank values the soft information it collects from borrowers by observing the usage of the credit line, the value of the relationship decreases with the increase in the unused portion of the credit line. In addition, liquidity risk arises from the bank's exposure to the undrawn portion of the loan commitment. In line with the literature, we also consider additional proxies for relationship banking, including the borrower's size (*Size*), scope of relationship (*Scope Relationship*), bank-borrower distance (*Distance 50*), bank's market share for a given borrower (*Bank Market Share*), borrower's group belonging status (*Group*) and (*Group Support*). These characteristics are assumed to facilitate the flow of soft information content from borrowers to the bank and therefore increase the value of the credit relationship.

To test our second hypothesis and explore whether the bank tightened its credit standards as an indication of active credit risk management, we use two rating changes: (i) the change in final rating from the previous credit review (*Downgrade*) and (ii) the difference between two types of internal rating: the statistical rating (which summarizes hard information), and the final rating, which incorporates both hard and soft information about the borrower's creditworthiness (*Soft Downgrade*). To control for the creditworthiness of the borrowers, we also control for an increased probability of

default (*PD Borrower*), or the absence of collateral (*Collateral*), or a decrease in profitability, proxied by the return on assets (*ROA*).

5.2 Empirical Model & Methodology

We first investigate the likelihood that the bank rations a borrower in our sample. Thus, we employ the following logit model:

$$\Pr\left(Credit\ Rationed_i = 1 | Rating\ Decrease_i, Unused_i, X_i\right) = \alpha + \beta * Rating\ Decrease_i + \gamma * Unused_i + \delta * Rating\ Decrease_i * Unused_i + \eta * X_i + \varepsilon_i \quad (1)$$

where *Credit Rationed* is a binary variable taking value 1 if there is a decrease in the amount of credit granted following the renewal process; *Rating Decrease*$_i$ is either Downgrade or Soft Downgrade and capture the worsening of the creditworthiness of the borrower; *Unused* is the undrawn portion of the credit line as a percentage of the credit granted before the renewal; and *X* is the set of control variables, which changes with the specification of the models. *X* always includes time fixed effects and industry fixed effects. Time fixed effects, which are based on 4-month periods, capture differences in the severity of the crisis over time. We include industry fixed effects to control for the demand of credit. We also add geographical dummies, to account for the region where the borrowers are located.

In addition to the probability of rationing a borrower, we also examine the change in the amount of credit granted. The OLS model we use is the following:

$$\Delta Credit_i = \alpha + \beta * Rating\ Decrease_i + \gamma * Unused_i + \delta * Rating\ Decrease_i * Unused_i + \eta * X_i + \varepsilon_i \quad (2)$$

where $\Delta Credit_i$ is the change in the credit granted by the bank to borrower following the renewal process. We scale this variable by the total debt granted by the bank to the business group to account for the importance of the credit reduction on the overall exposure of the bank to the group. As in Equation 1, *X* always includes time fixed effects and industry fixed effects.

Finally, as additional analysis, since credit rationing may consist in a reduction of the amount granted as well as the closure of the credit line, we estimate an ordered probit model to capture the intensity of the rationing. The model is the following:

$$\Pr(CR_i = j) = \Pr(k_{j-1} < \alpha + \beta * Rating\ Decrease_i + \gamma * Unused_i + \delta * X_i + \varepsilon_i \leq k_j) \quad (3)$$

where CR_i is a variable that takes value 0 if there is no credit rationing; 1 if there is credit rationing but the credit line is not closed; and 2 if the credit line is closed. k_i are the j cutpoints of the model (j=3).

6. Empirical Analysis

6.1 Baseline Model

We present the results of our baseline model in Table 3. In Columns (I), (II) and (III), we employ a logit regression analysis where the dependent variable is a binary variable taking value 1 if the granted loan amount has decreased with respect to the previous period. We use OLS regressions in Columns (IV), (V) and (VI), in which the dependent variable is the difference between the granted credit line after the renewal process and the existing credit line, scaled by the group debt. All models include both industry and time fixed effects as well as geographic dummies.

Our main finding is that the drawdown of the line of credit impacts credit rationing. *Unused* is positive and significant in all models, indicating that borrowers that use more their line of credit are less likely to be rationed by the bank at the time of the renewal of their credit facility application. This result indicates that the bank is more eager to reduce credit to firms that are not using their credit lines, thereby providing support to the importance of relationship lending. *Size* is not statistically significant in our models. This result is consistent with Campello *et al.* (2012), which show that European CFOs do not believe that firm size affects the initiation or the renewal of a line of credit. Buying additional services from the bank does not affect the credit rationing decision either. This is likely due to the fact we investigate renewals of credit lines, which implies an already existing

relationship between borrowers and the bank. Consistent with the evidence for Belgian relationship borrowers (Degryse and Ongena, 2005), firms headquartered close to the branch in which the loan officer is located do not receive a more favourable treatment. The bank market share of the borrower's debt or whether the borrower belongs to a group do not seem to influence the decision to ration credit.

Regarding forbearance-related variables, *Downgrade* has the expected positive sign and it is significant in Column (III), suggesting that the bank actively manage its risk exposure if the borrower's creditworthiness deteriorates. Contrary to Cerqueiro *et al*. (2016), we do not find collateral to reduce the likelihood to be credit rationed. Possible explanations are associated with the decreased redeployability of the assets offered as collateral during a severe crisis (Campello and Giambona, 2013) and with the negligible value of the collateral to the bank (Canales and Nanda, 2012). The probability of default which is computed internally by the bank, does not affect the credit rationing decision. Despite both Sufi (2009) and Campello *et al.* (2012) show the importance of cash flows in having a credit lines, *ROA*, our proxy of cash flows generated internally by the firm, is not significant.

[Please insert Table 3 about here]

We also test if the drawdown of the credit line affects the decision of how much credit to ration. In Columns (IV), (V) and (VI), we report the estimate of OLS models where the dependent variable is the change in the amount credit granted following the renewal. We find negative coefficient for *Unused*, suggesting that firms using their credit lines less are those that experience a larger reduction in the credit granted. This reduction is also economically significant: a one-standard deviation decrease in the unused portion of the credit line results in an increase of the credit line between 5.5% and 5.7%. This result contrasts with the findings of Accornero *et al*. (2017) who report a negative coefficient for the drawdown, but consider all types of loans, not just credit lines. These results provide further evidence that the bank manages its credit risk after a decrease in the quality of the borrower with respect to the previous review (Columns IV to VI). Similarly, a worsening of the credit rating after the inclusion of soft information does not affect the credit granted. Regarding the other variables, there are a few differences with respect to the models for the probability of being

rationed. We find a positive coefficient for *ROA*, which is consistent with Campello *et al*. (2012) and Sufi (2009).

Table 4 extends the analysis of credit rationing by capturing the different intensity of the credit rationing. In Columns (I) to (III), we employ an ordered logit model where the dependent variable takes values between 0 and 2. We assign a value of 0 to the dependent variable if the firm is not rationed, i.e. the change in the credit amount granted is positive or, at worst, zero; a value of 1 if there is a partial credit rationing, i.e. the credit amount decreases but the firm still receives some credit; and, finally, a value of 2 if the credit line is closed. Again, we find that undrawn credit positively impacts the probability of a credit reduction, even accounting for its intensity. In Column (III), we find some weak evidence that an increase in the credit risk of the borrower, captured by *Downgrade*, positively affects the probability of a credit reduction. Results for control variables are similar to those presented in the main analysis.

[Please insert Table 4 about here]

In Columns (IV) to (VI), the dependent variable of the logit where the dependent variable is *Binding Credit Rationing*. This binary variable captures a decrease in the amount of credit granted that forces the borrower to return at least part of the drawn credit, i.e. it takes value 1 if the reduction is larger than the unused portion of the credit line, 0 otherwise. Not surprisingly, *Unused* has a negative coefficient that is either not significant (Column IV) or weakly significant (Column VI). These results are due to the mechanical effect that a larger unused portion of the credit line decreases the likelihood of having a binding credit rationing. When we look at binding credit reductions, we observe a more significant role of forbearance-related variables. Indeed, an increase in the probability of default of the borrower significantly raises the probability of being rationed. In Column (VI), collateral has the expected negative coefficient, suggesting that banks value collateral when they take credit reduction decisions that may cause liquidity problems for the borrowers.

6.2 Unused Credit Lines, Credit Rationing and Ratings

In Table 5, we consider how proxies of credit risk and relationship lending affect the bank's decision to renew the credit granted to the borrower. Results show the unused portion of the credit line plays an important role in the provision of credit, while we find less conclusive results for credit risk. However, so far, we have not taken into account the interaction between the two risks. Previous literature has documented that credit line drawdowns are higher for riskier firms (Jimenez *et al.*, 2009; Kizilaslan and Manakzan Mathers, 2014), because of the incentive for riskier firms to accumulate precautionary balances in anticipation of performance declines. On the other hand, the cost of using credit lines can be too high for risky firms, leading them to use proportionally more cash. In this case, riskier firms have lower drawdowns (Sufi, 2009; Acharya *et al.*, 2014). Moreover, if a borrower experiences a decrease in its creditworthiness, the bank may have an incentive to cut unused lines of credit (i.e. low drawdowns) to avoid a costly capital charge.

[Please insert Table 5 about here]

In Table 5, we interact *Unused* with *Downgrade*. Column (I) shows the results for the probability of being rationed. Results are remarkably similar to those presented in Table 3, with *Unused* positive and highly significant. The decrease in rating neither amplifies nor reduces the effect associated with *Unused*. The interaction between *Unused* and *Downgrade* takes a positive sign, but it is not significant in this model, suggesting that the negative soft information the loan officer obtains during the loan renewal process does not increase the bank's willingness to credit ration the borrower. We replicate the same logit model in Column (2) using *Binding Credit Rationing* as dependent variable. Results follow closely the ones presented in Table 4, with no effect associated with either *Unused* or its interaction with *Downgrade*. Column (3) presents the results for the change in the credit granted. Again, results are highly consistent with those in Table 3. In particular, *Unused* is always negative and significant. Once we introduce the interaction term, the interaction with *Unused* is highly significant and negative. Here, credit risk acts as an amplifier of the liquidity risk effect. These results document that an increase in the cost of maintaining the credit line, i.e. more capital charges

associated to the worse credit rating, induces the bank to reduce even more the credit extended to a borrower that is not using the facilities. Surprisingly, we find a positive and weakly statistically coefficient for *Downgrade. ROA* and *Collateral* positively impact the variation in credit granted.

6.3. New Applications

The previous results support the view that relationship lending is important during crises, and banks tend to reduce credit to firms that do not use their credit lines enough. However, our sample comprises only renewals of credit lines. If banks value the relationship with their existing clients, then we should not observe an increase in lending to new borrowers. We use information about new applications received and evaluated by the bank during the period September 2011-August 2012 to test this conjecture in Table 6.

The table reports the average treatment on the treated following a propensity scoring matching where new credit line applications (26) are matched to the nearest neighbour of existing credit line using *Size, Scope Relationship, Distance, Bank Market Share, Group, Group Support, PD borrower, Collateral, ROA*, *final rating* as well as time and geography fixed effects.[12] We find a match in the common support for 25 of the 26 new applications. The unmatched results suggest that new applicants receive less as a percentage of their group debt. However, this difference disappears once we implement the matching approach controlling for the above-mentioned covariates. We do not find statistically significant differences when we look at the level of the granted amount either. Overall, these results suggest that banks do not substitute old clients with new ones during the crisis period.

[Please insert Table 6 about here]

7. Additional Analysis and Robustness Checks

7.1 Totally Unused Credit Lines

[12] We do not include Unused as control variable in the model because this variable cannot be computed for new applications.

More than one-third of the credit lines in our sample is totally unused (see Table 2). During a liquidity shock, the bank may opt to cut these credit lines first, as these do not provide any information. Moreover, these credit lines are of secondary importance to the borrower. Indeed, at the time of the shock, these credit lines provide flexibility to the borrower, but no liquidity. In Columns (I) and (II) of Table 7, we show that the bank is indeed more likely to ration borrower if they do not use at least partially their credit lines, supporting once again the view that the relationship between bank and borrower affects the bank decisions in a crisis time. We also find that borrowers that are part of a business group where at least some of the firms are in good financial health and thus can help the borrower, are less rationed. Finally, the bank rations firms whose credit rating worsened.

[Please insert Table 7 about here]

We also provide evidence about the intensity of the credit reduction in Columns (III) and (IV). Differently from Table 3, we do not find evidence that the amount of change in credit granted (as a percentage of the firm debt) is correlated with the dummy *Totally Unused*. Thus, leaving a credit facility completely undrawn affects the probability of being rationed but not the amount. We also observe that the variation in the credit granted is positively affected by being part of a group, especially if in good financial health, and by collateral and firm performance (*ROA*). This provides further evidence against zombie lending.

7.2 Uncommitted Credit Lines

The credit facilities we investigate can encompass both committed and uncommitted credit lines; the difference between these two types lies in the binding commitment for banks to provide the granted credit in the case of committed credit lines, while they may revoke uncommitted credit lines at will. Most of the credit lines in our sample are uncommitted, but in a few cases, committed ones are relevant. Since the drawdown of committed and uncommitted lines is remarkably different (see Table 1), our results may be driven by the composition of the credit line. To rule out this possibility, we replicate our main analysis using the undrawn credit from uncommitted facilities as a proxy for

relationship lending. We do not observe substantial changes when we use *Unused Uncommitted* in Table 8. The undrawn portion of the uncommitted loan is still highly significant and with the expected sign. Thus, even after we control for committed lines, we still find evidence suggesting that banks manage liquidity risk.

[Please insert Table 8 about here]

7.3 Alternative Measure of Rating Downgrade

As a final robustness test, we replicate Columns (II), (III), (V), and (VI) using an alternative measure of a rating downgrade. In Table 9, we add to the models *Soft Downgrade* as a proxy for the worsening of the borrower's financial status due to the soft information about the borrower's creditworthiness that the bank gathered during the credit renewal process. *Soft Downgrade* is a binary variable that takes value 1if the borrower's final rating is worse than his statistical rating. Results show that *Unused* maintains the same significance levels as in Table 3. Also, the magnitude of the coefficients is unaffected by the change in the downgrade variable. Concerning the rating downgrade variables, the coefficients of *Downgrade* are also similar to those in Table 3, with the same significance levels and signs. *Soft Downgrade*, on the other hand, is never significant. This suggests that the downgrades due to soft information to not affect the credit decisions, and this information confirms what the bank already knows from the statistical rating. The lack of significance for *Soft Downgrade* is also indirect evidence that soft information is already captured by the relationship lending variables, *Unused*.

[Please insert Table 9 about here]

8. Conclusions

In this paper, we analysed how banks managed the funding liquidity shock they experienced in August 2011, concomitant with the intensification of the Eurozone crisis. We exploit loan-level information regarding the renewal of credit lines to a pool of existing mid-corporate borrowers

generating an annual turnover between €150mn and €1bn. The mid-corporate segment is highly dependent on bank credit and in almost all EU countries sustained greater losses during the crisis, compared to either large or small-sized firms. By focusing on all existing borrowers holding a credit line and by exploiting the internal annual credit monitoring process, we avoid self-selection problems resulting only in firms with specific characteristics applying for and receiving funding during a crisis.

Our results indicate that credit availability did not dry up for mid-corporate private borrowers during the Eurozone crisis, suggesting that credit rationing was limited. Nevertheless, several firms' credit lines were either reduced or revoked, particularly those granted to firms that experienced a decrease in their credit rating compared to the previous monitoring exercises. Our findings provide support to the literature on relationship banking as they indicate that, in mid-corporate business lending, banks value existing relationships as they have invested in the collection of soft proprietary information. Banks are less likely to ration existing borrowers unless they pose an increased credit risk undermining the bank's financial health.

Our empirical findings have a clear policy implication as they suggest that, through relationship lending, banks can cushion existing customers during economic downturns. A concern is that this positive effect might lead to credit misallocation and evergreening of bad loans and come at the cost of a decrease in new credit origination. An increased emphasis on relationship lending might incentivise banks to extend credit to existing borrowers while forsaking more profitable investment opportunities. Our results suggest that banks actively manage both their credit and liquidity risk and decrease credit availability when risk increases. In this respect, our results do not provide support to the claim that the 2011 liquidity shock and the subsequent long-term liquidity injections by the European Central Bank may have encouraged the evergreening of existing bad loans.

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Appendix. Variable Definitions

Variable	Definition
	Credit Lines Variables
Granted Amount *t*	Total amount of credit granted to a given borrower at time *t (t+1)*, where *t* (*t+1*) is the beginning (end) of the renewal process.
ΔGranted Amount *t+1*	Granted Amount *t+1* minus Granted Amount *t.*
ΔGranted *t+1*	ΔGranted Amount *t+1* divided by the borrower's group total debt exposure to the banking group.
Credit Rationed *t+1*	Binary variable that takes value 1 if ΔGranted Amount *t+1* is negative, 0 otherwise.
Committed (Uncommitted) Granted Amount *t*	Amount of committed (uncommitted) credit granted to a given borrower at the beginning of the renewal process.
Committed (Uncommitted) Granted *t*	Committed (Uncommitted) Granted amount *t* divided by Granted Amount *t.*
Committed *t*	Binary variable that takes value 1 if the borrower has a committed credit line, 0 otherwise.
Rationing Order	Ordered variable that takes the following values: 0 if ΔGranted *t+1* is greater or equal to zero; 1 if ΔGranted *t+1* is negative but Granted Amount *t+1* is different from 0; 2 if Granted Amount *t+1* is equal to zero.
Binding Credit Rationing	Binary variable that takes value 1 if the reduction in credit granted is larger than the unused portion of the credit line, 0 otherwise.
	Relationship Banking Variables
Unused *t*	The unused portion of the credit line measured as (Granted Amount *t* - Used Granted Amount *t*) and divided by Granted Amount *t*
Totally Unused *t*	Binary variable that takes value 1if the credit lines is completely unused; 0 otherwise.
Uncommitted Unused *t*	The unused portion of the uncommitted credit line measured as the ratio between the unused amount of the uncommitted credit line and Uncommitted Granted *t*
Committed Unused *t*	The unused portion of the committed credit line measured as the ratio between the unused amount of the committed credit line and Committed Granted *t*
Size	Logarithm of the borrower's total assets as stated in the borrower's last available financial statements before the start of the renewal process.
Scope Relationship	Binary variable that takes value 1if the borrower purchases at least one other banking product from the bank; 0 otherwise.
Borrower-to-branch Distance	Logarithm of 1 plus the distance between the branch where the loan officer reviewing the renewal application works and the headquarters of the borrower.
Distance 50	Binary variable that takes value 1if the distance between the branch where the loan officer reviewing the renewal application works and the headquarters of the borrower is less than 50 km; 0 otherwise.
Bank Market Share	Fraction of the borrower's debt issued by the bank.
Group	Binary variable that takes value 1if the borrower is part of a business group; 0 if the borrower is a stand-alone company.
Group Support	Binary variable that takes value 1 if the group's PD is lower than the borrower's one; 0 otherwise. The variable is set to 0 if the borrower is not part of a business group.
	Forbearance Lending Variables
PD borrower	Probability of Default (PD) of the borrower computed by the bank.
Soft Downgrade	Binary variable that takes value 1 if the borrower's final rating is worse than his statistical rating; 0 otherwise.
Downgrade	Binary variable that takes value 1 if the borrower's final rating at the renewal is worse than the final rating at the end of 2010; 0 otherwise.
Collateral	Binary variable that takes value 1if the credit line is collateralized; 0 otherwise.
ROA	Return on Assets of the borrower computed as EBITDA divided by total assets. EBITDA and total assets are from the borrower's last available financial statements before the start of the renewal process.

Table 1 – Credit Lines and Credit Rationing

Panel A reports summary statistics (number of observations, mean, median and standard deviation) for credit lines. Uncommitted and Committed Granted amount *t* do no sum to Granted Amount *t* because of winsorization. Amounts are in € units. Panel B reports summary statistics (number of observations, mean, median and standard deviation) of the percentage of unused credit lines, rationed credit lines, and binding rationings by rating baskets. All non-binary variables are winsorized at the 2.5% in each tail.

Panel A: Credit lines				
Variables	No. Obs.	Mean	Median	St. Dev.
Granted Amount *t*	400	7556704	2062500	12981923
Granted Amount *t+1*	400	7510321	2000000	13916850
ΔGranted Amount *t+1*	400	-143681	0	2423828
ΔGranted *t+1* (% of Group Debt *t*)	396	-5.84%	0.00%	27.95%
Credit Rationed *t+1*	400	37.00%	0.00%	48.34%
Binding Rationining *t+1*	400	6.50%	0.00%	24.68%
Uncommitted Granted Amount *t*	400	5558272	1868513	9612621
Committed Granted Amount *t*	400	1561450	0	5095180
Uncommitted Granted *t*	400	90.10%	100.00%	25.94%
Committed *t*	400	17.25%	0.00%	37.83%

Panel B: Rationing by rating class				
Rating Class	Statistics	Unused *t*	Credit Rationed *t+1*	Binding Rationing *t+1*
Low Risk	No. Obs	134	134	134
	Mean	66.51%	33.58%	5.97%
	Median	78.39%	0.00%	0.00%
	St. Dev.	35.93%	47.40%	23.78%
Medium Risk	No. Obs	185	185	185
	Mean	59.28%	35.14%	5.41%
	Median	62.51%	0.00%	0.00%
	St. Dev.	38.02%	47.87%	22.67%
High Risk	No. Obs	58	58	58
	Mean	47.08%	48.28%	13.79%
	Median	54.27%	0.00%	0.00%
	St. Dev.	39.45%	50.41%	34.78%
Total	No. Obs	377	377	377
	Mean	59.97%	36.60%	6.90%
	Median	63.32%	0.00%	0.00%
	St. Dev.	37.96%	48.24%	25.37%

Table 2 – Summary Statistics

The table reports summary statistics (number of observations, mean, median and standard deviation) for rating, and control variables. All non-binary variables are winsorized at the 2.5% in each tail.

Variables	No. Obs.	Mean	Median	St. Dev.
PANEL A: Relationship Banking Variables				
Unused *t*	400	60.85%	67.09%	38.19%
Totally Unused *t*	400	34.25%	0.00%	47.51%
Uncommitted Unused *t*	400	66.60%	79.84%	37.41%
Committed Unused *t*	69	19.30%	0.00%	30.90%
Size (log)	364	17.88	18.23	1.74
Scope Relationship	400	55.25%	100.00%	49.79%
Distance 50	400	47.75%	0.00%	50.01%
Bank Market Share	335	36.60%	35.00%	12.24%
Group	400	88.25%	100.00%	32.24%
Group Support	371	16.17%	0.00%	36.87%
PANEL B: Forbearance Lending				
PD Borrower	379	2.15%	1.30%	3.41%
Downgrade	400	41.00%	0.00%	49.24%
Soft Downgrade	400	21.75%	0.00%	41.31%
Collateral	400	37.50%	0.00%	48.47%
ROA	352	6.97%	6.47%	6.03%

Table 3 – Credit Availability Changes, Unused Credit Lines, and Credit Ratings.
The table presents logit regression analyses for credit rationing (*Credit Rationed t+1)* in Columns I to III, and OLS models for the variation in credit granted in Columns IV to VI (ΔGranted *t+1*). Variable definitions are provided in the Appendix. All non-binary variables are winsorized at the 2.5% in each tail. All models include time and industry fixed effects. Industry clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Credit Rationed t+1			ΔGranted *t+1*		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Unused	1.385***		1.563***	-0.145**		-0.150***
	(0.192)		(0.271)	(0.036)		(0.027)
Size	0.000		0.032	0.002		-0.001
	(0.069)		(0.069)	(0.005)		(0.004)
Scope Relationship	0.049		0.014	0.021		-0.001
	(0.388)		(0.490)	(0.035)		(0.031)
Distance 50	-0.367		-0.438	-0.007		0.013
	(0.387)		(0.460)	(0.021)		(0.020)
Bank Market Share	-1.968		-0.931	0.083		0.065
	(1.392)		(1.201)	(0.139)		(0.184)
Group	-0.295		-0.244	0.104**		0.079*
	(0.261)		(0.251)	(0.024)		(0.033)
Group Support	-0.015		-0.206	0.021		0.057**
	(0.175)		(0.222)	(0.014)		(0.018)
PD Borrower		3.569	6.595		-0.229	0.395
		(4.351)	(14.655)		(0.336)	(1.056)
Downgrade		0.367	0.645*		-0.053*	-0.046*
		(0.331)	(0.336)		(0.024)	(0.020)
Collateral		-0.091	0.023		0.083*	0.053
		(0.294)	(0.347)		(0.032)	(0.027)
ROA		-1.380	0.400		0.782***	0.820**
		(1.820)	(2.021)		(0.137)	(0.261)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Macro Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Geography FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	318	350	306	318	346	306
Pseudo/Adj. R-squared	0.082	0.034	0.099	0.040	0.057	0.070

Table 4 – Types of Rationing.

The table reports estimates of on ordered logit model for credit rationing in Columns I to III. The dependent is *Rationing Order*. Columns IV to VI presents logit regression analyses for binding credit rationing (*Binding Credit Rationing t+1*). Variable definitions are provided in the Appendix. All non-binary variables are winsorized at the 1% of each tail. All non-binary variables are winsorized at the 2.5% in each tail. All models include time and industry fixed effects. Industry clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Rationing Order			*Binding Credit Rationing t+1*		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Unused	1.486***		1.676***	-8.334		-8.839*
	(0.223)		(0.295)	(5.521)		(5.295)
Size	0.009		0.045	-0.085		-0.034
	(0.064)		(0.061)	(0.175)		(0.194)
Scope Relationship	-0.049		-0.077	-0.793		-0.615
	(0.422)		(0.515)	(0.577)		(0.725)
Distance 50	-0.397		-0.460	0.116		0.617
	(0.372)		(0.442)	(0.471)		(0.660)
Bank Market Share	-2.106		-0.906	0.654		6.213
	(1.397)		(1.070)	(4.103)		(4.734)
Group	-0.274		-0.217	-0.439		-0.355
	(0.266)		(0.260)	(1.171)		(0.921)
Group Support	-0.009		-0.208	-0.962		-1.283
	(0.137)		(0.235)	(1.364)		(1.553)
PD Borrower		2.587	9.665		15.115**	45.052**
		(3.623)	(15.967)		(6.903)	(20.023)
Downgrade		0.257	0.598*		-0.072	-0.181
		(0.378)	(0.331)		(0.199)	(0.764)
Collateral		-0.124	-0.014		-0.245	-1.347**
		(0.272)	(0.330)		(0.350)	(0.615)
ROA		-1.952	0.439		7.039**	5.089
		(1.849)	(2.129)		(3.331)	(7.311)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Macro Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Geography FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	318	350	306	278	350	266
Pseudo R-squared	0.079	0.026	0.094	0.463	0.140	0.510

Table 5 – Unused Credit Lines, Credit Rationing and Ratings.

The table presents logit regression analyses for credit rationing (*Credit Rationed t+1* and *Binding Credit Rationing t+1*) in Columns I to II, and OLS models for the variation in credit granted in Column III (ΔGranted *t+1*). All models include time and industry fixed effects. Industry clustered standard errors are reported in parentheses. All non-binary variables are winsorized at the 2.5% in each tail. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Credit Rationed t+1	*Binding Credit Rationing t+1*	ΔGranted *t+1*
	(I)	(II)	(III)
Unused	1.533***	-8.020	-0.091**
	(0.332)	(7.252)	(0.029)
Unused*Downgrade	0.062	-2.521	-0.147**
	(0.463)	(10.408)	(0.033)
Size	0.032	-0.048	-0.002
	(0.069)	(0.213)	(0.003)
Scope Relationship	0.014	-0.598	0.001
	(0.489)	(0.687)	(0.036)
Distance 50	-0.439	0.599	0.015
	(0.464)	(0.653)	(0.021)
Bank Market Share	-0.937	6.150	0.094
	(1.202)	(4.910)	(0.171)
Group	-0.245	-0.262	0.084
	(0.250)	(1.003)	(0.042)
Group Support	-0.202	-1.396	0.045
	(0.235)	(2.003)	(0.023)
PD Borrower	6.564	45.636*	0.500
	(14.609)	(23.420)	(1.037)
Downgrade	0.605	0.088	0.040*
	(0.548)	(1.777)	(0.015)
Collateral	0.022	-1.371**	0.057*
	(0.350)	(0.557)	(0.025)
ROA	0.391	4.854	0.822**
	(2.048)	(6.367)	(0.281)
Time FE	Yes	Yes	Yes
Macro Industry FE	Yes	Yes	Yes
Geography FE	Yes	Yes	Yes
N. of obs.	306	266	306
Pseudo/Adj. R-squared	0.099	0.512	0.078

Table 6 – New Applications

The table reports the average treatment on the treated (ATT) following a propensity scoring matching where new credit line applications are matched to the nearest neighbor of existing credit line using *Size, Scope Relationship, Distance, Bank Market Share, Group, Group Support, PD borrower, Collateral, ROA, final rating* as well as time and geography fixed effects. Only observations with a match in the common support are considered in the rows ATT. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Treated		Controls				
	Mean	Obs.	Mean	Obs.	Difference	S.E.	T-stat
			Granted Amount (% of debt group)				
Unmatched	13.26%	26	37.29%	306	-24.02%	7.42%	-3.24***
ATT	13.56%	25	17.51%	25	-3.95%	8.74%	-0.45
			Granted Amount$_{t+1}$				
Unmatched	3806.68	26	8699.50	306	-4892.82	3074.44	-1.59
ATT	3952.94	25	4730.41	25	-777.47	3330.56	-0.23

Table 7 – Totally Unused Credit Lines.

The table presents logit regression analyses for credit rationing (*Credit Rationed t+1)* in Columns I and II, and OLS models for the variation in credit granted in Columns III and IV (ΔGranted *t+1*). Variable definitions are provided in the Appendix. All non-binary variables are winsorized at the 2.5% in each tail. All models include time and industry fixed effects. Industry clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Credit Rationed t+1		ΔGranted *t+1*	
	(I)	(II)	(III)	(IV)
Totally Unused	0.299**	0.484***	0.015	0.013
	(0.138)	(0.179)	(0.034)	(0.035)
Size	-0.040	-0.002	0.009	0.005
	(0.051)	(0.053)	(0.005)	(0.004)
Scope Relationship	0.103	0.095	0.018	-0.004
	(0.377)	(0.459)	(0.034)	(0.030)
Distance 50	-0.351	-0.399	-0.010	0.007
	(0.343)	(0.410)	(0.016)	(0.015)
Bank Market Share	-1.733	-0.810	0.048	0.065
	(1.348)	(1.155)	(0.118)	(0.151)
Group	-0.214	-0.180	0.090**	0.070*
	(0.255)	(0.260)	(0.022)	(0.030)
Group Support	-0.192	-0.369*	0.047**	0.076**
	(0.195)	(0.219)	(0.012)	(0.017)
PD Borrower		4.692		0.826
		(13.793)		(1.034)
Downgrade		0.564*		-0.034
		(0.325)		(0.019)
Collateral		-0.123		0.071*
		(0.345)		(0.030)
ROA		0.346		0.834*
		(1.925)		(0.309)
Time FE	Yes	Yes	Yes	Yes
Macro Industry FE	Yes	Yes	Yes	Yes
Geography FE	Yes	Yes	Yes	Yes
N. of obs.	318	306	318	306
Pseudo/Adj. R-squared	0.048	0.062	0.001	0.029

Table 8 – Credit Availability Changes and Uncommitted Unused Credit Lines.
The table presents logit regression analyses for credit rationing (*Credit Rationed t+1)* in Columns I and II, and OLS models for the variation in credit granted in Columns III and IV (ΔGranted *t+1*). Variable definitions are provided in the Appendix. All non-binary variables are winsorized at the 2.5% in each tail. All models include time and industry fixed effects. Industry clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Credit Rationed t+1		ΔGranted *t+1*	
	(I)	(II)	(III)	(IV)
Unused Uncommitted	1.350***	1.508***	-0.130**	-0.145**
	(0.211)	(0.192)	(0.037)	(0.032)
Size	-0.019	0.010	0.004	0.000
	(0.058)	(0.052)	(0.005)	(0.003)
Scope Relationship	-0.061	-0.072	0.034	0.011
	(0.386)	(0.486)	(0.038)	(0.034)
Distance 50	-0.392	-0.462	-0.006	0.014
	(0.345)	(0.414)	(0.024)	(0.023)
Bank Market Share	-1.457	-0.379	0.032	0.018
	(1.333)	(1.112)	(0.126)	(0.169)
Group	-0.285	-0.213	0.101**	0.076
	(0.204)	(0.178)	(0.026)	(0.038)
Group Support	-0.008	-0.230	0.021	0.055**
	(0.192)	(0.228)	(0.011)	(0.016)
PD Borrower		7.144		0.411
		(14.569)		(1.085)
Downgrade		0.634*		-0.047*
		(0.332)		(0.020)
Collateral		-0.093		0.065*
		(0.332)		(0.028)
ROA		0.026		0.851**
		(1.882)		(0.272)
Time FE	Yes	Yes	Yes	Yes
Macro Industry FE	Yes	Yes	Yes	Yes
Geography FE	Yes	Yes	Yes	Yes
N. of obs.	318	306	318	306
Pseudo/Adj. R-squared	0.079	0.095	0.032	0.067

Table 9 – Soft Rating Downgrade.

The table presents logit regression analyses for credit rationing (*Credit Rationed t+1)* in Columns I and II, and OLS models for the variation in credit granted in Columns III and IV (ΔGranted *t+1*). Variable definitions are provided in the Appendix. All non-binary variables are winsorized at the 2.5% in each tail. All models include time and industry fixed effects. Industry clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Credit Rationed t+1		ΔGranted *t+1*	
	(I)	(II)	(III)	(IV)
Unused		1.570***		-0.150***
		(0.252)		(0.027)
Size		0.033		-0.001
		(0.070)		(0.004)
Scope Relationship		0.023		-0.000
		(0.534)		(0.032)
Distance 50		-0.429		0.013
		(0.440)		(0.020)
Bank Market Share		-0.906		0.066
		(1.287)		(0.187)
Group		-0.249		0.079*
		(0.256)		(0.033)
Group Support		-0.201		0.057**
		(0.217)		(0.018)
PD Borrower	3.299	6.778	-0.249	0.400
	(4.245)	(15.564)	(0.343)	(1.078)
Downgrade	0.344	0.636*	-0.055*	-0.047*
	(0.346)	(0.371)	(0.024)	(0.020)
Soft Downgrade	0.225	0.073	0.019	0.002
	(0.219)	(0.351)	(0.022)	(0.019)
Collateral	-0.070	0.026	0.085*	0.054
	(0.300)	(0.339)	(0.034)	(0.027)
ROA	-1.509	0.372	0.772***	0.820**
	(1.978)	(2.164)	(0.131)	(0.260)
Time FE	Yes	Yes	Yes	Yes
Macro Industry FE	Yes	Yes	Yes	Yes
Geography FE	Yes	Yes	Yes	Yes
N. of obs.	350	306	346	306
Pseudo/Adj. R-squared	0.036	0.099	0.055	0.067

Figure 1. Interbank Spreads on Euro Markets (Q1:2011-Q4:2012)
The figure shows the series of spreads between the Euribor (the average interest rate for unsecured Euro term deposits, the reference rate in the short-term unsecured interbank market) for four different maturities and the corresponding Eurepo (the average interest rate for secured money market transactions in the euro area). The four maturities shown are: one month (1m); two months (2m); three months (3m); and six months (6m). Data are from the European Money Markets Institute (EMMI) (https://www.emmi-benchmarks.eu/)