Università degli Studi del Molise
Dipartimento di Economia

Economics and Statistics Discussion Paper
No. 083/22

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November 29, 2021

Abstract

At the beginning of the decade, many banks in euro-area periphery countries shifted their portfolios from corporate lending towards sovereign debt holdings. According to some scholars, this was the result of the moral suasion exerted by domestic authorities; others suggest instead that it was the outcome of a free choice of weak banks that bet-for-resurrection increasing the holdings of risky, high yielding government bonds. Our analysis shows that a contemporaneous increase in banks' total assets and a portfolio readjustment from loans to government bonds is consistent with a surge in the risk-premium required by banks on corporate lending. After briefly describing our hypothesis within a simple model of a bank's portfolio choice, we test its empirical implications on a large sample of individual loan data granted by over 100 Italian small banks during the post sovereign debt crisis period (2012-2014). Our results provide convincing evidence in support of our hypothesis.

JEL classifications: E51; G21.

Keywords: Credit Supply; Government bond purchases; Sovereign debt crisis; Small banks; Bank-firm relationship.

1 Introduction

While the global financial crisis of 2007-2008 had smaller impact on Italian banks than on those of most other developed countries, the shock caused by the following sovereign debt crisis in 2011 was severe. As shown by Carpinelli and Crosignani (2021), the drop in the value of government bonds impacted on banks' balance sheets, and in turn on their credit supply. At the same time, the ensuing recession caused an increase in non performing loans and a significant drop in profitability. The swift reaction of the Eurosystem helped sustaining the value of government bonds in the periphery countries of the euro area, including Italy. Altavilla et al. (2016) show that the sheer announcement of the possibility to activate the Outright Money Transactions (OMTs) reduced significantly government bond yields in Italy (and Spain) and favored a relevant increase in credit, GDP and consumer prices in the following three years. Similarly, Casiraghi et al. (2016) show that the measures taken by the ECB – the Securities Market Program, the three-year Long Term Refinancing Operations (LTROs), and the OMTs – had a positive and significant impact on credit supply. In particular, the three-year LTROs helped Italian banks to increase both credit supply and purchases of domestic government bonds (Carpinelli and Crosignani, 2021). Based on a simulation run with the Bank of Italy's quarterly model of the Italian economy (BIQM), Casiraghi et al. (2016) estimate that this caused a cumulative GDP growth response of 2.7% over the period 2012-2013.

The interventions of the ECB went in the right direction, but in the years following the Sovereign debt crisis the yields on Italian government bonds remained higher than before the financial crisis, and credit conditions remained tighter. Anecdotal evidence emerged that some banks decided to shift their asset portfolios towards domestic government bonds, that offered higher returns than in the past, and at the same time could also be used as collateral to access large and cheap financing from the ECB. According to this view, government debt was partly crowding out bank lending. Indeed, the decision of the ECB to launch the Targeted long term financing operations (TLTROs), linking the access to central bank's liquidity to the increase in bank loans, can be seen as a reaction to such crowding-out risk, that was certainly possible within the framework of the LTROs used since the aftermath of the global financial crisis. However, an alternative narrative also developed, suggesting that the drop in the amount of bank loans to the non-financial sector was not due to a plunge in credit supply, but to a reduction in credit demand, caused by the recession. As shown convincingly by Carpinelli and Crosignani (2021), the truth was in the middle: banks indeed increased their share of domestic government bond holdings, but at the same time they used the funding made available by LTROs also to foster credit supply.

Similar to Carpinelli and Crosignani (2021), our paper focuses on the two major stylized facts that characterized the period following the sovereign crisis in Italy: the 2.8% drop in the stock of loans granted by Italian banks between 2012 and 2014 (for a total value of 71 billion of euros), and the parallel 19.0% increase in the stock of Italian government bond holdings (for a total value of 65 billion of euros). Noticeably, this shift took place while the gross yield on time varying government bonds dropped from 3.27% to 1.11% and the interest rate on new bank loans granted to non financial corporations dropped from 3.6% to 2.6%, determining a fourfold rise in the spread between returns on loans and government bonds from 34 to 144 basis points.

Our contribution to understand this issue comes from studying the relationship between government bond purchases and loan supply to firms in a large sample of over 100 Italian co-operative banks lending to about 2,400 firms between 2012 and 2014, the three years following the outburst of the sovereign debt crisis. Focusing on Italian cooperative banks is particularly interesting for three main reasons. First, in Italy credit cooperatives are a major source of external financing for smaller firms, which represent the backbone of Italian economy, especially in terms of total employment (Barba Navaretti et al., 2019; Coccorese and Shaffer, 2021). Second, the previous literature showed that the Sovereign crisis hit mostly large banks (Albertazzi et al., 2014), suggesting indirectly that smaller financial intermediaries might not have changed significantly their lending policies. Third, the rich evidence provided by Carpinelli and Crosignani (2021) focuses on larger banks, that have been counterparties of the Bank of Italy at least once in their sample period, an unlikely event for the vast majority of the small banks in our sample.

Similar to Carpinelli and Crosignani (2021), our analysis exploits the presence of multiple banking relationships to fully control for shocks to credit demand by firms, therefore allowing to identify the effect of government bond purchases on credit supply. However, due to data availability, our analysis cannot follow their identification structure, and focuses on the broader question of whether those small co-operative banks that increased the most their total assets biased their portfolio composition relatively more towards government bond holdings.

Consistent with the findings of Carpinelli and Crosignani (2021) for larger banks, also the small banks in our sample that decided to acquire a larger amount of government bonds, increased relatively less their credit supply. Some crowding-out seems therefore to have taken place.

The rest of the paper is organized as follows. Section 2 briefly reviews the literature that is most relevant for our analysis. Section 3 presents a simple model to justify the empirical strategy that we devised, given our data availability. Section 4 describes the data used in the empirical analysis and presents some descriptive statistics. The following section presents the results of the baseline specification and discuss some additional characterizations. Section 6 concludes.

2 Literature review

A first strand of literature related to our paper studies the determinants of bank purchases of sovereign securities in the aftermath of the global financial crisis, a pervasive phenomenon especially after 2011. Ongena et al. (2019), for example, show that during the European sovereign debt crisis, domestic banks in fiscally stressed countries were more likely than foreign banks to increase their holdings of domestic sovereign bonds in months with relatively high domestic sovereign bond issuance. This effect was stronger for state-owned banks and for banks with low initial holdings of domestic sovereign bonds, and it was not fueled by central-bank liquidity provision. By the end of 2013, the share of government debt held by the domestic banking sectors of Eurozone countries was more than twice that held in 2007 (Becker and Ivashina, 2017).[1] Indeed, this may be a relevant cause of the drop in domestic lending, since banks that hold less government bonds than average have a higher growth rate of loans during crisis periods, as shown by the analysis of Gennaioli et al. (2018) on 20,000 banks in 191 countries and 20 sovereign default episodes over 1998-2012. Two main hypotheses have been proposed to explain how banks' purchases of sovereign debt securities is affected by macroeconomic determinants. According to the 'moral suasion' hypothesis, (Battistini et al., 2013; Ongena et al., 2019; Acharya and Steffen, 2015), the authorities of countries in financial distress urged domestic banks to sustain the financing of national public debt. On the contrary, according to the 'renationalization hypothesis', banks attributed a lower degree of riskiness to domestic sovereigns than foreign investors during the crisis, augmenting the domestic bias in asset holdings (Battistini et al., 2013; Angelini et al., 2014). Sovereign bonds purchases were indeed favored also by the large amount of liquidity provided by central banks. Using a unique security-level data set, Crosignani et al. (2020) show that

[1] Chronopoulos et al. (2020) show that the fact that domestic banks hold more domestic sovereign debt relative to their foreign counterparts is a general pattern, common also outside Europe. They also show that the home bias in sovereign debt holdings is more pronounced for government owned banks and in countries with less developed banking systems and less effective governance.

the ECB's three-year LTROs were associated with a strong increase in the purchases of short term domestic government bonds by Portuguese banks, a behavior fully consistent with the theoretical model proposed by Crosignani (2021), who shows that low-capital banks optimally tilt their government bond portfolio toward domestic securities. Remarkably, those same bonds could be pledged as collateral to obtain central bank liquidity. As argued by Carpinelli and Crosignani (2021), the LTROs allowed banks to engage in a profitable trade by buying high-yield securities through cheap financing. Indeed, banks' purchases of government bonds also had a positive effect on banks' balance sheets (Hildebrand et al., 2013). Studying a large sample of Italian banks between 2007 and 2013, Affinito et al. (2020) show that banks used government security purchases to support their financial and economic conditions. Indeed, this strand of literature has provided a number of different and possibly complementary explanations of the large readjustment in the portfolios of European banks in the years that followed the Global financial crisis and the sovereign debt crisis.

A second strand of literature related to our analysis has focused on the impact of government debt purchases on bank lending. Using bank-level data, Albertazzi et al. (2014) examine the implications of the sovereign debt tensions, through the 10-year BTP-Bund spread, on the Italian credit market. Among other results, they find that the sovereign spread significantly affects the cost of credit for firms and households and exerts a negative effect on loan growth. Using a FAVAR (Factor Augmented Vector Autoregressive Model) methodology, Neri and Ropele (2015) show that the tensions in the sovereign debt markets affected bank lending rates in the main euro-area countries, concluding that they have had a significant impact on the cost of credit in the peripheral countries. Indeed, the impact was stronger for Italian banks: Bofondi et al. (2017) show that lending by Italian owned banks grew significantly less and their interest rates grew significantly more than for foreign owned banks operating in Italy. On a related ground, Becker and Ivashina (2017) show that firms were more likely to substitute loans with bonds when local banks owned more risky domestic sovereign debt, and De Marco (2016) finds that banks that were more severely hit by the drop in government bond prices reduced more their credit supply and increased more the interest rates on their loans. Also banks with different ability and incentives to actively trade in the government bond market reacted differently to the crisis: Abbassi et al. (2016) show that banks with higher trading expertise increased their investments in securities and reduced their credit supply to firms relatively more than banks with lower expertise. Interestingly, investigating the impact of the 2008-2009 financial crisis and of the following sovereign debt crisis in a panel of 18 Western European countries, Meriläinen (2016) finds that it was particularly strong for cooperative banks. As it is clear from the discussion in the Introduction, the paper closest to our analysis is Carpinelli and Crosignani (2021), who study bank-firm relationships for a sample of 115 relatively large Italian banks between 2010 and mid-2012, showing that LTROs by the ECB supported banks' credit supply, even if banks used most the liquidity provided by the central bank to buy domestic government bonds and substitute missing wholesale funding.

A third strand of literature, partly related to our paper, examines the transmission of a bank balance sheet shock to corporate credit and its effects on the real economy. Gaiotti (2013) finds that the elasticity of a firm's investment to the availability of bank credit in Italy was significantly higher in periods of economic contraction than in other periods. Acharya et al. (2018) show that the lending contraction depressed investment, job creation, and sales of firms affiliated with banks that were hit relatively more strongly by the crisis. Bottero et al. (2020), using detailed loan level data matching firms and banks in Italy, show that the exogenous shock to sovereign securities held by financial intermediaries was passed on to firms through a contraction of credit supply in a two-year window around the Greek bailout. However, it led to a reduction in investment and employment only for the smaller firms, especially those which rely heavily on external financing. This result provides additional grounding to our anaysis, which focuses specifically on lending by small banks to small firms. The main difference with respect to our analysis is that they focus on the pre-bailout sovereign assets held by the bank, a dimension reflecting pre-existing bank characteristics, whereas we control for the changes in the sovereign bond holdings.

The focus on lending by credit cooperative banks connects our analysis also to the vast literature on small banks and small business lending. The relevance of these financial intermediaries has been vastly stressed in the literature, especially in relation to their ability to provide credit to smaller firms (Berger et al., 2004), and whose peculiarities have been thoroughly analyzed both in normal times (Berger and Udell, 2006; Berger and Black, 2010; DeYoung et al., 2004), and as a reaction to exogenous shocks (Ferrando et al., 2019).

So far the literature has produced a large consensus that the endogenous readjustment in bank portfolios that followed the financial and sovereign debt crises impacted severely on bank lending and on the real economy, and that this impact was heterogeneous depending on many bank characteristics. In the following, we will study this readjustment focusing on a sample of small co-operative banks. Clearly, since loans to the non-financial sector and government bonds are among the most important assets held by banks, sheer accounting suggests that a larger share of assets held in one form is mechanically associated with a smaller share held in the other. What is less obvious is how banks that decided to increase their total liabilities chose between lending and government bond holdings. The simple model and the discussion in the next Section will explain more in detail our research hypothesis and our identification assumption.

3 Theoretical background and empirical specification

The aim of our analysis is to verify if the 2.8% drop in the stock of loans described above can be explained by a shift of bank asset portfolios from loans to government bond holdings, as a result of an increase in the risk-premium required on corporate lending relative to government bond yields. To better explain the mechanism, in the following we present a simple model that allows to highlight the alternative mechanisms that can lead to a drop in lending, deriving some testable implications. The model borrows heavily from Khwaja and Mian (2008) and only aims at providing a concise and more transparent description of the mechanisms that we hypothesize might have been at work. Indeed, some features of banks' choices are not modeled explicitly, although their impact is discussed verbally.

Consider a profit maximizing bank i whose marginal cost of funding depends on its characteristics and on the amount of funds that it raises, according to the following equation:

$$F_i = f_i + \alpha^f r_i^f \tag{1}$$

where F_i is the amount of funds supplied by the market to bank i, f_i is a measure of the conditions faced by bank i in the funding market, r_i^f is the marginal cost of funding for bank i and $\alpha^f \geq 0$ is a parameter describing the elasticity of funding with respect to its cost. Clearly, the higher the interest rate paid by the bank – that is marginal cost of funding – the larger the amount of funds that it can raise.[2]

The bank has two options to use the funds that it has raised, granting loans or acquiring government bonds.[3] We assume for simplicity that each bank has only one borrower j and that it faces the following demand schedule:

$$L_{ij} = b_j - \alpha_j^l r_{ij}^l \tag{2}$$

[2]While in this simplified framework we do not distinguish different sources of funding, the large supply of liquidity granted by the ECB during our sample period suggests that α^f was likely to be very large.

[3]While this could be seen as a strong simplification, because in reality banks can also lend in the interbank market or acquire assets different from government bonds, the main intuition of the model is unchanged also if considering these additional features.

where b_j describes characteristics specific of borrower demand, r_{ij} is the interest rate charged by bank i to borrower j and $\alpha^l_j \geq 0$ is a parameter describing the elasticity of loan demand with respect to its cost.

Finally, we assume that government bonds give a flat return r^b, and that bank i, for its internal portfolio decisions, requires a premium θ_i on bank loan returns with respect to government bonds, that accounts for the different level of riskiness of the two types of assets. Since the bank always has the option of buying government bonds, that give a fixed and exogenous rate of return, it will be willing to lend only up to the point that the additional amount gives a return that is higher than that given by the sum of the return on government bonds and the spread. It will therefore lend to firm j only as along as $r^l_{ij} \geq r^b + \theta_i$. Assuming for simplicity that this inequality is satisfied as an equality, and substituting this condition into equation (2) we obtain the equilibrium amount of loans granted by bank i to borrower j:

$$L_{ij} = b_j - \alpha^l_j (r^b + \theta_i) \tag{3}$$

At the margin, a profit maximizing bank will also equate the marginal cost of funding with the marginal revenue of lending: $r^f_i = r^l_{ij} = r^b + \theta_i$. Substituting this condition into equation (1), we can therefore obtain the optimal amount of funding raised by bank i in equilibrium, F_i:

$$F_i = f_i + \alpha^f (r^b + \theta_i) \tag{4}$$

Since we have assumed, for simplicity, that the bank has only one borrower, the following balance sheet constraint needs to hold: $F_i = B_i + L_{ij}$, where B_i is the total value of government bonds held by the bank i.[4] Note that in this simplified representation of the bank's balance sheet, total liabilities and total assets are by definition equal to F_i. Substituting equations (3) and (4) into the balance sheet constraint defined above we can then express the equilibrium level of holdings of government bonds as a function of bank idiosyncratic characteristics, the returns on government bonds and the exogenous parameters of the model:

$$B_i = F_i - L_{ij} = (\alpha^f + \alpha^l_j)(r^b + \theta_i) + f_i - b_j \tag{5}$$

This simple representation shows that an increase in θ_i, the spread required by the bank on

[4]For simplicity, we also assume that the parameters are such that the condition $B_i \geq 0$ is always satisfied.

its loans with respect to the return of government bonds, determines a drop in bank lending (equation (3)), an increase in total funding (i.e., total assets; equation (4)) and an increase in total bond holdings (equation (5)). Since an increase in θ_i may also cause an increase in the cost of funding (i.e., a reduction of f_i or α^f), our result is confirmed only to the extent that the latter effect is not prevailing. However, this does not appear to be a strong assumption, given the large availability of cheap funding by the ECB, available especially to those banks which held enough government bonds to be used as collateral.

The intuition behind the simple model described above can be better gauged through a graphical analysis. The top-right panel of figure 1 describes the loan market, with interest rates measured on the positive interval of the Y-axis and the size of the loan measured on the X-axis. The downward sloping curve represents the loan demand schedule faced by the bank as a negative function of the interest rate: $L_{ij} = b_j - \alpha_j^l r_{ij}^l$. The top-left panel describes the funding market, with interest rates again measured on the (positive interval of the) Y-axis, and the size of funds on the X-axis. Starting from the origin, a move to the left represents an increase in the value of bank's funds (i.e., total liabilities). The upward sloping curve represents therefore the fund supply schedule faced by the bank as a positive function of the interest rate: $F_i = f_i + \alpha^f r_i^f$. The interest rate $r^b + \theta_i$ on the positive interval of the Y-axis is the lower threshold of the interest rates on bank loans: since the bank always has the option to purchase government bonds at an interest rate r^b, that it considers as equivalent to a return on loans of $r_{ij} - \theta_i$, it will never supply loans at a lower rate. Once the return on bank loans is fixed, from the equilibrium condition between the marginal cost of funding and the marginal revenue of lending, it is possible to find from the top-right panel the total value of loans granted by the bank, L_{ij}, and from the top-left panel the total value of funds raised by the bank, F_i. Of course, these two amounts do not need to coincide. The dotted line in the bottom-left panel of figure 1 is the 45-degrees line, so that in the negative interval of the Y-axis we can read the total value of funding. In the same way, the 45-degrees dotted line on the bottom-right panel allows to map the value of loans on the negative interval of the X-axis. The difference between the two values is the amount of bonds, B_i held by the bank.

Any shock hitting the economy at time t can be represented as a shift of the schedules in figure 1. For example, a drop in the demand for loans causes a shift to the left of the schedule in the top-right panel. In turn, assuming that the interest rate elasticity of the demand for loans is higher than that of the supply for deposits, a likely assumption that is mirrored in the figure, this causes an increase in the bank's holdings of government bonds.

Figure 2 presents the similar case of a shock that causes an increase in θ_i, the spread required

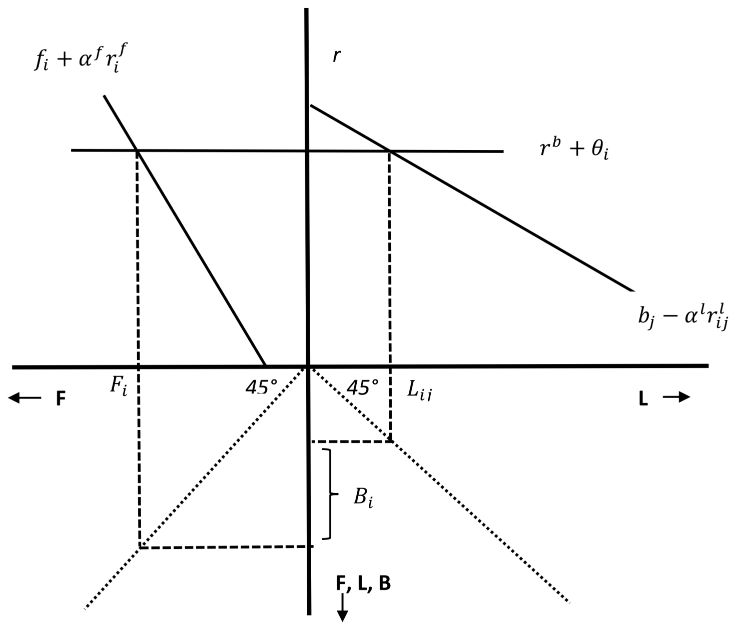

Figure 1: Bank's balance sheet equilibrium

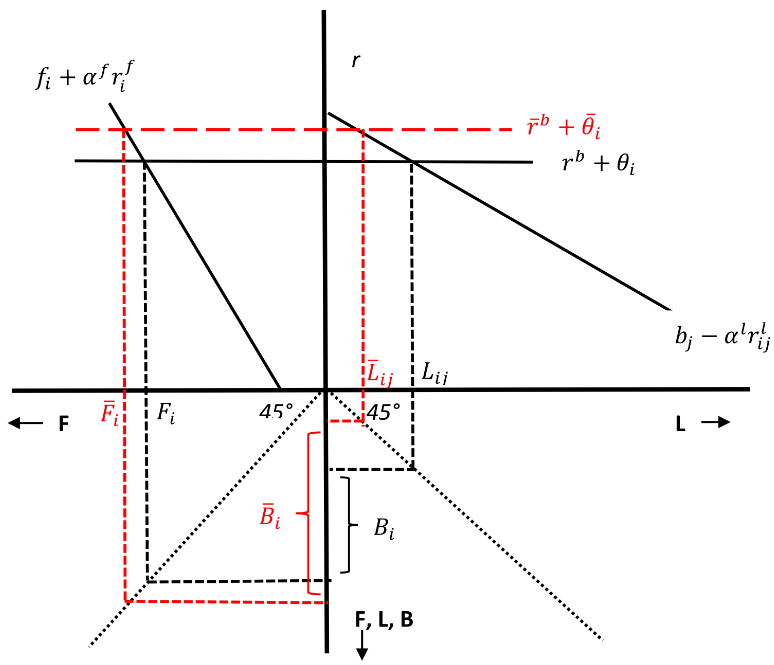

Figure 2: The effect of a shock on the lending-rate spread

by the bank on loans with respect to the return on government bonds, r^b, that amounts to a shift in the bank's portfolio preferences from loans to government bonds. In the new equilibrium after the shock, bank loans drop to $\bar{L}_{ij}$, funding and the size of the bank increases to $\bar{F}_i$, and government bond holdings raise to $\bar{B}_i$.

According to equations (3) and (5), only the following four shocks can account for both the drop in lending and the surge in government bond holdings that characterized Italian banks between 2012 and 2014: a) an increase in the returns on government bonds, r^b; b) an increase in the elasticity of loan demand with respect to its cost, captured by α_j^l; c) a decrease in loan demand, b_j; and d) an increase in the spread required by the bank on its loans, θ_i. In fact, changes in the conditions faced by bank i in the funding market, such as those caused by the non-standard monetary policy measures of the ECB, are captured by f_i and α^f, and while they would alter the optimal amount of government bonds held, they would have no impact on the equilibrium level of loans.

Of the four hypotheses above, hypothesis a) can be dismissed on the account that government bond yields dropped between 2012 and 2014. Indeed, even the additional possibility that the risk-adjusted returns on government bonds increased during the sample period, because of a drop in their probability of default, is inconsistent with a drop in bank lending, as shown by (3).

We can therefore discuss the implications of the other three hypotheses, highlighting possible testable implications that might help to disentangle one from the other. Hypotheses b) and c) are related to the characteristics of loan demand. Clearly, a drop in demand determines a contraction in bank loans and an increase in government bond holdings, independent on whether it is caused by a drop in b_j or by an increase in the parameter describing the elasticity of loan demand with respect to its cost, α_j^l. A critical aspect of our test of the presence of a supply-side effect in the contraction of bank lending will therefore be our ability to control for loan demand characteristics. To this aim, as we will better discuss below, we will exploit both the methodology of Khwaja and Mian (2008) and that of Degryse et al. (2019). As to hypothesis d), assuming that we can adequately control for loan demand, it provides two testable implications. First, from equations (3) and (4), we see that an increase in bank total liabilities, F_i, caused by a surge in θ_i (and therefore net of any bank idiosyncratic shock in funding f_i) is associated with a drop in lending:

$$L_{ij} = b_j - \frac{\alpha_j^l}{\alpha^f}(F_i - f_i) \tag{6}$$

Second, an increase in funding associated with a drop in lending leads necessarily, due to the balance sheet constraint, to a surge in government bond holdings. In turn, from equations (3), (4) and (5), it can also be shown that the ratio of loans to government bond holdings is negatively correlated with the size of total funding, thus providing an even more direct measure of the trade-off between lending and government bond holdings:

$$\frac{L_{ij}}{B_i} = \frac{b_j - \alpha^l(r^b + \theta_i)}{\alpha^l(r^b + \theta_i) - b_j + F_i} \tag{7}$$

In light of the discussion above, our empirical strategy is therefore based on the estimation of three sets of equations. First, we test whether there is a negative relationship between the rate of growth of bank total funding, $\frac{\Delta F_{it}}{F_{it}}$, measured by their total liabilities, and the rate of growth of loans, $\frac{\Delta L_{ijt}}{L_{ijt}}$:[5]

[5]To reduce the impact of outliers, we follow Bottero et al. (2020) and use standardized growth rates,

$$\frac{\Delta L_{ijt}}{L_{ijt}} = \varphi_0 + \varphi_1 \frac{\Delta F_{it}}{F_{it}} + \varphi_2 Dummy\ firm\ time_{jt} + \varphi_3 Dummy\ bank_i + \\ + \varphi_4 Bank\ characteristics_{it} + \varphi_5 Relationship\ characteristics_{ijt} + \epsilon_{ijt} \tag{8}$$

Second, we test whether there is a positive relationship between the rate of growth of bank total funding, $\frac{\Delta F_{it}}{F_{it}}$, and the rate of growth of government bond holdings, $\frac{\Delta B_{it}}{B_{it}}$:

$$\frac{\Delta B_{it}}{B_{it}} = \varphi_0 + \varphi_1 \frac{\Delta F_{it}}{F_{it}} + \varphi_2 Dummy\ bank_i + \varphi_3 Dummy\ time_t + \\ + \varphi_4 Bank\ characteristics_{it} + \epsilon_{it} \tag{9}$$

Last, we test whether there is a negative relationship between the rate of growth bank total funding, $\frac{\Delta F_i t}{F_i t}$, and the change in the ratio of loans to government bond holdings, $\Delta \frac{L_{ijt}}{B_i t}$:

$$\Delta \frac{L_{ijt}}{B_{it}} = \varphi_0 + \varphi_1 \frac{\Delta F_{it}}{F_{it}} + \varphi_2 Dummy\ firm\ time_{jt} + \varphi_3 Dummy\ bank_i + \\ + \varphi_4 Bank\ characteristics_{it} + \varphi_5 Relationship\ characteristics_{ijt} + \epsilon_{ijt}, \tag{10}$$

Exploiting the characteristic that our data comprise solely firms with multiple lending relationships, in empirical models (8) and (10) we control for loan demand including in the specification firm-time fixed effects, thus adapting the strategy first proposed by Khwaja and Mian (2008) to the case of panel data. In terms of the comparative static analysis of figure 2, our estimation strategy allows to assume that the loan demand schedule is fixed, because it provides a within firm comparison which fully absorbs firm-specific changes in loan demand. The estimated impact on loan changes is thus entirely due bank credit supply.

To better control for potentially confounding effects, we also include bank fixed effects and a set of bank time-varying characteristics. Following the recent empirical literature (Bottero et al., 2020; Altavilla et al., 2017), we account for the following time varying bank-level characteristics: (i) bank capital, measured by the ratio of Tier 1 capital to risk weighted assets (*Tier1 capital ratio*), (ii) profitability, measured by the return on average assets (*ROA*) and (iii) funding structure, measured by the ratio of interbank lending to interbank borrowing (*Interbank ratio*), computed as the ratio of money lend to other banks over money borrowed from other banks. Indeed, convincing empirical evidence shows that capital, profitability

defined a $\frac{X_t - X_{t-1}}{0.5(X_t + X_{t-1})}$.

and liquidity can have a significant impact on bank lending. Interestingly, Mesonnier and Monks (2015) show that banks that were forced to increase their capital ratios after the first EBA capital exercise – a requirement that could be easily fulfilled also through a portfolio readjustment from loans to bonds – had a significantly lower annualized loan growth rate. We also control for a number of bank-firm relationship characteristics, such as the contribution of each lender to the total bank debt of the borrower (*Bank share credit lines*), and the relationship length in terms of year (*Relationship length*). The inclusion of these controls allows us to rule out potential variation in credit supply due to the characteristics of the bank-firm relationship.[6]

A critical aspect of our empirical model is that it does not aim to estimate the causal effect of an increase in bank liabilities on the rate of change of lending and government bond holdings. Instead, it checks for the existence of a relationship between these aggregates that – within our simple theoretical framework and controlling for possible confounding effects, especially on loan demand – is driven by an increase in the spread required by each bank on its loan, θ_i, a characteristics which is not observable to the econometrician. Our approach is therefore different from, but not inconsistent with, analyses such as that of Carletti et al. (2021), who use a tax reform in Italy to study how an exogenous shock to funding costs affects bank lending, and Carpinelli and Crosignani (2021), who study the impact of LTROs on bank lending and government bond holdings.

As argued by Degryse et al. (2019), a drawback of including firm-time fixed effects to control for credit demand is that it constrains the sample to firms with multiple lending relationships, excluding those borrowing from only one bank. For this reason, in the robustness checks we also present the results obtained using the alternative methodology proposed by Degryse et al. (2019), who suggest to estimate the credit supply shocks using industry-location-size-time fixed effects in place of firm-time fixed effects.

Since previous research has shown that revolving credit lines are an important source of financing used by corporations (Bottero et al., 2020), we estimate equations (8)-(10) using data on credit lines. We will present and discuss some results on long-term loans as robustness checks.

[6] Clearly, what we cannot do is to control for bank.time fixed effects, as this would make it impossible to identify our variable of interest and other bank controls, since the rate of growth of bank's total funding only has bank-time variability.

4 Data and summary statistics

To perform the empirical analysis we need both information on banks' purchases of government securities, and on other characteristics of banks' balance sheets, and information on bank lending at the bank-firm level, in order to disentangle credit demand and credit supply effects. To this purpose, we use two data sources. On the bank side, we use Bankscope records, that provide balance sheet information for all cooperative banks in our sample. Remarkably, balance sheet data on this set of banks has been directly provided to Bureau van Dijk, the corporation producing Bankscope, by the Italian association of cooperative banks. Data on bank-firm relationships include detailed information on the credit lines granted on checking accounts and on long-term loans collected by CRIF (*Centrale dei Rischi Finanziari*), a credit rating agency providing ratings on Italian firms, and CSD (*Centro Servizi Direzionali*), an Italian consulting company providing electronic data processing services to co-operative banks. Within the Eurozone, Italy is one of the three countries where the cooperative banks have the largest market share. The most important feature of these banks is that of being local, mutual and not-for-profit cooperatives.[7] They are distinguished from commercial banks mainly through their capital structures and their branch networks. On the one hand, cooperative banks are not listed on stock exchanges and are held directly by their clients through member shares. Members participate directly in their governance and elect their representatives through general assembly meetings (Egarius and Weill, 2016). While we recognize that our sample is not fully representative of the entire Italian banking sector, what makes our focus on cooperative banks particularly interesting is that in Italy they are a relevant source of funding especially for the small, bank-dependent firms that represent the backbone of the manufacturing sector.

From the initial sample provided by CRIF and CSD, after checking for outliers, duplicates and missing values, and excluding financial services and the public administration sectors, the resulting sample consists of 2,397 firms and more than 8,300 bank-firm-year observations over the period 2012-2014. Our sample includes a large number of firms that have established multiple lending relationships with more than one bank. Firms operate in the following six macro-industries: agriculture, commerce, transports and hotels, manufacturing, construction and services. The 106 co-operative banks in the sample are located in different regions across Italy (60% in the North, 23% in the South and remaining banks in the Center). Our sample covers about 32.3% of the Italian cooperative banks by total assets and about 2.43% of the

[7] Cooperative banks were also excluded from EBA assessments, that have impacted on the asset portfolio composition of larger banks (Mesonnier and Monks, 2015).

entire Italian banking system (Banca d'Italia, 2015).

Table 1 displays the summary statistics of variables of interest, comparing descriptive statistics for our variables of interest in both the full sample available, including both single-bank firms and multiple-bank firms, and the estimation sample, including the multiple-bank firms that enters in our main regressions.

From table 1 it can be inferred that the average standardized rate of growth of credit-lines in our entire sample is -10%, and it is very similar to that in the estimation sub-sample of firms with multiple lending relationships, -14%.[8] At the same time, the average rate of growth of bank total funding was slightly above 5%, and that of government bond holdings higher than 20%. As a result, the ratio of the value of credit-lines granted to government bond holdings dropped on average of about 23 percentage points in the full sample, and 58 percentage points in the estimation sub-sample. These results are consistent with the hypothesis that banks perceived an increase in the riskiness of their lending, and therefore cut their credit supply, while increasing their total funding and government asset holdings. Reassuringly, the share of government securities over total assets for banks in the estimation sample (24%) is in line with that of all Italian cooperative banks (31.1%), as reported in Banca d'Italia (2015). Interestingly, all variables show a high level of variability across banks and firms, as confirmed by standard deviations larger than the means, thus allowing a better identification of the hypothesis under scrutiny. Indeed, our sample of banks is heterogeneous also with respect to the other bank characteristics: in the estimation sample, the Tier 1 capital ratio is on average 15%, with values ranging between 8% and nearly 28%; returns on assets (ROA) is on average 10%, but it also shows a very high variability. The net interbank ratio is on average 48%, meaning that banks in our sample lend to other banks significantly more than what they borrow from them. Concerning bank-firm relationship, table 1 shows that the main bank of the firm grants on average 47% of the total value of credit-lines granted and 45% of the total amount of term-loans. On average, the length of the bank-firm relationship is 2 years, with values ranging from 0 to 4 years. New credit-lines are 3.2% of the existing lending relationships, and lost credit-lines are 7.3%, while in the case of term-loans these shares are respectively 5.3% and 9.4%.

Table 2 reports the descriptive statistics of the main variables of interest for the two sub-samples of banks with a rate of growth of total funding above and below the median. It shows that banks with a higher rate of growth of total funding have a comparable rate of growth of the value of credit-lines granted and of term-loans, a higher value of the rate of

[8]By construction, the standardized growth rates ranges from -200% to +200%.

growth of government bond holdings, and a stronger drop in the ratio of credit-lines and term-loans to government bond holdings.

Interestingly, table 3 shows that while banks that severed more credit-lines (term-loans) than the median had a similar rate of growth of total funding to banks that severed less credit-lines (term-loans), banks that granted more credit-lines (term-loans) had a higher rate of growth of total funding than banks that granted less credit-lines (term-loans), 6.3% as opposed to 4.1% for credit-lines and 6% as opposed to 4.4% for term-loans. Consistent with this pattern, banks that increase their funding are more likely to expand their credit and to grant new term-loans.

Table 4 shows a negative correlation between the rate of growth of credit-lines and of term-loans and that of total funding and government bond holdings. These negative correlations are matched by the negative correlation between the rate of growth of total bank funding and the change in the ratio of credit-lines and government bond holdings and of term-loans and government bond holdings. However, few of these correlations are statistically significant.

Overall, the descriptive statistics provide some support to the hypothesis that the drop in bank credit registered between 2012 and 2014 was due to an increase in the spread required by banks on their loans. However, the descriptive statistics only provide preliminary evidence and are unable to control for important confounding factors, such as the changes in the demand for credit. For this reason, we will next move to a more refined econometric analysis.

5 Econometric analysis

5.1 Baseline results

According to the simple theoretical model of Section 3, if the drop in lending registered between 2012 and 2014 was due to an increase in the spread required by banks between the interest rate on loans and the return on government bonds, we should find a negative correlation between the rate of change of bank total funding and the rate of growth in bank's credit lines, once we have controlled for credit demand. This hypothesis can be tested using the specification of equation (8). To test this hypothesis, we can exploit the $8,363$ observations for firms that borrow from more than one bank. Column 1 of table 5 shows that the coefficient of the rate of growth of total funding is -1.645 and it is statistical significant at the 1% level. Consistent with the hypothesis that the contraction in bank lending was due to an increase in the spread required by banks on their loans, the banks that registered a stronger increase in size showed a smaller rate of growth of lending controlling for firm-time and bank fixed effects. In column 2 we control for a set of time-varying bank characteristics that might impact on the ability of the bank to grant credit. First, since Bottero et al. (2020) find evidence that during the Sovereign debt crisis, banks with a larger share of government bonds cut their lending relatively more, we control for the composition of the asset portfolio, proxied by the share of government securities holdings over total liabilities. In our sample we estimate a negative and statistically significant coefficient, −1.969. Second, we control for the value of Tier 1 capital over risk weighted assets, since better capitalized banks have more room to increase the value of their risk bearing assets, but in this case the estimated coefficient is statistically insignificant. Third, we control for bank profitability, on the ground that, *ceteris paribus*, more profitable banks have more room to absorb potential losses, and therefore may be more willing to grant credit to risky firms. But also in this case the estimated coefficient is not statistically significant. Last, we control for the interbank ratio, that is statistically insignificant. Reassuringly, controlling for time-varying bank characteristics does alter only marginally the original result: in column 2 the coefficient of the rate of growth of total funding increases slightly in absolute value, to −1.734, but it remains statistically significant at the 1% level. Finally, in column 3 we control for a set of time-varying characteristics of the lending relationship. Also in this specification, the coefficient of the rate of growth of total funding is negative, with a value of −1.401 and statistically significant at the 1% level. We next control whether this leads to an increase in government bond holdings. The negative and statistically significant coefficient of the interbank ratio confirms that banks that were lending more in the interbank market were also less willing to grant credit to firms. Interestingly, the coefficient of the share of credit lines granted by the bank over the total value of the credit-lines of the firm is −0.529 and it is statistically significant at the 1% level. The reduction in credit supply was therefore stronger for those same firms that were more dependent on the banks' funding. The length of the lending relationship between the bank and the firm, on the contrary, has no statistically significant impact. Since our specification includes firm-time fixed effects to fully control for credit demand, the impact of time-varying firm characteristics is fully absorbed by the fixed effects. In summary, our first set of regressions provide convincing evidence consistent with the hypothesis that the contraction in bank lending between 2012 and 2014 was due to an increase in the spread required by banks on their loans.

According to our theoretical model, a second implication of an increase in the spread required by banks between the return on loans and that on government bonds is a positive correlation between the rate of change of bank total funding and the rate of growth of bank's government bond holdings. This hypothesis can be tested using the specification of equation (9). This hypothesis can only be tested at the bank-time level, and we therefore have 208 observations in our sample. Column 1 of table 6 shows that the coefficient of the rate of growth of total funding is 1.891 and it is statistically significant at the 1% level. This provides additional support to the hypothesis that the contraction in bank lending was indeed due to an increase in the spread required by banks on their loans, i.e. a contraction in credit supply. In column 2 we control for a set of time-varying bank characteristics. Also in this specification the coefficient of the rate of growth of total funding is positive, with a value of 1.620, and it is statistically significant at the 1% level. Among the control variables, the only one that has a statistically significant effect, at the 1% level, is the share of government bond holding over total assets at the beginning of the period. Banks tended therefore to re-balance their holdings through time, reducing them when they are large and increasing them when they are low. The estimated coefficient of -4.156 suggests that banks that have a 1% larger share of government bonds over total assets have a nearly 4% lower rate of growth. Since on average government bonds amount to about 24% of bank's total assets, this suggest that excess holdings tend to be nearly entirely re-balanced within one year. All other time-varying bank-specific characteristics have no significant impact on the rate of growth of government bond holdings.[9]

Taken together, the results reported in tables 5 and 6 provide strong support to the hypothesis that the drop in lending registered between 2012 and 2014 was due to an increase in the spread required by banks between the interest rate on loans and the return on government bonds. Since the theoretical model shows that under this hypothesis banks also reduce the ratio of credit-lines to government bond holdings, as shown by equation (7), we check this additional implication by estimating equation (10). The results reported in table 7, based on the same sample of $8,363$ observations used to estimate the specification for the rate of growth of credit-lines, provide additional support to our hypothesis: in all three specifications we find a negative and statistically significant relationship between the rate of growth of bank total funding and the change in the ratio of credit-lines to government bond holdings. The coefficients range from -2.050 in the specification that includes time-varying characteristics of the bank and of the lending relationship (column 3) to -3.439 in column 2. In all three specifications, the estimated coefficients are statistically significant, at the 1% level. Interestingly, banks with a higher interbank ratio are found to reduce more the

[9] In additional robustness checks, available upon request, we verified that the coefficient of the rate of growth of total funding is not significantly different splitting the sample for banks above and below the median value of the Tier1 ratio, of ROA and of interbank ratio. Similarly, the coefficient of the interaction term of the rate of growth of total funding with the same bank characteristics is statistically insignificant.

ratio of credit-lines to government bonds, consistent with the results reported in table 5. No other time-varying bank specific characteristics have a significant impact. The results in column 3 also confirm that the ratio of credit-lines to government bond holdings drops by more for those firms that had a larger share of their credit-lines with the banks, consistent with the finding of table 5. The length of the lending relationship, also in this case, has no statistically significant effect.

Indeed, together with the previous evidence, the results of table 7 suggest that banks that increased their total liabilities not only used the additional funds to buy government bonds, but at the same time they reduced the amount of credit-lines that they granted.[10] In other words, judging that the riskiness of bank loans had increased, these banks traded-off lending with government bonds.[11]

5.2 Robustness checks

The results of our baseline specifications provide support to the hypothesis that the drop in lending registered between 2012 and 2014 was partly due to an increase in the spread required by banks between the interest rate on loans and the return on government bonds. In this section we test the robustness of the baseline specifications using three alternative techniques: the approach developed by Degryse et al. (2019), a quantile regression specification at the median, and a robust regression technique.

Table 8 reports the results obtained estimating our baseline specifications using the entire sample of multiple-bank and single-bank firms, and including industry-location-size-time fixed effects to control for demand shocks. Reassuringly, in the specification in which the dependent variable is the rate of growth of loans (equation (8)), the coefficient of the rate of growth of total funding is -0.436 and it is statistical significant at the 5% level, which confirms the result obtained using the smaller sample of firms with multiple lending relationships (column 1). Similarly, in the specification in which the dependent variable is the change in the ratio of credit-lines to government bond holdings (equation (10)), the coefficient of the rate of growth of total funding is -0.750 and it is statistical significant at the

[10] Since one can argue that to be able to make such a statement, one would need know that total liabilities actually increased, and total liabilities grew by 6% in our sample, but the standard deviation is large, we checked that we obtain similar results (available on request) on the sub-sample of banks with a positive growth of total liabilities.

[11] Reassuringly, all results are confirmed using normal rates of growth, defined as $\frac{X_t - X_{t-1}}{X_t}$, in alternative to the standardized rates of growth defined above.

1% level level (column 2).[12]

Next, we estimate our baseline specifications using quantile and robust regression techniques. Since quantile regressions minimize the sum of the absolute distance of each observation from a given quantile, our specification provides an estimate of the effect of each independent variable on the median of the sample of the dependent variable, and as such less sensitive to the role of outliers. Similarly, we have used a robust regression technique, that adopts an iterative procedure to assign smaller weight to potential outliers (Berk, 1990). Since using quantile and robust regression techniques is not feasible to control for credit demand including firm*time fixed effects, we have included the coefficients of the fixed effects estimated in the baseline specification among our explanatory variables. The results reported in table 9 confirm our baseline findings. The coefficient of the rate of growth of total funding is negative and statistically significant at the 1% level in all regressions for the rate of growth of credit-lines and for the change in the ratio between credit-lines and government bond holdings, and it is positive and statistically significant at the 1% level in the regression for the rate of change of government bond holdings.

5.3 Additional evidence

In addition to increasing or decreasing the size of the credit-lines offered to their clients, banks can also decide to grant a new credit-line to a firm that was not a previous customer, or to close an existing credit-line. In the terminology of trade economists, these are decisions that affect the extensive margin, while the amount lent refers to the intensive margin. However, since the dependent variable in equation (8) is a rate of growth, all cases in which a bank is granting a new credit-line to a firm are excluded by construction. Our results would therefore be biased if banks that increase their total funding used them to grant new credit-

[12] In unreported regressions, available upon request, we have verified whether industry-location-size-time fixed effects provide an adequate control for demand shocks. Following Degryse et al. (2019), we have run two regressions of the rate of growth in lending on firm fixed effects and industry-location-size-time fixed effects, respectively, using in both cases the same sample of firms with multiple lending relationships. Next, we have calculated the residuals of the two regressions, which can be interpreted as the changes in credit growth that is due to supply side characteristics. Reassuringly, the correlation between these two set of residuals is 0.78, confirming that the alternative set of fixed effects controls adequately for demand shocks. A similar procedure applied to the ratio of credit lines to government bonds gives a correlation of 0.96. Interestingly, the correlations between the residuals estimated on the whole sample, including industry-location-size-time fixed effects, and on the smaller sample, including firm fixed effects are much smaller: 0.26 and 0.72, respectively, for the growth in in credit-lines and the change in the ratio of credit lines to government bonds.

lines, instead of acquiring government bonds. Similarly, all cases in which a bank is closing a credit-line register a rate of growth of -100%, and are therefore dropped from our regressions as outliers. To assess the impact of the extensive margin on the change in bank lending between 2012 and 2014, we have therefore estimated two linear probability models. In the first model, the dependent variable takes the value of one if the bank has granted a new credit-line to a firm and zero otherwise, and the explanatory variables are the same as in equation (8), except for the characteristics of the lending relationship, since it did not exist. In principles, a firm could apply to any bank for a new credit-line, but given the nature of our sample, that includes small banks and small firms, it is very unlikely that this really happens. Moreover, since we control for credit demand exploiting the presence of multiple lending relationships, we can only include in our analysis those firms that already had a credit-line with a bank. Given these constraints, we include in our sample only those firms that already had a relationship with the bank, but not a credit-line, and had already a credit-line from another bank. This amounts to $16,781$ observations on a bit more than $4,543$ firms. The results, reported in table 10, provide additional support to our hypothesis, as shown by the coefficient of the rate of growth of total funding, that is negative (-0.510) and statistically significant at the 1% level. Columns 2 and 3 confirm the results also using robust regression techniques and probit estimates, including as before the coefficients of the fixed effects estimated in the baseline linear specification among the explanatory variables. Banks that increased by more their total funding not only had a lower rate of growth of the existing credit-lines, but they were also less likely to grant new credit-lines to clients with which they already had a different type of lending relationship.

The second linear probability model focuses on the closure of existing credit-lines. In this case, the sample includes all credit-lines active in each year with firms that had more than one lending relationship. Column 4 of table 10 shows that while banks that had a higher rate of growth of total funding were more likely to close an existing credit-line, as shown by the positive coefficient of 0.026, the effect is not statistically significant. However, columns 5 and 6 present the results obtained using a robust regression and a probit model, and including also in this case the coefficients of the fixed effects estimated in the baseline specification among the explanatory variables, which show that the estimated coefficient is similar in size and, in the case of the robust model, it is statistically significant at the 1% level. Again, this provides additional support to our hypothesis, showing that banks that increased more total funding by more not only had a lower rate of growth of the existing credit-lines, but they were also more likely to close them.

So far we have focused our analysis on credit-lines, because they reflect more quickly any change in the credit supply of a bank, since they have very short maturity and can be changed much more easily than other types of loans, such as term-loans. Indeed, this intuition is confirmed by the results of the estimation of equation (8) on term-loans instead of credit-lines. Columns 1-3 of table 11 shows that there is a negative and significant relationship between the rate of growth of bank total funding and the rate of growth of term-loans, with a coefficient ranging between -0.954, in the specification including all controls and -1.917 in the simplest specification. However, since we know from the results of table 6 that banks that experienced a higher rate of growth of total funding also had a higher rate of growth of government bond holdings, it is to be expected that these banks also experienced a drop in the ratio of their term-loans to government bonds. Indeed, columns 4-6 of table 11 confirm this expectation, as shown by the negative and highly statistically significant coefficients in all three specifications. Clearly, these results suggest that bank might have also been willing to cut this type of lending, but since term-loans have by construction lower time variability they could not do so to an extent such as to become empirically accountable.

However, if banks had been willing to cut also their lending through term-loans – as a result of the increase in the perceived riskiness and, in turn, in the interest rate spread with respect to government bonds – this should still impact on the likelihood that banks grant new term-loans to their clients. To verify this hypothesis we have replicated the analysis on credit-lines, estimating a model in which the dependent variable takes the value of one if the bank has granted a new term-loan to a firm and zero otherwise, and the explanatory variables are the same as in equation (8), excluding the characteristics of the lending relationship. As in the case of credit-lines, we include in the estimation sample only those firms that already had a relationship with the bank, but not a term-loan, and had already a term-loan from another bank. This amounts to $16,781$ observations on a bit more than $1,100$ firms. Column 1 of table 12 reports the results of the estimates of a linear probability model. The coefficient of the rate of growth of total funding is -0.205 and it is statistically significant at the 5% level, confirming that banks that increased by more their funding had a lower probability of granting new term loans. Interestingly, we find that the likelihood of granting new term-loans was also higher for more profitable banks. Columns 2 and 3 present the results of the estimation of the same model, using a robust regression and a probit specification, respectively. Reassuringly, also in these cases the coefficient of the rate of growth of total liabilities is negative and highly statistically significant.

Although the maturity of a term-loan is typically predetermined, and only in very specific situations such as the breach of covenants a pre-closure can take place, in many cases firms tend to renew a term-loan that reaches maturity. However, banks that are willing to reduce their lending should be less likely to renew an expired term-loan. An additional implication of our hypothesis is therefore that banks that increase by more their external funding are more likely to end term-loan relationships with their clients. Columns 4-6 of table 12 present the results of the estimation of a model similar to equation (8), in which the dependent variable takes the value of one if an existing term-loan is terminated and zero otherwise, and all explanatory variables are as in the previous specifications. The results provide mixed support to the view that a higher rate of growth of total funding is associated with a higher probability that a term-loan relationship is terminated. The coefficients estimated using a linear probability model (column 1) and a probit model (column 2) are positive but not statistically significant. Reassuringly, The coefficient estimated using a robust regression is 0.039 and it is statistically significant at the 1% level (column 2).

Overall, also the evidence obtained from term-loan relationships provides some support to the original hypothesis that the drop in lending registered between 2012 and 2014 was due to an increase in the spread required by banks between the interest rate on loans and the return on government bonds.

6 Conclusions

The sovereign crisis of 2011 had a severe impact on bank lending in Italy. Part of this was due to the negative impact on bank balance sheets and part on the drop in credit demand. But some anecdotal evidence also points to the shift in bank asset portfolios from loans to domestic government bonds, lead by an increase in the perceived riskiness of corporate lending.

Using a large sample of over 100 Italian co-operative banks lending to about 2,400 firms between 2012 and 2014, the three years following the outburst of the sovereign debt crisis, we have found credible support to the anecdotal evidence: indeed, some banks increased their funding to purchase government bonds, while at the same time reducing the size of their credit-lines and the extent to which they granted new term-loans. As a result, the ratio of loans to government bond holdings drop. The answer of our empirical analysis to the original question is yes: Italian banks did trade-off lending with government bond purchases.

Indeed, a strong link between the Sovereign debt crisis and bank lending conditions has been identified in the empirical literature, showing that Eurozone banks increased their holdings of government bonds (Becker and Ivashina, 2017), the more so those in periphery countries

(Ongena et al., 2019), thus hampering credit supply (Gennaioli et al., 2018; Crosignani et al., 2020). We contribute to this literature showing that also small banks cut their lending to small firms, while increasing the amount of government bonds in their portfolios.

Our results confirm that monetary policy interventions, especially non-standard ones, need to be carefully structured effectively achieve specific goals. In the case of fostering credit supply, the decision of the ECB in June 2014 to introduce the TLTROs, that link the amount that banks can borrow, as well as the borrowing rate, to their loans to non-financial corporations and households, can be seen precisely as a step to limit the potential drawbacks highlighted in our analysis of less specific policies, such as the "non-targeted" LTROs. Indeed, TLTROs have been recently renewed, in June 2019, while LTROs, expired in February 2015, have not. Using data on lending relationships to evaluate how TLTROs impacted on each bank's credit supply is the next, crucial step in this line of research.

Table 1: Descriptive statistics - full and estimation sample

Sample	**Full sample**					**Estimation sample**				
Variable	**mean**	**st. dev.**	**1st perc.**	**99th perc.**	**obs.**	**mean**	**st. dev.**	**1st perc.**	**99th perc.**	**obs.**
Dependent variable										
Growth of credit-lines	-0.101	0.700	-2	2	88,069	-0.142	0.675	-2	2	8,363
Growth of term-loans	-0.166	1.060	-2	2	54,535	-0.182	0.972	-2	2	3,940
Δ credit-lines / government bonds	-0.228	2.120	-4.971	1.027	97,000	-0.579	3.799	-11.539	2.609	8,363
Δ term-loans / government bonds	-0.171	2.127	-5.250	2.619	108,204	-0.933	5.223	-21.758	9.268	3,940
Growth of government bond holdings	0.221	0.231	-0.662	0.790	109,049	0.252	0.208	-0.248	0.805	8,363
Independent variable										
Growth of total liabilities	0.054	0.097	-0.165	0.482	114,372	0.057	0.089	-0.126	0.482	8,363
Government bonds / total assets	0.255	0.085	0.061	0.477	113,115	0.242	0.079	0.070	0.418	8,363
Tier 1 ratio	0.156	0.052	0.070	0.315	118,304	0.150	0.038	0.079	0.281	8,363
Returns on assets (ROA)	0.102	0.636	-2.822	0.809	118,438	0.104	0.533	-1.953	0.809	8,363
Interbank ratio	0.553	0.524	0.056	2.140	118,103	0.482	0.343	0.067	1.539	8,363
Bank's lending share (credit-lines)	0.896	0.254	0	1	88,795	0.469	0.236	0	1	8,363
Bank's lending share (term loans)	0.867	0.316	0	1	53,105	0.453	0.319	0	1	3,940
Length of relationship	1.869	0.863	0	3.434	127,748	2.098	0.838	0	4.127	8,363
Alternative dependent variable										
New credit-lines						0.032	0.175	0	1	16,781
Severed credit-lines						0.073	0.260	0	1	11,354
New term-loans						0.053	0.224	0	1	16,781
Severed term-loans						0.094	0.292	0	1	8,811

Notes: This table reports the descriptive statistics of variables used in the empirical analysis calculated on the full sample (including both single-bank firms and multiple-bank firms) and on the estimation sample (including the multiple-bank firms) of observations.

Table 2: Low and high growth of total liabilities

Variable	Low liabilities growth	High liabilities growth	t-test significance
Growth of credit-lines	-0.136	-0.149	
Growth of total liabilities	0.005	0.112	***
Growth of government bond holdings	0.162	0.345	***
Growth of term-loans	-0.217	-0.224	
Δ credit-lines / government bonds	-0.471	-0.691	**
Δ term-loans / government bonds	-0.857	-1.139	*

Notes: This table reports the mean of variables used in the empirical analysis for the two sub-samples of banks with a rate of growth of total liabilities above and below the median (4.452%). The approximate degrees of freedom for the t-test are obtained from the Welch (1947)'s formula. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

Table 3: Growth of total liabilities for banks with high/low new/severed credit-lines/term-loans

Variable	Low	High	Significance
New credit-lines	0.041	0.063	**
Severed credit-lines	0.046	0.058	
New term-loans	0.044	0.060	*
Severed term-loans	0.055	0.050	

Notes: This table reports the mean growth rate of total liabilities for banks below and above the median of new and severed credit-lines and new and severed term-loans. **, * denote significance at 5% level and 10% level, respectively.

Table 4: Correlations

Credit-lines estimation sample									
Variables	1	2	3	4	5	6	7	8	9
1 Growth of credit-lines									
2 Growth of government bond holdings	-0.002								
3 Δ credit-lines / government bonds	0.211*	-0.156*							
4 Growth of total liabilities	-0.021	0.585*	-0.019						
5 Tier 1 ratio	0.040*	-0.134*	0.024	-0.029*					
6 Returns on assets (ROA)	0.025	-0.113*	0.025	0.127*	0.284*				
7 Interbank ratio	0.044*	-0.153*	-0.013	-0.100*	0.066*	0.110*			
8 Bank's lending share (credit-lines)	0.300*	-0.002	0.004	0.006	0.037*	0.014	0.015		
9 Bank's lending share (term loans)	0.055*	0.027	0.033	0.031	-0.002	0.011	-0.019	0.221*	
10 Length of relationship	0.009	-0.002	-0.038*	-0.000	-0.039*	-0.024	-0.027	0.027	0.026

Term-loans estimation sample									
Variables	1	2	3	4	5	6	7	8	9
1 Growth of term-loans									
2 Growth of government bond holdings	-0.103*								
3 Δ term-loans / government bonds	0.239*	-0.300*							
4 Growth of total liabilities	-0.057*	0.6197*	-0.073*						
5 Tier 1 ratio	-0.004	-0.106*	0.036	-0.021					
6 Returns on assets (ROA)	-0.118*	0.141*	-0.059*	0.237*	0.393*				
7 Interbank ratio	0.009	-0.157*	-0.010	-0.120*	0.081*	0.061*			
8 Bank's lending share (credit-lines)	0.022	0.122*	-0.029	0.172*	0.074*	0.178*	-0.038		
9 Bank's lending share (term loans)	0.346*	-0.015	0.059*	0.019	0.020	-0.021	-0.012	0.268*	
10 Length of relationship	-0.026	0.039	-0.055*	0.032	0.007	0.069*	-0.014	0.105*	0.018

Notes: This tables report the correlations between variables used in the empirical analysis, respectively for the credit-lines sub-sample (8,363 observations) and the term-loans sub-sample (3,940 observations). * denote significance at 1% level.

Table 5: Credit lines

	(1)	(2)	(3)
Growth of total liabilities	-1.645***	-1.734***	-1.401***
	(0.577)	(0.644)	(0.456)
Government bonds /		-1.969**	-1.696**
total assets (lagged)		(0.837)	(0.675)
Tier 1 ratio		-0.001	0.002
(lagged)		(0.030)	(0.024)
ROA		0.035	0.015
(lagged)		(0.079)	(0.068)
Interbank Ratio		-0.002	-0.002*
(lagged)		(0.001)	(0.001)
Bank's lending share			-0.529***
(credit lines; lagged)			(0.050)
Length of relationship			0.024
(log)			(0.015)
Observations	8,363	8,363	8,363
Adjusted R^2	0.400	0.401	0.454

Notes: This table reports the results obtained estimating equation (8). The dependent variable is the growth of credit-lines at the bank-firm-time level. Standard errors, clustered by banks, are reported in parentheses. All regressions include firm-time and bank fixed-effects. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

Table 6: Government bond holdings

	(1)	(2)
Growth of total liabilities	1.891***	1.620***
	(0.260)	(0.244)
Government bonds /		-4.156***
total assets (lagged)		(0.705)
Tier 1 ratio		0.000
(lagged)		(0.014)
ROA		0.043
(lagged)		(0.093)
Interbank Ratio		0.000
(lagged)		(0.001)
Observations	208	208
Adjusted R^2	0.423	0.610

Notes: This table reports the results obtained estimating equation (9). The dependent variable is the growth of government bond holdings at the bank-time level. Standard errors, clustered by banks, are reported in parentheses. All regressions include bank and time fixed-effects ***, **, * denote significance at 1% level. 5% level and 10% level, respectively.

Table 7: Credit-lines to government bonds ratio

	(1)	(2)	(3)
Growth of total liabilities	-2.996***	-3.439***	-2.050*
	(0.617)	(0.789)	(1.055)
Government bonds /		1.154	2.294
total assets (lagged)		(5.924)	(5.989)
[1em] Tier 1 ratio		0.007	0.021
(lagged)		(0.106)	(0.106)
ROA		-0.985	-1.069
(lagged)		(0.680)	(0.710)
Interbank ratio		-0.028**	-0.027*
(lagged)		(0.014)	(0.014)
Bank's lending share			-2.211***
(credit lines; lagged)			(0.466)
Length of relationship			0.102
(log)			(0.078)
Observations	8,363	8,363	8,363
Adjusted R^2	0.225	0.231	0.260

Notes: This table reports the results obtained estimating equation (10). The dependent variable is the change in the ratio of credit-lines to government bond holdings at the bank-firm-time level. Standard errors, clustered by banks, are reported in parentheses. All regressions include firm-time and bank fixed-effects. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

Table 8: Single-bank and multiple-bank firms

	Growth of credit-lines	Δ credit-lines / government bonds
Growth of total liabilities	-0.436**	-0.750***
	(0.210)	(0.129)
Government bonds / total assets (lagged)	-0.172	1.169*
	(0.386)	(0.612)
Tier 1 ratio (lagged)	0.006	-0.002
	(0.010)	(0.013)
ROA (lagged)	0.004	-0.109**
	(0.033)	(0.047)
Interbank ratio (lagged)	0.001	-0.004***
	(0.000)	(0.001)
Bank's lending share (credit lines; lagged)	-0.094***	-0.149***
	(0.034)	(0.021)
Length of relationship (log)	0.015***	-0.034***
	(0.004)	(0.005)
Observations	46,806	48,532
Adjusted R^2	0.040	0.165

Notes: Column 1 reports the coefficients obtained estimating equation (8) in which the dependent variable is the rate of growth of loans, including industry-location-size-time fixed effects to control for demand shocks. Column 2 reports the coefficients obtained estimating equation (10) in which the dependent variable is the change in the ratio of credit-lines to government bond holdings, including industry-location-size-time fixed effects to control for demand shocks. Standard errors, clustered by banks, are reported in parentheses. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

Table 9: Quantile and robust regressions

	Quantile	Robust	Quantile	Robust	Quantile	Robust
	Growth of credit-lines		Growth of government bond		Δ credit-lines / government bonds	
	(1)	(2)	(3)	(4)	(5)	(6)
Growth of total liabilities	-1.319***	-1.524***	1.709***	1.686***	-0.955***	-0.259***
	(0.021)	(0.049)	(0.151)	(0.074)	(0.082)	(0.011)
Government bonds /	0.064***	-0.003	-2.672***	-2.686***	0.957***	0.188***
total assets (lagged)	(0.014)	(0.055)	(0.195)	(0.124)	(0.087)	(0.014)
Tier 1 ratio	-0.001	0.000	0.003*	0.003*	0.012***	0.003***
(lagged)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
ROA	0.006***	0.002	-0.022	-0.024	-0.471***	-0.031***
(lagged)	(0.002)	(0.007)	(0.020)	(0.015)	(0.045)	(0.002)
Interbank ratio	0.000	-0.000	0.001***	0.001***	-0.011***	-0.001***
(lagged)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Bank's lending share	-0.079***	-0.419***			-0.436***	-0.081***
(term loans; lagged)	(0.008)	(0.016)			(0.036)	(0.004)
Length of relationship	-0.000	0.003			0.033***	-0.006***
(log)	(0.001)	(0.005)			(0.007)	(0.001)
Observations	8,363	8,363	208	208	8,363	8,361
Adjusted R^2		0.731		0.842		0.489

Notes: Column 1 and 2 report the results obtained estimating equation (8) using the bootstrapped quantile regression (100 replications) and the robust regression; the dependent variable is the growth of credit-lines at the bank-firm-time level. Columns 3 and 4 report the results obtained estimating equation (9) using the bootstrapped quantile regression (100 replications) and robust regression; the dependent variable is the rate of growth of government bond holdings at the bank-time level. Columns 5 and 6 report the results obtained estimating equation (10) using the bootstrapped quantile regression (100 replications) and the robust regression; the dependent variable is the change in the ratio of credit-lines to government bond holding at the bank-firm-time level. Firm-time and bank fixed effects are estimated from the companion OLS regressions and included among the regressors. Standard errors, clustered by banks, are reported in parentheses. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

Table 10: New and severed lending relationships

	New credit-lines			Severed credit-lines		
	LPM	Robust	Probit	LPM	Robust	Probit
	(1)	(2)	(3)	(4)	(5)	(6)
Growth of total liabilities	-0.510**	-0.509***	-4.517***	0.026	0.030***	0.340
	(0.197)	(0.012)	(0.718)	(0.053)	(0.002)	(0.419)
Government bonds /	-0.584**	-0.583***	-5.499***	0.397*	0.320***	3.945***
total assets (lagged)	(0.259)	(0.016)	(0.656)	(0.223)	(0.003)	(0.735)
Tier 1 ratio	0.005	0.005***	0.048***	-0.001	0.000**	-0.035***
(lagged)	(0.010)	(0.000)	(0.013)	(0.006)	(0.000)	(0.009)
ROA	-0.014	-0.014***	-0.136**	-0.004	-0.007***	0.237***
(lagged)	(0.010)	(0.001)	(0.069)	(0.009)	(0.000)	(0.068)
Interbank ratio	-0.000	-0.000***	-0.003***	0.001	0.000***	0.005***
(lagged)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
L.Bank's lending share				0.094***	0.010***	1.571***
(credit lines; lagged)				(0.013)	(0.001)	(0.133)
Length of relationship				-0.010**	-0.006***	-0.023
(log)				(0.004)	(0.000)	(0.046)
Observations	16,781	16,781	16,781	11,354	11,354	11,354
Adjusted R^2	0.165	0.564		0.360	0.992	

Notes: In columns 1–3 the dependent variable is a dummy that takes the value of one if the bank has granted a new credit-line to a firm and zero otherwise. The sample includes those firms that already had a relationship with the bank, but not a credit-line, and had already a credit-line from another bank. In columns 4–6 the dependent variable is a dummy that takes the value of one if the bank has severed existing credit-lines to a firm and zero otherwise. The sample includes all credit-lines active in each year with firms that had more than one lending relationship. Columns 1 and 4 report the results obtained estimating a linear probability model; columns 2 and 5 report the results obtained estimating a robust regression; columns 3 and 6 report the results obtained estimating a probit model. Columns 1 and 4 include firm-time and bank fixed-effects. In columns 2–3 and 5–6 firm-time and bank fixed effects are estimated from the companion OLS regressions and included among the regressors. Standard errors, clustered by banks, are reported in parentheses. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

Table 11: Term loans

	Growth of term-loans			Δ term-loans / government bonds		
	(1)	(2)	(3)	(4)	(5)	(6)
Growth of total liabilities	-1.917***	-1.346*	-0.954*	-5.763**	-2.767*	-1.284
	(0.677)	(0.787)	(0.550)	(2.413)	(1.503)	(1.707)
Government bonds / total assets (lagged)		0.399	-0.106		20.199	18.256
		(2.038)	(1.503)		(12.240)	(11.331)
Tier 1 ratio (lagged)		-0.054	-0.034		-0.453*	-0.377*
		(0.061)	(0.044)		(0.262)	(0.225)
ROA (lagged)		0.827***	0.600***		1.944*	1.082
		(0.128)	(0.088)		(1.016)	(0.908)
Interbank ratio (lagged)		-0.001	-0.001		-0.037*	-0.039*
		(0.002)	(0.002)		(0.022)	(0.021)
Bank's lending share (term loans; lagged)			-0.717***			-2.723***
			(0.074)			(0.381)
Length of relationship (log)			-0.027			-0.130
			(0.031)			(0.250)
Observations	3,940	3,940	3,940	3,940	3,940	3,940
Adjusted R^2	0.140	0.186	0.269	0.190	0.218	0.260

Notes: Columns 1–3 report the results obtained by estimating equation (8), where the dependent variable is the growth of term-loans at the bank-firm-time level. Columns 4–6 report the results obtained by estimating equation (10), where the dependent variable is the change in the ratio of term-loans to government bond holding at the bank-firm-time level. Standard errors, clustered by banks, are reported in parentheses. All regressions include fixed-time and banks fixed-effects. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

Table 12: Term loans: new and severed relationships

	New term-loans			Severed term-loans		
	LPM	Robust	Probit	LPM	Robust	Probit
	(1)	(2)	(3)	(4)	(5)	(6)
Growth of total liabilities	-0.205**	-0.203***	-1.321***	0.048	0.039***	0.419
	(0.087)	(0.012)	(0.469)	(0.076)	(0.003)	(0.321)
Government bonds /	0.016	0.015	0.233	0.644*	0.453***	6.103***
total assets (lagged)	(0.271)	(0.015)	(0.529)	(0.327)	(0.005)	(0.441)
Tier 1 ratio	-0.000	-0.000	0.003	0.010	0.007***	0.081***
(lagged)	(0.008)	(0.000)	(0.009)	(0.010)	(0.000)	(0.010)
ROA	0.132***	0.130***	1.088***	-0.019	-0.020***	-0.218***
(lagged)	(0.019)	(0.003)	(0.056)	(0.013)	(0.000)	(0.071)(
Interbank ratio	-0.000	-0.000*	-0.001	0.001**	0.001***	0.012***
(lagged)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Bank's lending share				0.127***	0.007***	1.859***
(term loans; lagged)				(0.010)	(0.001)	(0.085)
Length of relationship				0.003	0.002***	0.121***
				(0.006)	(0.000)	(0.041)
Observations	16,781	16,781	16,781	8,811	8,811	8,811
Adjusted R^2	0.152	0.600		0.166	0.980	

Notes: In columns 1–3 the dependent variable is a dummy that takes the value of one if the bank has granted a new term-loan to a firm and zero otherwise. The sample includes those firms that already had a relationship with the bank, but not a term-loan, and had already a term-loan from another bank. In columns 4–6 the dependent variable is a dummy that takes the value of one if the bank has severed existing term-loans to a firm and zero otherwise. The sample includes all term-loans active in each year with firms that had more than one lending relationship. Columns 1 and 4 report the results obtained estimating a linear probability model; columns 2 and 5 report the results obtained estimating a robust regression; columns 3 and 6 report the results obtained estimating a probit model. Standard errors, clustered by banks, in parentheses. Columns 1 and 4 include firm-time and bank fixed-effects. In columns 2–3 and 5–6 firm-time and bank fixed effects are estimated from the companion OLS regressions and included among the regressors. ***, **, * denote significance at 1% level, 5% level and 10% level, respectively.

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Acknowledgements

We are grateful to Francesca Arnaboldi, Salvatore Nisticó, Zeno Rotondi, Damiano Silipo, and seminar participants at University of Molise, Beijing Normal University, LUISS Guido Carli, Kobe University, and at Societá Italiana degli Economisti (Cosenza, 2017), Money, banking and finance (Rome, 2017), Financial intermediation network on european studies (Trani, 2017), Financial engineering and banking society (Rome, 2018), EFiC conference in banking and finance (Essex, 2019). All remaining errors are our own responsibility.