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THE ROLE OF BANK SUPPLY IN THE ITALIAN CREDIT MARKET: EVIDENCE FROM A NEW REGIONAL SURVEY

by Andrea Orame[*]

Abstract

The work analyses the characteristics of supply in the Italian credit market with a focus on the years 2009-2014. By using a new survey, I find that approximately 40 percent of the decline in business lending originates in the tightening of bank credit standards, with a significant decrease in supply after the first semester of 2011. The data also reveal a substantial supply-side heterogeneity: illiquid, profitable, efficient and group-member banks reduce their supply further, as do banks with a low dependence on interest income. Banks in larger groups also display a different supply pattern, with greater tightenings and easings. Capital and funding seem to play no significant role.

JEL Classification: E32, E51, G01, G21, G28, G32.
Keywords: financial crisis, supply of credit, bank lending, bank fragility, universal banking, capital, regulation, governance.
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Contents

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1. Introduction[‡]

Since the start of the financial crisis in 2008, the slowdown in bank lending to non-financial corporations has prompted a heated debate in several countries.[1] One side argues that the slowdown in credit originates from a reduction in supply, where banks are responsible for hurting the economy. The other side argues that the slowdown originates from a lack of demand. The debate grows even fiercer where policy intervention or changes to the regulations are concerned. This is because a proper course of action inevitably depends on the forces that drive the credit market. In light of the growing concern about the functioning of the credit market, this work studies the supply of credit in the years 2009-2014 in Italy.

To study the supply of credit is a difficult task. A reduction in business loans, although widely debated, is uninformative about the role of supply: the demand for credit might explain the reduction in loans. Moreover, even knowledge about banks that reduce their supply is only partially informative: changes can be diverse and of unknown intensity. Laffont and Garcia [50] and Sealey [64] seek to overcome the problem by maintaining that some factors only drive one side of the market, Jiménez et al. [43] by convincingly controlling for the demand of credit, and Khwaja and Mian [47] and Paravisini [57] by resorting to a quasi-experimental design. Nevertheless, the limitations in existing techniques have led policymakers towards the use of dedicated surveys,[2] subsequently

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[1]In Italy, the 2007 growth rate of business loans was above 10 per cent. Since then, such level has never been reached again.

[2]The European Central Bank coordinates the Bank Lending Survey (BLS), see Berg et al. [16]. In the United States, the Federal Reserve System manages the Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOOS), see Schreft and Owens [62]. Similar surveys in the United Kingdom and in Japan are known as the Credit Conditions Survey (CCS) and the Senior Loan Officer Opinion Survey on Bank Lending Practices at Large Japanese Banks (SLOJ). Survey data make it easier to achieve an understanding of supply that (i) avoids strong identification assumptions (think of the assumptions in Sealey [64]), (ii) possibly includes any borrower and relates both to common and idiosyncratic changes (survey data does not discard firms that liaise with only one bank, as in Jiménez et al. [43] or Amiti and Weinstein [4]. Ciccarelli et al. [26] also note that survey data applies "to the whole pool of borrowers", not only accepted loans. In addition, Amiti and Weinstein [4], among others, identify idiosyncratic shocks, i.e. shocks with respect to a reference bank-firm couple, and they remain silent on the common supply or demand shock), and that (iii) overcomes the gaps in non-recurring identification strategies (think of identification strategies that rely on one-off

exploited in several studies.

Following that literature, I worked with the Regional Bank Lending Survey (RBLS) of the Bank of Italy. This is the first study to use its wide cross-section of regional and bi-annual records at the bank level to deal with the question of the contribution of supply to the dynamics of the credit market.[3] Making use of individual data and exploiting for the first time the entire set of the survey's distinctive features, I provide new evidence to supplement Del Giovane et al. [29] for the years 2009-2014, by sharpening their results and using an improved version of their model. In fact, my dataset allows for new bank-area and area-time fixed effects and proves that the inclusion of controversial variables such as GDP and interest rates is unnecessary. Furthermore, I recognize that banks can also respond to existing economic conditions, providing a more comprehensive analysis of supply than Bassett et al. [11], in which supply changes in response to factors outside the banking industry are indeed discarded. Moreover, while Del Giovane et al. [29] and Bassett et al. [11] are the first to use banking-group level data, I am the first to use bank-area level data[4] sourced from a survey covering a large number of medium and small banks. As a consequence, the survey needs to be tested against alternative models and the outcomes studied critically.

In addition, I investigate the diverse supply behaviour of banks, looking at balance-sheet information, such as cash and capital, and at other features such as group membership or profit orientation. This exercise cannot be done by other surveys, as they sample small groups of large banks, and allows survey's data to make a new contribution to this topic.

In terms of methodology, I analyse the change in supply along with two components: whether a bank changes supply and how it does so;[5] the data show that the two components often produce different insights. Furthermore, I trace the customers affected by such changes.[6] On the one hand, this approach permits me to distinguish the scenario in which a few banks tighten their supply significantly from the one in which many banks only tighten their supply mildly. On the other, it allows me to appreciate how several factors affect lending without bank size confounding the

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shocks, as in Khwaja and Mian [47]).

[3]Nobili and Orame [56] provides a preliminary analysis that uses a different section of the RBLS.

[4]Each bank is broken down into different regions.

[5]Here I mean the strength of the change.

[6]Appendix E provides the rationale for using lags of outstanding loans. However, it still represents a proxy because customers can also be affected by the supply of other banks. Differently from other surveys, a bank in the RBLS can either serve a big set of customers or a small community.

results. Finally, I describe a convenient procedure to pass from individual to market data. The intuition is similar to that of Amiti and Weinstein [4], but applies to a different context and originates from a different setting.

Interestingly, a literal interpretation of the RBLS consistently fits the developments of the credit market, showing that supply contributes to approximately 40 per cent of the decline in lending between 2009 and 2014, i.e. 1.75 out of 4.41 percentage points. I also find a substantial reduction in supply after the first semester of 2011 that originates from a significant increase in the intensity of the changes. Further investigations show that illiquid, profitable, efficient and group-member banks reduce their supply of credit more than other banks, as do banks with a low dependence on interest income. Banks in larger groups also evidence a different supply pattern, with greater tightenings and easings. Capital and funding seem to play no significant role. Hence, I find that banks more connected to other financial players and with a less traditional business model cut their supply more than other banks.

The rest of this paper is structured as follows. Section 2 reviews the literature and Section 3 introduces the dataset. Section 4 develops the empirical strategy and Section 5 shows the estimates, which are then challenged in Section 6 and 7. Section 8 aggregates data, which are then analysed in detail in Section 9. Section 10 concludes.

2. Related literature

The work can be related to the literature that uses survey data to test the 'credit view' pioneered by Bernanke and Blinder [20]. Most of this literature uses aggregate survey data to study how credit supply affects economic activity. Among others, Demiroglu et al. [32] and Ciccarelli et al. [26][7] find that a supply tightening is related to a slowdown in lending and economic activity.

Closer to my approach, Bassett et al. [11] and Del Giovane et al. [29] use individual data. Bassett et al. [11] find that credit supply accounts for 40 per cent of lending variations in 1991-2012 and Del Giovane et al. [29] find that supply accounts for between −2.3 and −3.1 percentage points in each year in 2007-2009. Del Giovane et al. [30] also show that the cumulative supply-induced

[7] See also Lown et al. [52], Lown and Morgan [51], Cunningham [27], Bayoumi and Melander [13], Swiston [69], Cappiello et al. [25], De Bondt et al. [28], Hempell and Kok [39], Haltenhof et al. [38] and Buca and Vermeulen [23].

reduction in the stock of loans is approximately 8 percentage points in 2007-2012 .[8]

The contribution to that literature is two-fold. On the one hand, I test a new survey and I show that I can achieve a higher level of precision, shedding light on controversial issues still open in the literature. Most of them concern the interpretation and credibility of survey data. In addition, I clarify the procedure for passing from individual to market data. On the other hand, I provide new empirical evidence by means of survey data over the 2009-2014 credit cycle,[9] and I make clear the difference between the number of banks that change supply and the magnitude of those changes.

Furthermore, the work contributes to the literature that studies the diverse supply behaviour of banks.[10] The literature is not conclusive and I provide for the first time a large-scale point of view of survey data in relation to supply heterogeneity.[11] Bassett et al. [11] find that most bank-level variables have statistically significant but modest effects on lending standards and Bofondi et al. [21] find an aggregate reduction in supply after the first half of 2011 that is not explained by heterogeneity in bank characteristics. By contrast, this work shows that bank characteristics affect lending significantly.

In that literature, large and well-capitalized banks tend to be less responsive to shocks, particularly monetary policy shocks. Maddaloni and Peydro [55] find that banks entering the 2008 crisis with more capital softened their lending conditions more, but Lown and Morgan [51] find a weak to insignificant relation between bank capital ratios and credit standards.[12] In addition, Banerjee et al. [10] and Alessandri and Bottero [2] show that well-capitalized banks reduce their supply less.[13] On the one hand, I find no significant role for capital and, on the other, I find that banks that belong to a banking group decrease their supply more than stand-alone banks.

Furthermore, Khwaja and Mian [47] find a significant effect of liquidity shocks on credit supply and Demirgüç-Kunt and Huizinga [31] show that banks relying more on non-interest income and non-deposit funding enhance their fragility. Beltratti and Stulz [15] find that banks with good

[8] According to Del Giovane et al. [30], supply accounts for 35 per cent of credit reduction in 2008-2009 and 45 per cent in 2011-2012. I would like to thank Federico M. Signoretti for doing this calculation.

[9] Anecdotal evidence suggests that this period starts after the most acute phase of the 2007-2008 crisis and ends a the point in which supply stabilizes after the sovereign debt crisis.

[10] Among others, see Kashyap and Stein [46].

[11] The exercise was not possible before owing to the small number of large banks sampled in other surveys.

[12] See Kishan and Opiela [48], Diamond and Rajan [33], Gambacorta and Mistrulli [37], Baglioni [7], Peek and Rosengren [58] (capital).

[13] They study the years 2008-2013 and 2003-2012.

performances had lower returns before the crisis in 2008 and that large banks from countries with more restrictions on bank activities reduced loans less. Bonaccorsi di Patti and Sette [22] show that, in 2007 and 2008, the transmission of the securitization freeze to bank supply was weaker for banks with more liquid assets.[14] Although the funding mix plays no significant role in my analysis, I find that liquidity positively affects lending and that higher returns and dependence on non-interest income are related to a greater decrease in credit supply.

3. Data sources and descriptive analysis

The work matches bank-area individual survey data on lending practice with bank-area individual loans to firms. A key source of data is the RBLS, a new regional survey on bank lending carried out by the local branches of the Bank of Italy. The survey covers an unbalanced panel of 420 banks between 2009 and 2014, which is an extraordinary number of banks for this type of survey.[15] The sample accounts for 90 per cent of the Italian bank-intermediated business credit market, accurately reflecting market trends (Figure 1). All intermediaries rated as active banks, legally and *de facto*, are contacted by the closest branch of the Bank of Italy.[16] To the best of my knowledge, there is full compliance, namely 100 per cent of contacted banks responded, and the only reason for the sample being unbalanced is market entry and exit. Hence, as is common for this type of survey, there is no controversy over compliance even though truth-telling is an issue.[17] This is addressed by treating individual responses confidentially and distancing them from the supervisory department. However, loan officers can still avoid the truth or misinterpret the questionnaire,

[14] See Diamond and Rajan [34] and Kashyap et al. [45] (liquidity), Berger and Humphrey [17], Stiroh [66] and Stiroh [67] (non-interest income), Flannery [36], Kopecky and VanHoose [49] and Pennacchi [59] (risk profile).

[15] Del Giovane et al. [29] work with an unbalanced panel of 11 banking groups (the Italian portion of the European BLS) and Bassett et al. [11] with 68 banks that belong to a publicly traded American bank holding company (a subset of the 140 banks in their SLOOS sample). Altavilla et al. [3] work with 137 European banking groups (BLS). None of them use data at the sub-national level.

[16] Cassa Depositi e Prestiti and Banco Posta are not in the sample. They are not considered banks because they are either linked to the Government or to the Italian postal service.

[17] On truth-telling, both Schreft and Owens [62] and Del Giovane et al. [29] are concerned by the low number of supply easings in their surveys. Schreft and Owens [62] state that ‘as tightenings outnumbered easings from 1967 through 1983, if we take the survey results literally, lending standards would have been unbelievably stringent by late 1983’ (p. 10). Del Giovane et al. [29] state that ‘according to a literal reading of the banks’ answers, the degree of tightening at the end of 2009 would be significantly higher than it was at the peak of the financial crisis’ (p. 2729). Swiston [69] and Bassett et al. [11] have recently seen an increase in the number of easings, although smaller than expected. In this regard, I notice that multiple minor changes in one direction can compensate for a strong change in the opposite direction.

which makes statistical testing necessary.[18]

A distinctive feature of the survey is its breakdown of the four Italian regions.[19] Small banks report their qualitative supply-and-demand assessments for their single region of operation, while medium to large banks report multiple assessments, one for each region. Out of $5,481$ observations, $2,071$ are from banks with multiple assessments. This feature can enhance the quality of comparisons with banks operating at different levels, such as small community and large national banks.[20]

The fact that the RBLS is a bi-annual survey also makes it an important source of information. Similar surveys are run quarterly and, while being bi-annual can be a limit, it adds to data quality. In fact, higher frequencies tend to reveal the (irrelevant) internal debate on future supply, in addition to the (relevant) policy in force. Moreover, bi-annual data can add to the debate over the lapse in time between the enactment of a supply change and the trace of its effect on loans.

At the core both of this work and of the survey, there are two questions to the loan officer concerning the semi-annual change in credit standards[21] and in the demand for credit from non-financial corporations. The option are tightened considerably (-2), tightened somewhat (-1), basically unchanged (0), eased somewhat (1) and eased considerably (2) for supply and decreased considerably (-2), decreased somewhat (-1), basically unchanged (0), increased somewhat (1) and increased considerably (2) for demand.

The outcome of the two questions is matched with data from the ‘Credit and Financial Institutions’ Supervisory Reports’ of the Bank of Italy, as they trace the equilibrium outcome of the market. All other balance-sheet data are from that source. Outstanding loans to non-financial corporations include productive households, bad loans and loans under a repurchase agreement. Bank-area growth rates are adjusted by the effects of securitizations, reclassifications and other variations that are not a result of ordinary transactions, most notably mergers and takeovers (Appendix B).

[18] Testing survey data against different model represents a first and important step in this direction.

[19] They are better known as ‘macro areas’. They are North-West, North-East, Center, and South and Islands.

[20] In this paper, multiple-area responses can be thought of as coming from different banks, and hence I use the term bank to refer to a bank-area. A bank in the RBLS can either serve a big set of customers or a small community.

[21] Credit standards shape the supply policy of a bank. Credit standards are defined here as ‘the price and non-price terms and conditions at which a bank prefers to lend rather than not to lend’; see Appendix A.

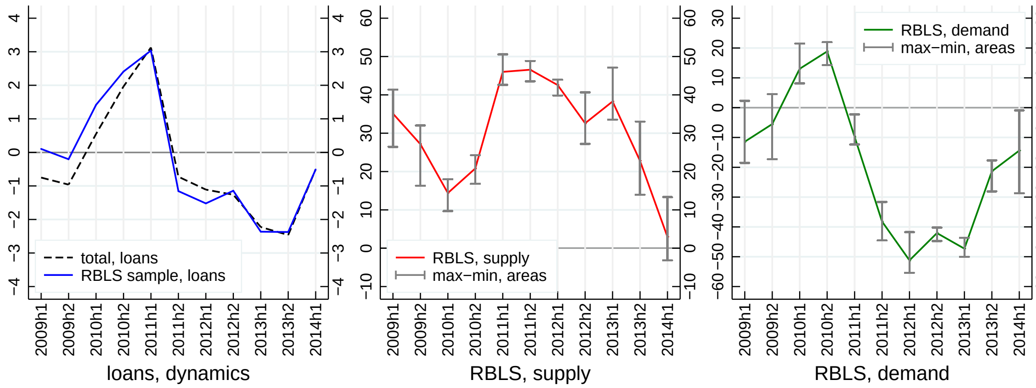

Figure 1: Loans to non-financial corporations (percentage points; half-yearly growth rates adjusted—securitizations, reclassifications and other variations that are not a result of ordinary transactions—at the national bank level) and RBLS indicators (net percentages, percentage points) for non-financial corporations. The net percentage is the simple difference between the share of banks reporting a tightening (increase) in credit standards (demand) and the share of those reporting an easing (decrease). Positive (negative) values for the supply indicator reflect a tightening (easing) in supply, positive (negative) values of the demand indicator reflect an increase (decrease) in demand. Max and Min refer to maximum and minimum values among the net percentages of the four areas of the country. For additional details, see Appendix C.

Figure 1 and Table 1 show survey records in net percentages[22] and reveal the key features of the data. First, the 2009-2014 period shows few easings and many tightenings in supply. Second, supply and demand records are correlated (Appendix C) and, third, supply changes in 39 per cent of the occurrences.

Table 1: Summary statistics.

	Mean	Std Dev	Min	Median	Max
Growth rate, loans ($\Delta L^{\%}_{i,a,t}$)	1.195	8.294	-71.815	0.513	95.547
Dummy, supply tightening ($Sup^{tight}_{i,a,t}$)	0.345	0.475	0	0	1
Dummy, supply easing ($Sup^{ease}_{i,a,t}$)	0.043	0.203	0	0	1
Dummy, demand decrease ($Dem^{decr}_{i,a,t}$)	0.421	0.494	0	0	1
Dummy, demand increase ($Dem^{incr}_{i,a,t}$)	0.232	0.422	0	0	1

$\Delta L^{\%}_{i,a,t}$: half-yearly growth rates in percentage points (loans non-financial corporations). Dummies are equal to one in the event of a tightening (decrease) or easing (increase) in supply (demand) to non-financial corporations. 5,481 observations. 420 banks. 4 areas. Between 2009h1 and 2014h1, an average of 375 banks are surveyed in each semester: 229 are mutual banks and 146 are non-mutual banks. Mutual banks are small non-profit community banks. The North-West and the North-East have an average of 286 reporting banks, the South and the Center 214.

[22] Net percentages show the number of banks changing their supply. The net percentage is the simple difference between the share of banks reporting a tightening (increase) in credit standards (demand) and the share of those reporting an easing (decrease). Although completely arbitrary, as pointed out in Bassett et al. [11], positive values in net percentages are commonly considered as a proxy for an inward shift in supply (upward shift in demand).

4. Motivations for the empirical strategy

In this Section I set out the econometric model of this work and I discuss several considerations in support of its parsimony. The model is:

$$\Delta L^{\%}_{i,a,t} = \mu + \alpha_{i,a} + \eta_{a,t} + \gamma Sem_t + \beta_1 Sup^{tight}_{i,a,t} + \beta_2 Sup^{ease}_{i,a,t} + \beta_3 Dem^{decr}_{i,a,t} + \beta_4 Dem^{incr}_{i,a,t} + \varepsilon_{i,a,t} \quad (1)$$

$\Delta L^{\%}_{i,a,t}$ refers to the half-yearly growth rate of loans to non-financial corporations for bank i in area a at time t. μ is an overall intercept. The model also features a full set of fixed effects. $\alpha_{i,a}$ denotes a bank-specific intercept that intends to capture self-reporting habits, portfolio composition effects, and other factors affecting the trends of loans for any given supply schedule. Note that multiple intercepts are allowed for banks operating in more than one region. $\eta_{a,t}$ refers to area-year fixed effects that control for the trend and structure of both the productive and financial sectors, thereby accounting for borrowers' creditworthiness possibly changing both over time and also across regions.[23] Sem_t is a seasonal dummy equal to one in the first semester of every year.

$Sup^{tight}_{i,a,t}$ is a binary indicator equal to one if bank i in area a at time t reports a tightening in its credit standards and $Sup^{ease}_{i,a,t}$ is a binary indicator for an easing. In turn, $Dem^{decr}_{i,a,t}$ is a binary indicator equal to one if bank i in area a at time t reports a decrease in the demand for loans and $Dem^{incr}_{i,a,t}$ is a binary indicator for an increase. Supply-and-demand decreases and increases are allowed to exert a different impact on lending and this choice can only be evaluated by means of econometric analysis, which Section 5 does. Finally, $\varepsilon_{i,a,t}$ is the usual error term that closes the model.

I now discuss some points in support of this model. First, survey supply and demand records comove over time. When addressing similar evidence for their survey, Bassett et al. [11] argue that supply records are the confluence of supply and demand factors. By contrast, I see it as a possibly similar response to common shocks, in line with Amiti and Weinstein [4], for whom bank and firm shocks can indeed be correlated.[24]

[23] Samolyk [61] notes that the credit market is likely made up of sub-national markets. The creditworthiness of firms is assessed based on their balance sheets. As new and official balance-sheet data are usually publicly available each year, area-year fixed effects should control better for non-financial corporation creditworthiness than area-semester fixed effects.

[24] Altavilla et al. [3] argue that supply-and-demand net percentages are driven to a significant extent by common shocks over the business cycle. Lown and Morgan [51] note that tighter standards could signal some negative disturbances in economic activity that also reduce loan demand.

Second, the literature relies more on survey supply records than on demand records. Nevertheless, demand records isolate the specific demand faced by each bank, here in each area of operation, and thus they control for the endogenous matching of bank and customers. Other proxies cannot control for the specific demand actually faced by each bank, thereby undermining the veracity of the results. Moreover, alternative variables cannot be accurately related either to supply or to demand. Del Giovane et al. [29], for instance, additionally control for a number of macroeconomic variables 'at the expense of a less immediate interpretation, since it is impossible to determine whether the part of credit developments explained by the control variables should be attributed to supply or to demand effects' (p. 2728). Some of the variables that one can find in the literature are GDP, interest rates, business failure rates, excess bond premiums and the VIX index. At the other extreme, Bassett et al. [11] target supply innovations that originate from within the banking industry by controlling for as many factors as they can, but discarding relevant and still genuine supply changes in response to external factors. As a consequence, I essentially rely on demand records, no macroeconomic variable enters my model and the fixed effects are mostly intended to control confounding factors beyond supply and demand.[25]

Finally, the RBLS tracks changes in supply and demand. This means that the RBLS provides no direct information on credit rationing, for which a knowledge of the level of supply and demand would be required. However, Bernanke and Lown [19] note that 'the notion that a macroeconomically significant credit crunch necessarily involves elements of credit rationing or a complete cutoff of some groups from credit is incorrect'. If I discard the terms 'significant' and 'safe interest rate' from their definition of credit crunch because they raise controversial issues (Appendix A), there emerges what the RBLS can most easily trace, namely 'inward shifts in the supply curve for bank loans, holding constant both the overall demand of credit and the quality of potential borrowers'.

However, two other points are worth discussing. First, raw survey data are recoded into three wider categories: easing, tightening, unchanged and increase, decrease, unchanged.[26] Indeed, both as a

[25] Only the data will tell us if this is indeed the case. Note that I take monetary policy as a given. In this respect, as long as policy innovations pass evenly through supply and demand their relative contribution is not affected. A similar issue arises in Amiti and Weinstein [4] as it is not possible to tell how much of the common shock is due to firm borrowing or bank lending.

[26] On the supply side, 'tightened considerably' is grouped with 'tightened somewhat', 'eased considerably' with 'eased somewhat', and 'supply basically unchanged' remains in its original form. On the demand side, 'decreased considerably' is grouped with 'decreased somewhat', 'increased considerably' with 'increased somewhat', and 'de-

cross section and over time, what appears to be a strong change in the eyes of one loan officer may be seen as mild by others.[27] However, the direction of the change, up or down, cannot be misunderstood. Finally, Holmstrom and Tirole [41] argue that an increase in the net worth of companies should lead to a demand shift from bank loans to market bonds.[28] This work focuses on bank loans and the $Dem^{decr}_{i,a,t}$ dummy should account for this well-known fact: other relevant factors being equal, a major switch to the capital market should show up in a genuine decrease in the survey-reported demand for bank-intermediated credit.

5. How a change in supply affects lending: estimation

I now present the estimates of the benchmark model and I show that the arguments in Section 4 are corroborated by the empirical findings of this Section. Table 2 shows dummy-variable OLS estimates of the relationship between supply dummies and the growth rate of loans. Those parameters are important because they show *how* supply, on average, affects lending.[29] Table 2 indicates that the estimates are statistically significant and economically meaningful when all the relevant fixed effects are included. While Column 1 includes no fixed effects and poorly accounts for the functioning of the credit market, Column 2 allows for bank-fixed effects and the tight-supply coefficient becomes statistically significant at the 5 per cent level.[30] By contrast, Column 3 shows that area fixed effects alone change the estimate much less. Instead, bank-area fixed effects in Column 4 are critical and Column 5, in which I have bank-area and area-year fixed effects, isolates the specific impact of supply better than any other specification. By contrasting Column 2 and 5, I notice that the demand-decrease coefficient drops by 42 per cent and the demand-increase by 24 per cent. The tight-supply coefficient goes up by 17 per cent and the ease-supply coefficient, although not statistically significant, critically turns positive. The fixed effects are still jointly statistically

mand basically unchanged' also remains in its original form.

[27] Alternatively, loan officers may be less keen to report the truth on the details of the change. The 'institutional memory hypothesis' of Berger and Udell [18] may also be at work. In fact, memory loss of the internal process guiding the internal assessments of supply and demand can threaten the overall consistency of the survey. However, there are also reasons for the turnover of loan officers to affect data quality positively. In fact, Hertzberg et al. [40] find that loan officers have incentives to report truthfully when a rotation policy is in place.

[28] It is for this pattern that Becker and Ivashina [14] identify supply shocks.

[29] The estimate is for a change in supply. The net percentage will additionally tell us how many banks change their supply.

[30] This contrasts with Del Giovane et al. [29], where bank fixed effects are not critical. They state: 'excluding bank fixed effects does not provide any significant change in the results' (p. 2724 footnote 12).

significant and all but one of the coefficients are statistically significant at the 1 per cent level. The estimate supports the arguments in Section 4, where the fixed effects were intended to control confounding factors beyond supply and demand, and for that reason Column 5 in Table 2 is the benchmark estimate of this work.

In fact, Column 5 in Table 2 reveals the explanatory power and the precision of the RBLS, when at work with an appropriate model. Row 1 indicates that a tightening in supply leads to a significant decline of 0.90 percentage points in the half-yearly growth rate of loans. In turn, Row 2 indicates that an easing in supply is associated with an upside acceleration of 0.25 points. Although the point estimate makes economic sense,[31] its standard error rises to the point that the effect is indistinguishable from zero, either because easings are rare in the sample or because they are particularly mild. Concerning demand controls, Row 3 shows that a decrease in demand is associated with a slowdown in the dynamics of loans of 0.82 points,[32] and Row 4 that an increase is associated with an upside acceleration of 1.68 points.

The difference in supply coefficients in Rows 1-2 suggests that upside and downside changes in supply relate to the dynamics of loans asymmetrically. The supply-ease coefficient is not distinguishable from zero, whereas the supply-tight coefficient is robustly and statistically different from zero. The outcome shows the importance of accounting separately for upside and downside changes in order to follow their effect on loans properly. Overall, the estimate reveals that, when correctly understood, the RBLS provides valuable and precise additions to the understanding of the unfolding of the credit market.

[31] Although not statistically significant, Del Giovane et al. [29] always produce a negative sign for their easing coefficient.

[32] In contrast to Del Giovane et al. [29] and Lown et al. [52], demand coefficients have the expected sign. Del Giovane et al. [29] state: 'quite often a negative BLS [the lending survey of the European Central Bank] demand indicator is associated with a largely positive change in loans' (p. 2729).

Table 2: OLS estimates.

	(1)	(2)	(3)	(4)	(5)
					BENCH.
$Supply^{tight}$	-0.37 [0.2842]	-0.77** [0.3516]	-0.37 [0.2853]	-0.75** [0.3526]	-0.90*** [0.3086]
$Supply^{easing}$	-0.45 [0.8577]	-0.19 [1.1040]	-0.42 [0.8813]	-0.11 [1.1619]	0.25 [1.1156]
$Demand^{decrease}$	-1.58*** [0.3744]	-1.35*** [0.3217]	-1.58*** [0.3672]	-1.19*** [0.3629]	-0.82*** [0.3050]
$Demand^{increase}$	2.92*** [0.4559]	2.20*** [0.4295]	2.88*** [0.4493]	2.29*** [0.4616]	1.68*** [0.5028]
n observations	5,481	5,481	5,481	5,481	5,481
R^2	0.0469	0.2022	0.0497	0.2845	0.3165
Pr>W[1]	.	0.0000	0.0000	0.0000	0.0000
n banks	420	420	420	420	420
n areas	4	4	4	4	4
n times	11	11	11	11	11
Intercept	Yes	Yes	Yes	Yes	Yes
Seasonal dummy	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	No	Yes	No	No	No
Area fixed effects	No	No	Yes	No	No
Bank-area fixed effects	No	No	No	Yes	Yes
Area-year fixed effects	No	No	No	No	Yes

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are in parentheses. Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. Dummy-variable OLS estimates. Standard errors clustered by bank and time. [1]*p-values* for the exclusion of fixed effects.

6. Robustness checks

The statistical significance of the results is not sensitive to the clustering of the standard errors and in the remaining part of the work I rely on two-way clustering by bank and time (Appendix D). In addition, the main results of the baseline model continue to hold when balancing the panel, not including bad loans or using area-semester fixed effects instead of area-year fixed effects.[33]

Another well-known issue is the robustness of the results with regard to the dynamic persistence of loans, once changes in supply and demand occur. Indeed, broken lending relationships take time to be restored and a demand-driven decrease in loans can also affect the dynamics of loans in subsequent periods, as tranches of the same deal are not renewed. Agents' habits or perverse incentives can lead to 'evergreen loans' or to additional reasons for the drifting of lending despite

[33]Results are available upon request.

a new supply policy.[34] Column 5 in Table 3 shows the Arellano and Bover [6] estimate of the dynamic version of the baseline model that passes routine tests. Rows 3 to 6 show that the coefficients remain significant. In addition, the coefficients on both lags of the dependent variable are positive and statistically significant, which shows that trends in the credit market do not revert immediately to former positions.[35] However, Table 3 also reveals that the magnitude of the supply-tight coefficient falls from −0.90 to −0.54. A full accounting of the direct and indirect effects, the latter acting through the dynamic part of the model, reveals an overall supply contribution that is 0.40 percentage points smaller in the dynamic model.[36] Considering that the moderate time dimension of the sample challenges the accuracy of the dynamic estimate, I opted for the static model as the reference point for this work.

7. Further robustness checks

One additional concern is how loan officers interpret the questionnaire. Del Giovane et al. [29] claim that the European Central Bank's lending survey can be better interpreted in relation to 'some benchmark condition they [lending officers] are likely to have in mind' (p. 2731) and Swiston [69] argues that loan officers are likely to report a tightening in supply during a period that is considered austere, regardless of whether a real change in supply has occurred.[37] To test this hypothesis, I match the growth rate of loans with the first time-difference of survey indicators.[38] Following this transformation, two equally austere periods should cancel each other out, signalling the correct set-up of supply. However, the hypothesis is rejected, because three out of four supply-and-demand coefficients are not statistically significant, supporting the view that a literal interpretation of the survey fits the developments of the market better (Appendix D).

Nevertheless, there is the option of using the cumulative sum of the changes. In fact, what occurred

[34] The argument is different from that in Lown and Morgan [51] in which there is feedback from loans to credit standards, best interpreted as a sort of credit cycle. In my view, supply shapes the market, not the other way around.

[35] The result contrasts with Del Giovane et al. [29], where 'the coefficient of the lagged dependent variable did not result to be statistically significant in any of the specifications considered' (p. 2722 footnote 10). Note that Del Giovane et al. [29] work with quarterly data.

[36] The comparison is performed where the two models overlap, namely from 2011$h1$ onwards, and by applying the technique described in Section 8.

[37] Schreft and Owens [62] argue that 'the survey's results are most meaningful when viewed relative to those from previous periods' (p. 33).

[38] I use the first time-difference Δ, i.e. $x_t - x_{t-1}$, for each bank-area supply-and-demand dummy.

Table 3: Dynamic models.

	(1)	(2)	(3)	(4)	(5)	(6)
						BENCH.
$\Delta S^{\%}_{t-1}$		-0.05 [0.0358]	0.01 [0.1253]	-0.05 [0.0359]	0.09** [0.0356]	
$\Delta S^{\%}_{t-2}$			0.06 [0.1536]		0.14*** [0.0331]	
$Supply^{tight}$	-0.86*** [0.2725]	-0.64*** [0.2405]	-0.47* [0.2754]	-0.40* [0.2336]	-0.54** [0.2441]	-0.90*** [0.3086]
$Supply^{easing}$	0.50 [0.6464]	0.36 [0.7059]	0.75 [0.9083]	-0.39 [0.6432]	0.63 [0.7196]	0.25 [1.1156]
$Demand^{decrease}$	-0.61** [0.2808]	-0.48* [0.2638]	-0.47 [0.3234]	-0.71** [0.2773]	-0.68** [0.2748]	-0.82*** [0.3050]]
$Demand^{increase}$	1.04*** [0.3266]	1.49*** [0.3544]	1.62*** [0.3722]	1.32*** [0.3680]	1.46*** [0.3510]	1.68*** [0.5028]
n observations	4,780	4,535	4,321	5,147	4,907	5,481
Instruments	.	16	16	27	27	.
Test Wooldridge (*p-value*)	0.9030	.	.	.	.	.
Test Arellano-Bond (*p-value*)	.	0.6047	0.0186	0.9728	0.0333	.
Test Sargan (*p-value*)	.	0.8103	0.4667	0.3300	0.0006	.

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are in parentheses. Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. (1) Model with data in first-difference and no intercept. The Wooldridge [73] test on data in first-difference shows a significant autocorrelation of -0.5 points. (2) (3) Arellano and Bond [5] estimator. (4) (5) Arellano and Bover [6] estimator. (2) (3) (4) (5) Two-step estimators corrected as in Windmeijer [72]. Models include a seasonal dummy. Arellano-Bond test: *p-values* are for the second lag. The Arellano-Bond test for error autocorrelation suggests introducing two lags for the dependent variable. The Sargan test suggests using one lag of the dependent variable as an instrumental variable. (6) Baseline model. Dummy-variable OLS estimates.

in the past may also be important for current lending, either because there is a difference between a first tightening and a further tightening or because the cumulative sum proxies the level of supply, which is perhaps more informative than its change. Del Giovane et al. [29] show that the inclusion of the cumulative indicators provides unclear results, compromising the fit of their equations. By contrast, van der Veer and Hoeberichts [71] claim that the cumulative indicators provide valuable information. In my setting, the cumulative supply-and-demand indicators are not statistically significant, supporting the view that their explanatory power is limited (Appendix D).

In addition, I used the 3-class version of the survey (Section 4). Resorting to the original 5-class form, the hypothesis that 'strong' and 'somewhat' coefficients have the same magnitude is not rejected. Moreover, the 'strong decrease' coefficient is smaller than the 'decreased somewhat' and the 'strong easing' coefficient is negative and, oddly enough, statistically significant. The estimates are consistent with the view that what can appear as a strong change to one loan officer is at times seen as mild by others, threatening the internal consistency of the survey (Appendix D).

Another key issue is whether supply and demand need any time to pass before they affect loans, whereby lagged survey records can explain lending better. Swiston [69] finds that credit standards pre-date most economic and financial data, while Bassett et al. [11] argue that due to the reluctance of banks to make abrupt changes one can expect new strategies in credit standards to be implemented slowly.[39] A bank may also need time to fully implement a new strategy and an increase in demand, although perceived by the loan officer, may need time to materialize. Unintentional misreporting can also play a role and lagged or even forwarded records may explain lending better. In fact, loan officers may either report what they observe when filling in the questionnaire or what they are discussing internally, namely supply prospects for the next future. Moreover, loan officers can also report old changes in supply because hard information for the reference period is not yet available. As a consequence, I test different lag-and-forward combinations of survey indicators, including the scheme by Del Giovane et al. [29], namely lagged supply and contemporaneous demand. The estimates show that changing the timing of the indicators worsens the fit of my model and that the RBLS mostly produces loan-coincident indicators of the credit market (Appendix D).

Finally, although it requires a different empirical strategy, nationwide individual bank survey records are matched with individual bank lending at the national level. When this is done, the R^2 increases slightly, but the supply-ease coefficient turns negative. Additionally, the supply-tight coefficient is no more statistically significant at the 1 per cent level and its magnitude falls considerably (-47 per cent). Overall, the estimates do not reject the hypothesis that the geographical breakdown of the RBLS is an important factor when making use of large and small banks at the same time, as it prevents the estimate of how banks change supply from being biased.[40]

[39] In Cunningham [27], the lags of credit standards add to the prediction of loans. In Lown and Morgan [51], credit standards still explain 18 per cent and 28 per cent of the variance of credit at four and eight quarters. De Bondt et al. [28] show that credit standards lead business loans by four quarters. On the implementation of new bank credit standards, see Luckett [53].

[40] Results are available upon request.

8. Putting together the estimate of the effect of a supply change with actual changes: from individual to market data

I have so far established that changes in supply were both widespread and significant. Bank supply changed in 39 per cent of the occurrences (Table 1) and lending decreased, on average, by 0.90 percentage points after a tightening in supply (Table 2). This, however, does not necessarily translate into a significant change in the overall supply of credit at the market level. In fact, it is necessary to account for the bank-specific impact of each change and for any balance between tightening and easing. When doing so, it is useful to recognize that the observed growth rate of loans for bank i in area a at time t can be written as follows:

$$\begin{aligned} \Delta L^{\%}_{i,a,t} = \Delta L^{\%,0}_{i,a,t} + \\ \left(\Delta L^{\%,1,tight}_{i,a,t} - \Delta L^{\%,0,tight}_{i,a,t}\right) Sup^{tight}_{i,a,t} + \\ \left(\Delta L^{\%,1,ease}_{i,a,t} - \Delta L^{\%,0,ease}_{i,a,t}\right) Sup^{ease}_{i,a,t} \end{aligned} \tag{2}$$

The actual growth rate of loans for bank i in area a at time t ($\Delta L^{\%}_{i,a,t}$) is seen as the growth rate of loans in the absence of any change in supply ($\Delta L^{\%,0}_{i,a,t}$) plus the effect of any easings or tightenings ($\Delta L^{\%,1,x}_{i,a,t} - \Delta L^{\%,0,x}_{i,a,t}$). $Sup^{tight}_{i,a,t}$ and $Sup^{ease}_{i,a,t}$ are the usual binary indicators.

Starting from Equation 2, Appendix E shows that the overall contribution of supply is given by Equation 3 (x_1=*tight*, x_2=*ease*), where lagged lending ($L_{i,a,t-1}$) and the use of the simple growth rate of loans in the baseline econometric model are both critical to guarantee consistency. The result is surprisingly similar to Amiti and Weinstein [4], but applies to a different context and originates from a different setting.[41]

$$\text{overall supply contribution} = \sum_{j=1,2} \left(\underbrace{\hat{\beta}_j}_{\text{how much}} \underbrace{\sum_i \sum_a^n Sup^{x_j}_{i,a,t}}_{\text{how many}} \underbrace{\frac{L_{i,a,t-1}}{\sum_i \sum_a^n L_{i,a,t-1}}}_{\text{individual impact factor}} \right) \tag{3}$$

[41] In relation to Amiti and Weinstein [4], bank-area supply-and-demand data already factor in the formation and termination of lending relationships. Note that contrasting the no-bank with the all-banks tightening scenario would not be directly related to the research question of this study. Indeed, $\hat{\beta}_1$ itself can be interpreted as the difference in the aggregate dynamics of loans between those two hypothetical scenarios. Therefore, the supply-tight coefficient can also be understood as the contemporaneous market change in the dynamics of loans in one semester if *all* banks in *all* areas tightened their supply, with respect to the dynamics of loans in which *no* banks tightened their supply. Such an exercise would be a thought experiment and not an assessment of the actual overall supply contribution.

Using Equation 3, Table 4 displays my best estimate of the overall contribution of supply to the dynamics of the Italian bank-intermediated business credit market between 2009 and 2014. With respect to 2008, actual lending declined by 4.41 percentage points. In the absence of any change in supply,[42] there would be a decline of 2.66 percentage points. Hence, the estimate suggests that approximately 40 per cent of the overall decline in lending between 2009 and 2014 can be related to pure supply factors, i.e. 1.75 out of 4.41 percentage points.

Table 4: Overall supply contribution.

	ACTUAL STOCK	SYNTHETIC STOCK	SUPPLY CONTRIBUTIONS
2009*h*1	99.25	99.45	-0.20
2009*h*2	98.30	98.34	-0.16
2010*h*1	98.84	98.95	-0.07
2010*h*2	100.78	101.02	-0.13
2011*h*1	103.93	104.44	-0.26
2011*h*2	103.17	104.06	-0.36
2012*h*1	102.03	103.27	-0.34
2012*h*2	100.74	102.11	-0.14
2013*h*1	98.50	100.09	-0.26
2013*h*2	96.07	97.76	-0.13
2014*h*1	95.59	97.34	-0.08
Difference, 2014*h*1 – 2009*h*1	-4.41	-2.66	.
Difference, ACTUAL – SYNTHETIC	-1.75	.	.
Sum, SEMESTERS	.	.	-2.13

2008*h*2, end of period, stock of loans to non-financial corporations set to 100. Percentage points. Difference, 2014*h*1 – 2009*h*1: 2014*h*1 stock of loans minus 2009*h*1 stock of loans. Difference, ACTUAL – SYNTHETIC: 2014*h*1 actual stock of loans minus 2014*h*1 synthetic stock of loans. Sum, SEMESTERS: sum of the supply contributions in each semester between 2009*h*1 and 2014*h*1. The actual dynamics of loans are based on total loans, not on the loans of the sample, with growth rates adjusted (securitizations, reclassifications and other variations that are not the result of ordinary transactions) at the national bank level. The exercise was performed using the four-digit tight coefficient −0.8959.

9. Exploring heterogeneity in bank supply

Now that a model has been tested, it is possible to investigate supply heterogeneity by means of survey data. The exercise is not permitted by other surveys as they sample small groups of large banks. In this work I can consider three types of heterogeneity. The first looks at the different share of banks that change their supply[43] and the second at the different intensity of those changes.[44] Then, by combining those factors, I can assess their different overall supply patterns, thus producing a third.[45] In doing so, I first allow different coefficients to banks assigned to dif-

[42] $\hat{\beta}_2$ is not distinguishable from zero and tightening is the only part relevant to the calculation.

[43] How many banks in each group change their supply?

[44] Do banks in each group calibrate their supply change differently?

[45] To avoid mechanical differences between groups of banks owing to their size, the weighting scheme works inside each group but not across groups.

ferent groups and then I resort to the Classifier Lasso estimator (C-Lasso) to group together banks with similar supply changes.[46]

9.1. *Using interaction terms to test group differences*

In principle, I would like to retrieve how each bank changes supply to be put side by side with how many changes it makes, as directly reported in the survey. However, as in Maddala et al. [54], some of the coefficients that I obtain from each bank-area time series have an unexpected sign and are difficult to interpret (Appendix F). Baltagi and Griffin [9] point out that a time series cannot properly control for important features of the data and Baltagi et al. [8] argue that 'in panel datasets with T up to 10, traditional homogeneous panel estimators would appear the only viable alternative' (p. 796). Still, the heterogeneous supply behaviour of banks is an interesting area of research not only in relation to a single bank but also in relation to groups of banks. In fact, a different number of banks in each group can decide to change supply and they can also calibrate their changes differently. Accordingly, I use interaction terms to allow different coefficients to banks assigned to different groups.

First, I use the following classifications:

(1) PRE-POST, namely before and after 2010h2, 2011h1, 2011h2, 2012h1;[47]
(2) NORTH-SOUTH, namely the reference area of the response;[48]
(3) FAREAS-MAREAS, namely the few (1, 2) or many (3, 4) areas in which a bank operates;
(4) NOGRU-GRU, namely the membership or non-membership of a bank in a banking group;
(5) NOTOP-TOP, namely the membership in a big (top five) banking group;[49]
(6) NOMUT-MUT, namely whether or not a bank is a mutual bank.[50]

For each group, Figure 2 shows how many banks changed their supply, Table 5 how they changed it and Figure 3 their overall supply pattern.

Interestingly, the estimate shows that the overall contribution of supply increased after the first

[46] I also ran quantile regressions to further investigate supply heterogeneity. No supply coefficient is significantly different from the others. Results are available upon request.
[47] Swiston [69] argues that a shorter period minimizes the possibility of problems owing to structural breaks in any of the relationships.
[48] The South includes the Centre and the North includes North-West and North-East.
[49] According to total funds intermediated.
[50] Mutual banks are small non-profit community banks.

semester of 2011 because of a significant increase in the strength of the changes. The overall contribution of supply was also different depending on whether the bank belonged to a banking group: group-members reduced their supply of credit more than stand-alone banks. Moreover, members of large banking groups changed their supply less frequently but with greater intensity, with the result of greater tightenings in 2011 and 2012 as well as more generous easings in both 2013 and 2014. The evidence complements Beltratti and Stulz [15], in which large banks from countries with more restrictions on bank activities reduce loans less. In fact, banks belonging to a group usually run a wider range of activities and can be considered more exposed to a crisis because they are more connected to other financial players.

Furthermore, the share of banks that changed supply was significantly different between North and South. More banks changed supply in northern than in southern Italy in the first part of the period, while the opposite was true in the second part. The same type of difference applies to banks that operated in few and in many regions as well as to mutual and non-mutual banks. Mutual banks reduced their overall supply less than non-mutual banks on account of the fact that the high share of mutual banks that changed supply was more than compensated by mildness of their changes. Although the evidence can reconcile opposing views on the role of mutual and non-mutual banks in the crisis, the large but statistically insignificant difference in the intensity of the changes does not allow for a robust conclusion.

I now move to study supply heterogeneity by means of balance-sheet indicators, on which I calculate the average for 2005-2006. The procedure aims to limit both endogeneity, early signs of financial distress date back to 2007, and data quality concerns, one single year can record exceptional numbers. The indicators I use to classify banks as being above (A) or below (B) the median[51]

[51] The distribution of each indicator is shown in Appendix G. The exercise may read as follows: did banks of lower/higher SIZE (or RISK, CAP, LIQ, FMIX, GBOND) at the onset of the crisis reduce their supply of credit more/less? For each indicator, banks outside the 1^{st}-99^{th} percentiles are not used for the purpose of estimation. Cutting the tail of the distributions sharpens the statistical significance of the results when splitting the sample according to profit-and-loss indicators. After several robustness checks the 40^{th} percentile substitutes for the median when dealing with TRA.

Table 5: Empirical analysis: breakdown by time, areas, size and profit orientation.

	PRE2010h2	POST2010h2	PRE2011h1	POST2011h1	PRE2011h2	POST2011h2	PRE2012h1	POST2012h1	NORTH	SOUTH	FAREAS	MAREAS	NOGRU	GRU	NOTOP	TOP	NOMUT	MUT
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
$Supply^{tight}$	-0.72*	-0.98***	-0.28	-1.41***	-0.73**	-1.11***	-0.67**	-1.36***	-0.91***	-0.88	-0.53**	-1.91**	-0.39	-1.61**	-0.76***	-2.76**	-1.31**	-0.49***
	[0.4235]	[0.3667]	[0.3980]	[0.4427]	[0.3670]	[0.4047]	[0.3420]	[0.5244]	[0.3121]	0.5934]	[0.2307]	[0.8823]	[0.2676]	[0.6493]	[0.2607]	[1.3387]	[0.5938]	[0.1875]
$Supply^{easing}$	-0.39	0.68	-0.03	0.52	-0.19	0.68	-0.30	0.86	0.3397	0.1118	-0.34	0.82	0.95	-0.59	-0.09	2.49***	0.75	-0.50
	[1.2789]	[1.5486]	[1.1345]	[1.6596]	[1.0943]	[1.7155]	[1.0615]	[1.7613]	[0.7831]	[1.9932]	[0.3500]	[2.9006]	[1.2816]	[1.5101]	[1.2108]	[0.8805]	[1.9493]	[0.4469]
$Demand^{decrease}$	-1.50*	-0.48	-0.64	-0.89**	-1.30***	-0.31	-1.02**	-0.47	-0.99***	-0.56	-0.73***	-1.04	-0.95***	-0.64	-0.70**	-1.43	-0.74	-0.91***
	[0.7870]	[0.3090]	[0.6080]	[0.3733]	[0.4687]	[0.4294]	[0.4097]	[0.4089]	[0.3666]	[0.4740]	[0.2861]	[0.6891]	[0.3641]	[0.4918]	[0.3084]	[1.0954]	[0.5131]	[0.2692]
$Demand^{increase}$	1.17	2.07***	1.88***	1.35**	1.62**	1.62**	1.78***	1.32**	1.68***	1.71***	1.73***	1.56	1.55***	1.86**	1.64***	1.98	1.92**	1.41***
	[0.7146]	[0.4809]	[0.6332]	[0.5653]	[0.6684]	[0.6350]	[0.5804]	[0.6030]	[0.6129]	[0.5290]	[0.3129]	[1.3493]	[[0.5316]	[0.8528]	[0.5111]	[1.3131]	[0.8846]	[0.3528]
Wald test of the difference (*p-values*)																		
$Supply^{tight}$ / $Supply^{easing}$		0.5931		0.0114		0.3413		0.1835		0.9727		0.1121		0.0945		0.1135		0.1918
		0.5798		0.7732		0.6493		0.5503		0.8932		0.6874		0.3974		0.0435		0.5201

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are in parentheses (two-way clustered by bank and time). Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. Baseline setting with bank-area, area-year fixed effects and seasonal dummy. The interaction terms are displayed side by side for ease of reading. NORTH: North-West and North-East. SOUTH: South and Center. FAREAS: banks operating in 1 or 2 areas. MAREAS: banks operating in 3 or 4 areas. NOGRU: banks not in a banking group. GRU: banks in a banking group. NOTOP: banks not in one of the top five banking groups (according to funds intermediated). TOP: banks in one of the top five banking groups (according to funds intermediated). NOMUT: non-mutual banks. MUT: mutual banks (mutual banks are small non-profit community banks). Unbalanced panel of 420 banks.

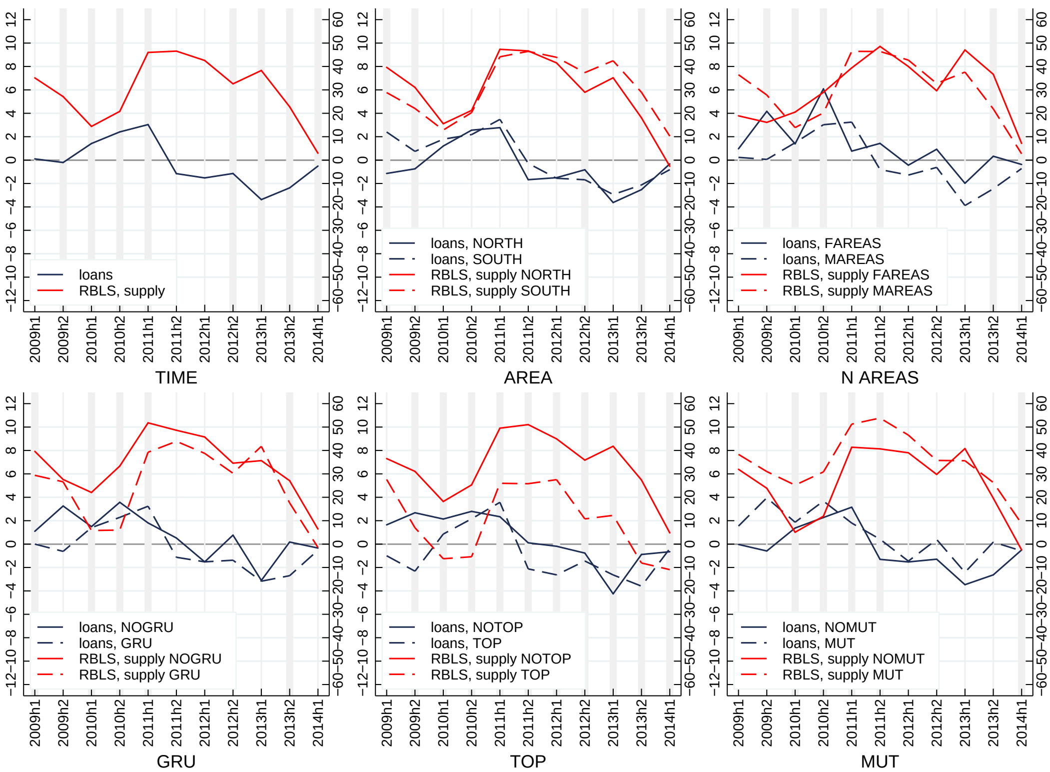

Figure 2: Growth rates of loans to non-financial corporations (left-hand scale, percentage points; half-yearly growth rates adjusted—securitizations, reclassifications and other variations that are not a result of ordinary transactions—at the area-bank level) and RBLS supply net percentages (right-hand scale, percentage points) for non-financial corporations. Thick vertical lines indicate statistical significance (at least 10 per cent) of the difference in net percentages (two-sided Welch test). The supply net percentage is the simple difference between the share of banks reporting a tightening in credit standards and the share of those reporting an easing. First picture: statistical significance refers to the difference in the net percentage of the current semester against the net percentage of the previous semester. 2009*h*1 not testable. NORTH: North-West and North-East. SOUTH: South and Center. FAREAS: banks operating in 1 or 2 areas. MAREAS: banks operating in 3 or 4 areas. NOGRU: banks not in a banking group. GRU: banks in a banking group. NOTOP: banks not in one of the top five banking groups (according to funds intermediated). TOP: banks in one of the top five banking groups (according to funds intermediated). NOMUT: non-mutual banks. MUT: mutual banks (mutual banks are small non-profit community banks). Unbalanced panel of 420 banks.

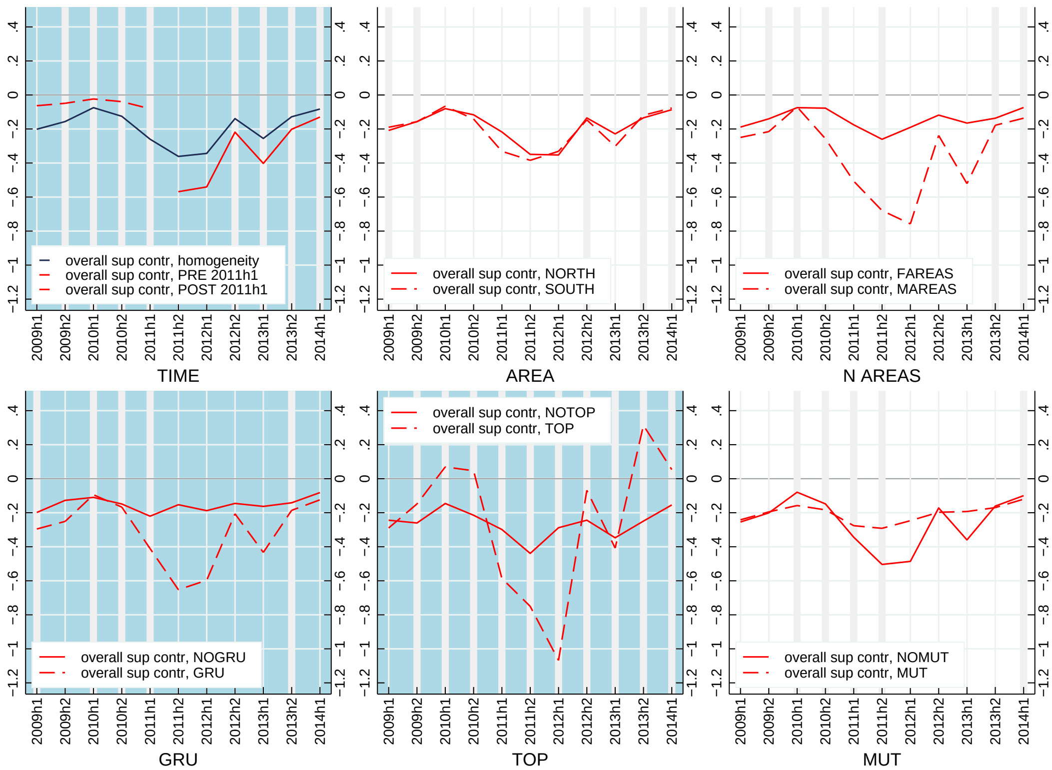

Figure 3: Overall supply contributions to the dynamics of loans to non-financial corporations (percentage points; this quantity parallels the last Column of Table 4 in Section 8). A dark plot region refers to the statistical significance of the difference in supply coefficients (at least 10 per cent). Tight or easing coefficients must be different between groups and at least one must be distinguishable from zero. Tight coefficients are used at face value. Easing coefficients are set to zero with the exception of TOP group. Thick vertical lines indicate statistical significance (at least 10 per cent) of the difference in the net percentages (two-sided Welch test). The supply net percentage is the simple difference between the share of banks reporting a tightening in credit standards and the share of those reporting an easing. First picture: statistical significance refers to the difference in the net percentage of the current semester against the net percentage of the previous semester. 2009*h*1 not testable. To avoid mechanical differences between groups due to their size, the weighting scheme works inside each group. NORTH: North-West and North-East. SOUTH: South and Center. FAREAS: banks operating in one or two areas. MAREAS: banks operating in three or four areas. NOGRU: banks not in a banking group. GRU: banks in a banking group. NOTOP: banks not in one of the top five banking groups (according to funds intermediated). TOP: banks in one of the top five banking groups (according to funds intermediated). NOMUT: non-mutual banks. MUT: mutual banks (mutual banks are small non-profit community banks). Unbalanced panel of 420 banks. See Appendix E.

are:

(7) SIZE, logarithm of total assets;

(8) RISK, bad debts to total loans;

(9) CAP, capital and reserves to total assets;

(10) LIQ, cash to total assets;

(11) FMIX, deposits and bank bonds over total loans;

(12) GBOND, government bonds over total assets;

(13) ROE, net profits over capital and reserves;

(14) EFF, gross income over personnel costs;

(15) TRA, net interest income over gross income.

For each group, Figure 4 shows how many banks changed their supply, Table 6 how they changed it and Figure 5 their overall supply pattern.

Interestingly, banks that started the period with less cash reduced their overall supply more because of the strength of their changes. This can easily be explained by the liquidity stresses and strains of the crisis. The position in government bonds provides similar but less clear-cut evidence, consistent with the view that government bonds can partially substitute for cash. From 2011 to 2014, banks that were more profitable also reduced their credit supply more than less profitable banks. Previously, the low number of them that changed supply offset the strength of the changes, with the possible interpretation that their profitability was related to a latent risk that only materialized later on during the crisis. The finding is similar to Beltratti and Stulz [15], in which banks with good performances had lower returns before the crisis in 2008. The overall contribution of supply was also larger for banks that were efficient, because of the strength of their changes, probably owing to an efficiency-correlated ability to change supply in a more controlled and effective way.

Furthermore, the share of banks that changed supply was significantly different depending on the ratio of bad loans to total assets. A large share of banks with a high ratio changed supply in the first part of the period, probably reflecting the same relaxed supply conditions that generated their bad debt profile. The result further specifies Accornero et al. [1], in which there is a weak relationship between non-performing loans and loan supply. The share of banks that changed supply is also bigger for banks with a high interest-to-income ratio, but the large and statistically insignificant difference in how they changed it requires further investigation. Finally, minor differences in the share of banks that changed supply are generated by the funding mix.

Adding to a well-known debate, banks that entered the 2009-2014 period with different capital positions did not show any significant difference in their supply behaviour, and this also holds true when looking at the tier-1 or at the tangible common equity ratio.[52] In fact, the difference in how they changed supply is not statistically significant and the difference in the share of banks that changed it is almost never statistically significant.

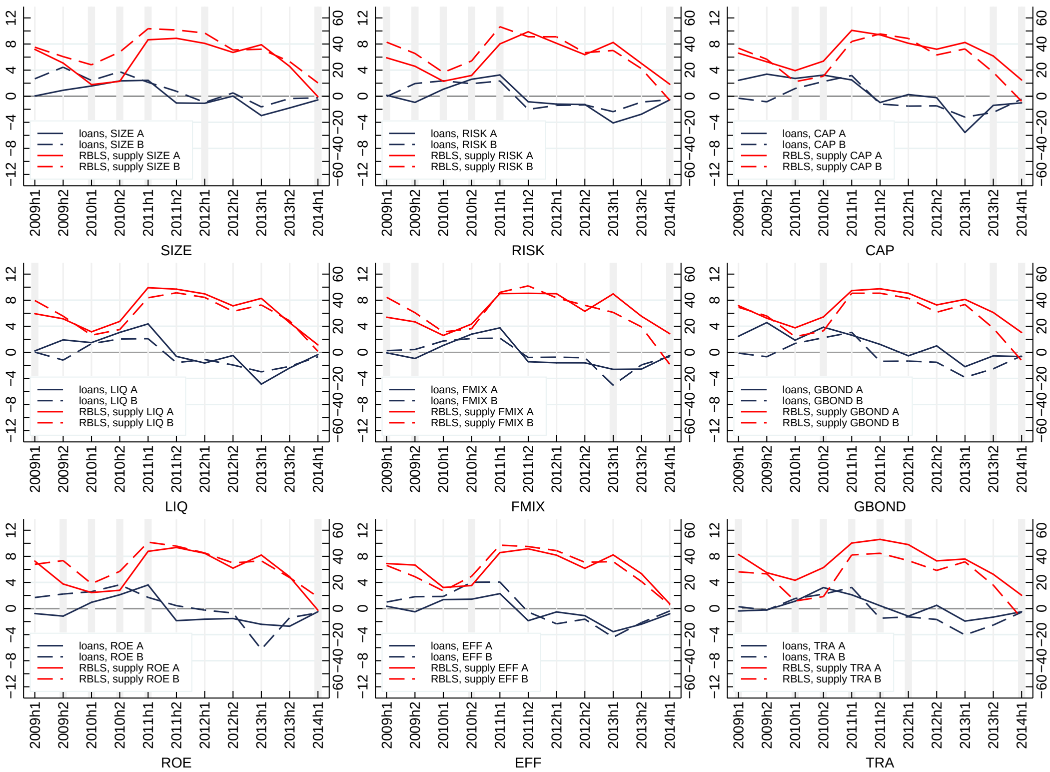

Figure 4: Growth rates of loans to non-financial corporations (left-hand scale, percentage points; half-yearly growth rates adjusted—securitizations, reclassifications and other variations that are not a result of ordinary transactions—at the area-bank level) and RBLS net percentages (right-hand scale, percentage points) for non-financial corporations by above (A) and below (B) median balance-sheet indicators of banks (for TRA the 40^{th} percentile substitutes the median). Balance-sheet classification is performed according to the 2005−2006 average. Thick vertical lines indicate statistical significance (at least 10 per cent) of the difference in net percentages (two-sided Welch test). The supply net percentage is the simple difference between the share of banks reporting a tightening in credit standards and the share of those reporting an easing. For two banks some balance-sheet data refers to end-2007. The outcome is robust to using banking-group level data. SIZE: logarithm of total assets. RISK: bad debts to total loans. CAP: capital and reserves to total assets. LIQ: cash to total assets. FMIX: deposits and bank bonds over total loans. GBOND: government bonds over total asset. ROE: net profit over capital and reserves. EFF: gross income over personnel costs. TRA: net interest income over gross income. Unbalanced panel of 413 banks.

[52] Tier-1 ratio: regulatory capital to total risk-weighted assets and capital and reserves minus preferred stock. Tangible common equity ratio: capital and reserves minus preferred stock and intangible assets to total assets minus intangible assets.

Table 6: Empirical analysis: breakdown by balance-sheet indicators (how banks change their supply).

	SIZE-A	SIZE-B	RISK-A	RISK-B	CAP-A	CAP-B	LIQ-A	LIQ-B	FMIX-A	FMIX-B	GBOND-A	GBOND-B	ROE-A	ROE-B	EFF-A	EFF-B	TRA-A	TRA-B
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
$Supply^{tight}$	-1.07**	-0.68***	-0.85	-0.92**	-0.92***	-0.94*	-0.56	-1.38***	-0.62	-0.99**	-0.63***	-1.24**	-1.43***	-0.64*	-1.26***	-0.61**	-0.44**	-1.40**
	[0.5076]	[0.2496]	[0.5762]	[0.4470]	[0.3177]	[0.4934]	[0.4287]	[0.3616]	[0.3826]	[0.4959]	[0.2058]	[0.4930]	[0.4415]	[0.3287]	[0.4119]	[0.2957]	[0.2135]	[0.7041]
$Supply^{easing}$	1.81	-1.80	0.10	0.27	-0.28	0.53	1.38	-0.88	-0.39	0.89	-1.65	1.34	0.89	-0.11	0.44	-0.17	-1.57	1.82
	[1.5528]	[1.3732]	[0.8130]	[1.9329]	[0.6480]	[1.7863]	[1.6169]	[1.3717]	[1.8082]	[0.8792]	[1.3600]	[1.4677]	[0.5358]	[1.8503]	[1.2761]	[1.4818]	[1.0796]	[1.7186]
$Demand^{decrease}$	-0.63	-0.68*	-0.82*	-0.50*	-0.67**	-0.77*	-0.86*	-0.56	-0.56	-0.97***	-0.93***	-0.49	-0.78**	-0.66*	-0.57**	-0.67	-0.60**	-0.80*
	[0.3853]	[0.3953]	[0.4977]	[0.2730]	[0.3207]	[0.4232]	[0.4454]	[0.4242]	[0.4175]	[0.3380]	[0.3104]	[0.3920]	[0.3889]	[0.3809]	[0.2495]	[0.4148]	[0.2962]	0.4718]
$Demand^{increase}$	1.40**	1.99***	1.72**	1.77**	2.12***	1.46*	1.45**	1.86***	2.48***	1.01*	1.54***	1.85***	1.46**	1.97***	1.58***	2.04***	1.83***	1.72*
	[0.6791]	[0.6218]	[0.6908]	[0.6971]	[0.3534]	[0.8775]	[0.5926]	[0.7027]	[0.6819]	[0.5234]	[0.4631]	[0.7064]	[0.7214]	[0.7413]	[0.5102]	[0.7185]	[0.3411]	[0.9586]
Wald test of the difference (*p-values*)																		
$Supply^{tight}$		0.4905		0.9323		0.9705		0.0880		0.5414		0.2332		0.0884		0.0814		0.1834
$Supply^{easing}$		0.0756		0.9262		0.6662		0.2387		0.4705		0.1151		0.5938		0.7103		0.0729

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are in parentheses (two-way clustered by bank and time). Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. Estimates by above (A) and below (B) median balance-sheet indicators (for TRA the 40^{th} percentile substitutes the median). Balance-sheet classification is performed according to the 2005−2006 average. For two banks some balance-sheet data refers to end-2007. Baseline setting with bank-area, area-year fixed effects and seasonal dummy. The interaction terms are displayed side by side for ease of reading. The outcome is robust to using banking-group level data. SIZE: logarithm of total assets. RISK: bad debts to total loans. CAP: equity to total assets. LIQ: cash to total assets. FMIX: deposits and bank bonds over total loans. GBOND: government bonds over total asset. ROE: net profit over equity. EFF: gross income over personnel costs. TRA: net interest income over gross income. Unbalanced panel of 413 banks.

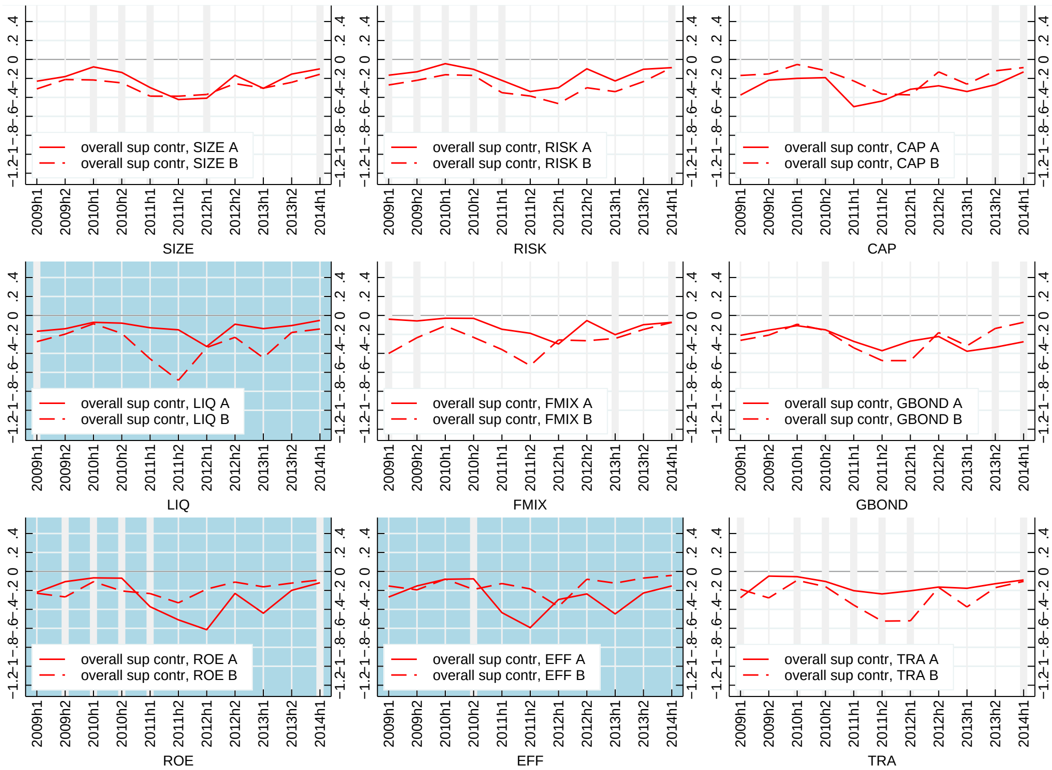

Figure 5: Overall supply contributions to the dynamics of loans to non-financial corporations (percentage points; this quantity parallels the last Column of Table 4 in Section 8) by above (A) and below (B) median balance-sheet indicators of the banks (for TRA the 40th percentile substitutes the median). Balance-sheet classification is performed according to the 2005−2006 average. A dark plot region refers to the statistical significance of the difference in supply coefficients (at least 10 percent). Tight or easing coefficients must be different between groups and at least one must be distinguishable from zero. Tight coefficients are used at face value. Easing coefficients are set to zero. Thick vertical lines indicate statistical significance (at least 10 percent) of the difference in the net percentages (two-sided Welch test). The supply net percentage is the simple difference between the share of banks reporting a tightening in credit standards and the share of those reporting an easing. To avoid mechanical differences between groups due to their size, the weighting scheme works inside each group. For two banks, some balance-sheet data refers end-2007. The outcome is robust to using banking-group level data. SIZE: logarithm of total assets. RISK: bad debts to total loans. CAP: capital and reserves to total assets. LIQ: cash to total assets. FMIX: deposits and bank bonds over total loans. GBOND: government bonds over total asset. ROE: net profit over capital and reserves. EFF: gross income over personnel costs. TRA: net interest income over gross income. Unbalanced panel of 413 banks. See Appendix E.

9.2. Using the Classifier Lasso estimator to uncover hidden heterogeneity

Although it is common practice, assigning banks to different groups can be a poor exercise for two reasons. On the one hand, there is the assumption that the group classification is fully known according to a number of different external classifications, an assumption that is questionable in many respects. On the other, alternating single indicators is a process that neglects important balance-sheet interactions.[53] I therefore use the Classifier Lasso (C-Lasso) penalized profile likelihood estimator of Su et al. [68]. This estimator is able to achieve simultaneous classification and

[53] Bonaccorsi di Patti and Sette [22] argue that the level of capital can influence the elasticity of lending to liquid assets (p. 9 of the working paper version). See also Kapan and Minoiu [44].

consistent estimation in a single step by shrinking individual coefficients to the unknown groups and group-specific coefficients. In other words, the C-Lasso makes multiple individual and group estimates in order to group banks that change supply in a similar way. Once the C-Lasso classifies the banks, I can analyse their overall supply pattern, composition and balance-sheet configuration.[54]

Interestingly, I find two groups of banks. The supply-tight coefficient of the first group is statistically different from zero at the 1 per cent confidence level, whereas the supply-tight coefficient of the second group is not statistically significant; its value is small and only marginally below zero signalling exceptionally mild supply changes (Table 7). As a consequence, I find that the first group reduced its overall supply more than the banks in the second group.

Most of the results in the previous Subsection are confirmed. However, the differences between the two groups are statistically significant for group membership and income origination. In fact, in the first group, there are more banking group members and the net interest income tends to be a low share of their total income. The evidence is similar to Demirgüç-Kunt and Huizinga [31], in which banks relying more on non-interest income increase their fragility. Non-interest income has usually been a much more volatile source of revenue than interest rate income and is thus considered a riskier source of income. Therefore, I find that banks that belonged to a banking group and that had less traditional business models, at least as suggested by their lower dependence on interest income, reduced their supply more than other banks (Appendix H).

[54] For additional details, see Appendix I.

Table 7: C-Lasso estimates.

	GROUP-1	GROUP-2
	(1)	(2)
$Supply^{tight}$	-2.53***	-0.00
	[0.8139]	[0.2745]
$Supply^{easing}$	0.00	0.19
	[1.7400]	[1.6905]
$Demand^{decrease}$	-1.52***	-0.01
	[0.4199]	[0.3134]
$Demand^{increase}$	0.00	3.32***
	[1.0840]	[0.5602]

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are in parentheses (two-way clustered by bank-and-time). Bootstrap standard errors provide similar results. Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. Post C-Lasso estimates with non-standardized variables. Post C-Lasso estimates with a standardized variable produce similar results. Baseline setting with bank-area, area-year fixed effects and seasonal dummy. Balanced panel of 301 banks.

Final remarks

Adding to the debate on the 2009-2014 slowdown in business loans and on the information content of lending surveys, I find that a literal interpretation of the Regional Bank Lending Survey (RBLS) consistently fits the developments in the Italian bank-intermediated business credit market: properly-aggregated survey records show that pure supply factors account for approximately 40 percent of the decline in lending, i.e. 1.75 out of 4.41 percentage points. Bank credit supply has also declined substantially since the first semester of 2011.

The banks that reduced their supply more than other banks tended to be less liquid and their activity was not concentrated in the most classic loan generation activity, at least as suggested by their lower dependence on interest income. These banks were also efficient. However, their profitability originated from the risk hidden in the high volatility of their revenues. Such banks were also more connected to other financial players because they tended to belong to a banking group. In addition, when they belonged to a large group, their supply pattern was significantly different from other banks, with greater tightenings and easings. Hence, I find that traditional and stand-alone banks were a more stable source of external funding for non-financial firms in the years 2009-2014.

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Appendix A. Credit standards: definition

In this study, credit standards are defined as the price and non-price terms and conditions at which a bank prefers to lend rather than not to lend. The loan supply policy of a bank results from its credit standards. To stress the relative importance of non-price terms and conditions, Lown et al. [52] state that 'bank loan officers set standards that companies must clear even before the rate is negotiated'. Moreover, both the availability doctrine of the 1950s and the modern theory of credit rationing[55] put non-price terms and conditions at the core of the bargaining process between lender and borrower. Lown and Morgan [51] only put non-price terms and conditions in their definition of credit standards, as Bayoumi and Melander [13] and many others do. Although Lown and Morgan [51] define standards 'as any of the various non-price lending terms', they also argue that 'the price of credit is a vector of terms (not just a simple scalar)'. Schreft and Owens [62] write that 'The Board reasoned that banks first responded to changes in the cost and availability of loanable funds by changing non-price lending terms and conditions of lending; only later would they adjust their interest rate'. The view of this study is that any item entering the bargaining process between lender and borrower contributes to the closure of the contract. Accordingly, credit standards can also include the interest rate. In this respect, a bank has a number of bundles made up of the terms and conditions (*prices* included) at which it prefers to lend rather than not to lend.[56] In the BLS,[57] for instance, the lending officer has to rank a set of terms and conditions, interest rates included, immediately after the general question on credit standards. Moreover, an older version of the SLOOS[58] asked for both credit standards and the general willingness of banks to lend, the latter unavoidably also related to the interest rate. Schreft and Owens [62] show that the two series are highly correlated[59] (0.88 points). Regarding the information content of credit standards, Cunningham [27] argues that the loan officer knows something special. Swiston [69] shows that credit standards affect the growth of output even after accounting for the forward-looking information in financial markets.[60]

[55] See Scott [63], Stiglitz and Weiss [65] and Jaffee and Stiglitz [42].

[56] Other factors being equal, it is also true that the richer the set of the bundles the laxer the supply of credit. Questionnaires on lending practices are usually sufficiently ambiguous to cover all the items entering the bargaining process, interest rates included.

[57] The BLS is the lending survey carried out by the European Central Bank.

[58] The SLOOS is the lending survey carried out by the Federal Reserve System.

[59] Schreft and Owens [62] argue that 'changes in the willingness to lend and changes in the net credit standards generally move together'.

[60] Swiston [69] concludes that estimates of the effects of credit standards on economic activity are usually biased downward, unless the amplification from financial markets is accounted for.

Appendix B. On bank lending activity and loan growth rates

In this paper, credit quantities refer to the growth rate of outstanding loans as in Del Giovane et al. [29]. Bassett et al. [12] argue for the use of fully decomposed lending flows.[61] However, data availability represents a constraint. Bassett et al. [11] match SLOOS[62] data with the sum of outstanding loans (on balance sheet) and unused commitments (off balance sheet). Similarly, Bonaccorsi di Patti and Sette [22][63] use committed credit. Bonaccorsi di Patti and Sette [22] claim that their measure reflects more bank supply. In this paper, outstanding loans are: (i) a measure that does not exclude loans below €$30,000$ as committed credit would do; (ii) a measure that might provide lower bound estimates for the contribution of supply, at least according to Bonaccorsi di Patti and Sette [22]; (iii) a measure that is convenient, as it is closely monitored by the Bank of Italy; and (iv) a measure that is highly correlated with committed credit, as shown in Bassett et al. [11] and Bonaccorsi di Patti and Sette [22].

The bank-area growth rate of loans is adjusted by the effects of securitizations, reclassifications and other variations not due to ordinary transactions, most notably mergers and takeovers. For the former the procedure works on a monthly basis. If the acquired bank shuts down in the month of the deal, the acquiring bank-area growth rates are corrected by the acquired bank areas' latest reported loans. If this is not the case, when the acquired bank areas' outstanding loans fall more than 80 per cent, the acquiring bank-area growth rate will be adjusted, and the acquired bank-area growth rate neutralized. Remember that the correction works on a monthly basis and half-yearly data are used. However, a few bank-area loan growth rates still show exceptional variations, likely related to single client events, to new market entries (or exits) from marginal regions, or to data issues. The estimates discard growth rates with an absolute value greater than 100 per cent. Some 18 out of $5,499$ observations drop out of the sample, but no bank exits the analysis altogether. The main results of this work continue to hold when (i) setting a threshold of 150 points; (ii) dropping Cook-distant observations according to a $4/n$ cutoff (n represents the total number of observations); (iii) dropping the maximum and the minimum growth rates in each region half-yearly; and (iv) working with raw data.

It is also important to address the issue of bad loans, which are included in the analysis for several reasons. First, subtracting bad loans could suggest trends related neither to supply nor to demand. Second, the time frame in which good loans become bad loans is idiosyncratic. Third, the European System of Central Banks methodology for calculating loan growth rates does include bad loans. However, their relevance needs to be evaluated by means of econometric analysis. Thus, the baseline model is also estimated by subtracting bad loans from outstanding loans. The results, available upon request, parallel the ones in Table 2 of Section 5, showing that bad loans are not an issue for this work.

[61] Bassett et al. [12] state that 'information on drawdowns, credit line expirations, and bank- or borrower- induced reductions or cancellations of credit lines is also crucial to any effort that attempts to monitor bank lending capacity during a cyclical downturn'. Anecdotal evidence shows that the credit standards in force might not apply to the renewal of old loans.

[62] The SLOOS is a lending survey carried out by the Federal Reserve System.

[63] On this subject, consider the working paper version of their study.

Appendix C. Data

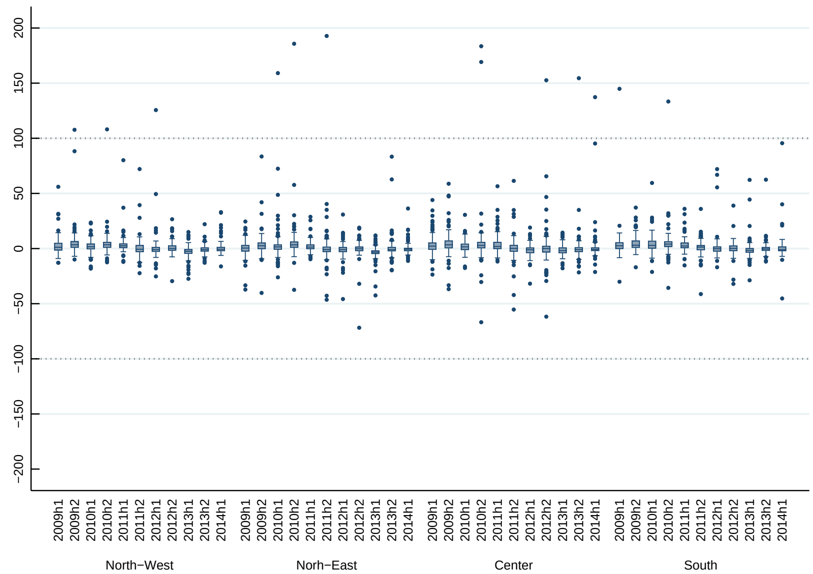

Figure C.6: Individual bank-area data. Loans to non-financial corporations by area (RBLS sample) before dropping values above 100 in absolute value. Individual half-yearly growth rates (percentage points): box plot with outside values. Five observations are out of range.

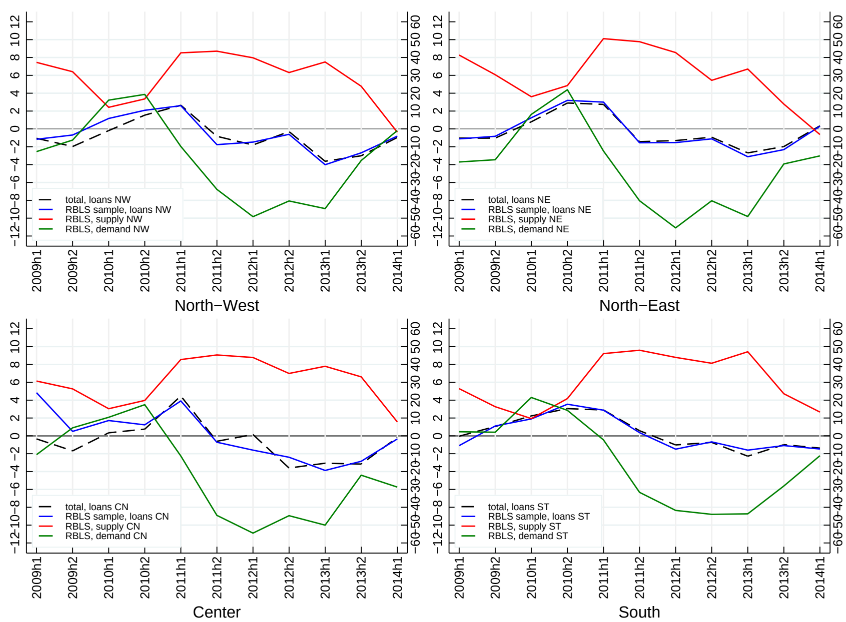

Figure C.7: Loans to non-financial corporations (left-hand scale, percentage points, half-yearly growth rates adjusted—securitizations, reclassifications and other variations that are not a result of ordinary transactions—at the area-bank level) and RBLS indicators (right-hand scale, net percentages, extensive margin) for non-financial corporations. RBLS: net percentages, positive (negative) values of the RBLS supply indicator reflect a tightening (easing) in supply, positive (negative) values of the RBLS demand indicator reflect an increase (decrease) in demand. The net percentage is the simple difference between the share of banks reporting a tightening (increase) in credit standards (demand) and the share of those reporting an easing (decrease). Sample of the baseline model estimate.

Table C.8: RBLS survey records: conditional correlations.

	$Sup^{tight}_{i,a,t}$	$Sup^{ease}_{i,a,t}$	$Dem^{decr}_{i,a,t}$	$Dem^{incr}_{i,a,t}$
$t-1$	0.07***	0.21***	0.06***	0.09***
	(0.0201)	(0.0449)	(0.0204)	(0.0224)
				$t-2$
-0.07***	-0.07	-0.03*	-0.07**	
	(0.0188)	(0.0357)	(0.0187)	(0.0191)
$t-3$	-0.13***	-0.10***	-0.17***	-0.14***
	(0.0180)	(0.0280)	(0.0178)	(0.0171)

Regressions of the dependent variables (top of the column) on its own lags. $Sup^{tight}_{i,a,t}$ is a binary indicator for a tightening in credit standards, $Sup^{ease}_{i,a,t}$ is a binary indicator for an easing in credit standards, $Dem^{decr}_{i,a,t}$ is a binary indicator for a decrease in the demand for credit, $Dem^{incr}_{i,a,t}$ is a binary indicator for an increase in the demand of credit. Overall intercept, bank-area fixed effects, area-year fixed effects, half-yearly seasonal dummy. Robust standard errors. Sample of the baseline model estimate. $3,622$ observations.

Table C.9: RBLS survey records: correlations.

	$Dem^{incr}_{i,a,t}$	$Dem^{incr}_{i,a,t-1}$	$Dem^{incr}_{i,a,t-2}$	$Dem^{incr}_{i,a,t-3}$	$Dem^{decr}_{i,a,t}$	$Dem^{decr}_{i,a,t-1}$	$Dem^{decr}_{i,a,t-2}$	$Dem^{decr}_{i,a,t-3}$	$Sup^{ease}_{i,a,t}$	$Sup^{ease}_{i,a,t-1}$	$Sup^{ease}_{i,a,t-2}$	$Sup^{ease}_{i,a,t-3}$	$Sup^{tight}_{i,a,t}$	$Sup^{tight}_{i,a,t-1}$	$Sup^{tight}_{i,a,t-2}$	$Sup^{tight}_{i,a,t-3}$
$Sup^{tight}_{i,a,t}$	-0.0883*	-0.0157	0.0949*	0.1201*	0.1947*	0.0880*	-0.0484*	-0.0815*	-0.1577*	-0.0683*	-0.0031	0.0203	1			
$Sup^{tight}_{i,a,t-1}$	-0.0577*	-0.0974*	-0.0068	0.0908*	0.1178*	0.2147*	0.0628*	-0.0571*	-0.0625*	-0.1380*	-0.0537*	0.0017	0.3730*	1		
$Sup^{tight}_{i,a,t-2}$	-0.0420	-0.0585*	-0.0913*	-0.0088	0.0689*	0.1212*	0.1986*	0.0432*	0.0085	-0.0310	-0.1274*	-0.0427	0.2169*	0.3645*	1	
$Sup^{tight}_{i,a,t-3}$	0.0273	-0.0322	-0.0520*	-0.0779*	0.0109	0.0698*	0.1028*	0.1893*	0.0830*	0.0571*	-0.0114	-0.1309*	0.1302*	0.2077*	0.3159*	1
$Sup^{ease}_{i,a,t}$	0.1628*	0.0297	-0.0030	-0.0196	-0.0997*	-0.0390	0.0197	0.0349	1							
$Sup^{ease}_{i,a,t-1}$	0.1312*	0.1402*	0.0063	0.0191	-0.1087*	-0.0741*	0.0014	0.0200	0.3330*	1						
$Sup^{ease}_{i,a,t-2}$	0.0450*	0.1170*	0.1222*	0.0185	-0.0812*	-0.0896*	-0.0804*	-0.0170	0.0814*	0.2647*	1					
$Sup^{ease}_{i,a,t-3}$	0.0099	0.0488*	0.1056*	0.1239*	-0.0417	-0.0823*	-0.0797*	-0.0848*	-0.0122	0.0517*	0.2407*	1				
$Dem^{decr}_{i,a,t}$	-0.4441*	-0.1985*	-0.1142*	-0.0219	1											
$Dem^{decr}_{i,a,t-1}$	-0.2113*	-0.4475*	-0.1932*	-0.1204*	0.3521*	1										
$Dem^{decr}_{i,a,t-2}$	-0.1276*	-0.1976*	-0.4646*	-0.2159*	0.2039*	0.3297*	1									
$Dem^{decr}_{i,a,t-3}$	-0.0231	-0.1150*	-0.1994*	-0.4857*	0.0410	0.1864*	0.3324*	1								
$Dem^{incr}_{i,a,t}$	1															
$Dem^{incr}_{i,a,t-1}$	0.3598*	1														
$Dem^{incr}_{i,a,t-2}$	0.2042*	0.3219*	1													
$Dem^{incr}_{i,a,t-3}$	0.0901*	0.2070*	0.3235*	1												

Listwise correlations. * $p < 0.01$. $Sup^{tight}_{i,a,t}$ is a binary indicator for a tightening in the credit standards, $Sup^{ease}_{i,a,t}$ is a binary indicator for an easing in credit standards, $Dem^{decr}_{i,a,t}$ is a binary indicator for a decrease in the demand for credit and $Dem^{incr}_{i,a,t}$ is a binary indicator for an increase in the demand for credit. Sample of the baseline model estimate.

Appendix D. Robustness checks

Table D.10: Clustering the standard errors of the baseline model estimate.

	COEF.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Supply^{tight}$	-0.90	[0.2583]***	[0.2406]***	[0.2729]***	[0.2951]***	[0.2823]***	[0.2789]***	[0.3086]***
$Supply^{easing}$	0.25	[0.5585]	[0.8106]	[0.9354]	[1.0520]	[0.9714]	[0.7256]	[1.1156]
$Demand^{decrease}$	-0.82	[0.2654]***	[0.2588]***	[0.2865]***	[0.3281]**	[0.2501]***	[0.2082]***	[0.3050]***
$Demand^{increase}$	1.68	[0.3064]***	[0.3400]***	[0.3878]***	[0.4566]***	[0.4279]***	[0.4872]***	[0.5028]***

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are in parentheses. Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. Dummy-variable OLS estimates. Baseline model. Heteroskedasticity is not rejected by a Breusch-Pagan test. (1) Spherical standard errors. (2) Standard errors robust to heteroskedasticity. (3) Standard errors clustered by bank-area. (4) Standard errors clustered by bank. (5) Standard errors clustered by time. (6) Non-parametric standard errors as in Driscoll and Kraay [35]. Bandwidth set to 1. Although this technique does not require any prior knowledge of the exact form of the contemporaneous and lagged cross-unit correlations, Monte Carlo evidence points to a downward bias when dealing with a short time series. See Driscoll and Kraay [35]. (7) Two-way standard errors by bank and time. Unbalanced panel of 420 banks. Two-way exercise follows Thompson [70], with the additional correction of Cameron et al. [24]. I make use of the material in Petersen [60] to run the two-way exercise.

Table D.11: Misunderstandings with the loan officers.

	(1)	(2)	(3)	(4)
	BENCH.			
$Supply^{tight}$	-0.90***			
$Supply^{easing}$	0.25			
$Demand^{decrease}$	-0.82***			
$Demand^{increase}$	1.68***			
$\Delta Supply^{tight}$		-0.14		
$\Delta Supply^{easing}$		0.67		
$\Delta Demand^{decrease}$		-0.15		
$\Delta Demand^{increase}$		0.61***		
$\sum_{j=1}^{t} Supply_j^{tight}$			-0.42**	
$\sum_{j=1}^{t} Supply_j^{easing}$			0.85	
$\sum_{j=1}^{t} Demand_j^{decrease}$			-0.07	
$\sum_{j=1}^{t} Demand_j^{increase}$			-0.12	
$Supply^{tight-strong}$				-1.60**
$Supply^{tight-somewhat}$				-0.88***
$Supply^{easing-strong}$				-6.90*
$Supply^{easing-somewhat}$				0.50
$Demand^{decrease-strong}$				-0.44
$Demand^{decrease-somewhat}$				-0.80**
$Demand^{increase-strong}$				6.02***
$Demand^{increase-somewhat}$				1.29***
n observations	5,481	4,771	4,789	5,481
R^2	0.3165	0.2498	0.2836	0.3226

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are two-way clustered by bank and time. Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. Baseline setting with bank-area fixed effects, area-year fixed effects and seasonal dummy.

Table D.12: Distributed lag models.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	BENCH.							
$Supply^{tight}$	-0.90***			-0.29		-0.89***	-0.75***	
$Supply^{easing}$	0.25			0.31		-1.01	0.63	
$Demand^{decrease}$	-0.82***			-0.56***		-0.89***		-1.00***
$Demand^{increase}$	1.68***			1.93***		1.62***		1.77***
$Supply^{tight}_{t-1}$		-0.26		-0.18				-0.35
$Supply^{easing}_{t-1}$		-0.87		-1.17*				-1.03
$Demand^{decrease}_{t-1}$		-0.66***		-0.30			-0.68***	
$Demand^{increase}_{t-1}$		0.56*		0.43			0.52	
$Supply^{tight}_{t-2}$			-0.17	-0.03				
$Supply^{easing}_{t-2}$			0.23	0.25				
$Demand^{decrease}_{t-2}$			0.00	0.03				
$Demand^{increase}_{t-2}$			0.12	0.15				
$Supply^{tight}_{t+1}$					0.26	0.43*		
$Supply^{easing}_{t+1}$					-0.08	0.14		
$Demand^{decrease}_{t+1}$					-0.45	-0.30		
$Demand^{increase}_{t+1}$					0.95*	0.80		
n observations	5,481	4,789	4,254	4,191	4,784	4,784	4,789	4,789
R^2	0.3165	0.2843	0.2711	0.2876	0.2890	0.3022	0.2875	0.2942

* p <0.10, ** p <0.05, *** p <0.01. Standard errors are two-way clustered by bank and time. Dependent variable: half-yearly growth rate of loans to non-financial corporations in percentage points. Benchmark setting with bank-area fixed effects, area-year fixed effects and seasonal dummy.

Appendix E. The aggregation exercise: technical note

This section describes a computationally parsimonious procedure to assess the *overall contribution of supply* at the market level. It also provides the rationale for weighting survey indicators by lagged outstanding loans. Without losing generality, the focus is on one point in time, t, and changes are always intended over $t-1$.

$\Delta L^{\%}_{i,a,t}$ is the percentage growth rate of loans by bank i in area a as it results at time t. $\Delta L^{\%}_{t}$ is the country-wide percentage growth rate of loans. $\Delta L_{i,a,t}$ and ΔL_t are the changes in outstanding loans, and $L_{i,a,t}$ and L_t their levels. $\Delta L^{\%,0,tight}_{i,a,t}$ is the percentage growth rate of loans by bank i in area a as it would be at time t if bank i did not tighten its supply, irrespective of whether it actually tightened it. $\Delta L^{\%,1,tight}_{i,a,t}$ is the percentage growth rate of loans by bank i in area a as it would be at time t if bank i tightened its supply, irrespective of whether or not it actually tightened it. $\Delta L^{\%,0,ease}_{i,a,t}$ is the percentage growth rate of loans by bank i in area a as it would be at time t if bank i did not ease its supply, irrespective of whether it actually eased it. $\Delta L^{\%,1,ease}_{i,a,t}$ is the percentage growth rate of loans by bank i in area a as it would be at time t if bank i eased its supply, irrespective of whether it actually eased it. $\Delta L^{\%,0}_{i,a,t}$ is the percentage growth rate of loans by bank i in area a as it would be at time t if bank i did not ease or tighten its supply, irrespective of whether it actually eased or tightened it. A similar interpretation applies to the remaining piece of notation. The baseline model is shown in Equation E.1. $Sup^{tight}_{i,a,t}$ is a binary indicator equal to 1 when bank i in area a at time t tightens its supply and $Sup^{ease}_{i,a,t}$ is a binary indicator equal to 1 in case bank i in area a at time t eases its supply. N is the population size, n the sample one (banks times areas).

$$\Delta L^{\%}_{i,a,t} = \mu + \alpha_{i,a} + \eta_{a,t} + \gamma Sem_t + \beta_1 Sup^{tight}_{i,a,t} + \beta_2 Sup^{ease}_{i,a,t} + \beta_3 Dem^{decr}_{i,a,t} + \beta_4 Dem^{incr}_{i,a,t} \varepsilon_{i,a,t} \tag{E.1}$$

Individual bank-area growth rates can be written as:

$$\begin{aligned} \Delta L^{\%}_{i,a,t} = \Delta L^{\%,0}_{i,a,t} + \\ \left(\Delta L^{\%,1,tight}_{i,a,t} - \Delta L^{\%,0,tight}_{i,a,t}\right) Sup^{tight}_{i,a,t} + \\ \left(\Delta L^{\%,1,ease}_{i,a,t} - \Delta L^{\%,0,ease}_{i,a,t}\right) Sup^{ease}_{i,a,t} \end{aligned} \tag{E.2}$$

It follows that the growth rate of loans by bank i in area a at time t if bank i did not ease or tighten its supply, irrespective of whether it eased or tightened, is given by:

$$\begin{aligned} &\Delta L^{\%,0}_{i,a,t} = \\ &\quad \Delta L^{\%}_{i,a,t} - \underbrace{\left(\Delta L^{\%,1,tight}_{i,a,t} - \Delta L^{\%,0,tight}_{i,a,t}\right)}_{\beta_1} Sup^{tight}_{i,a,t} - \underbrace{\left(\Delta L^{\%,1,ease}_{i,a,t} - \Delta L^{\%,0,ease}_{i,a,t}\right)}_{\beta_2} Sup^{ease}_{i,a,t} \end{aligned} \tag{E.3}$$

Averaging Equation (E.3) out of the entire *population* gives the following equation:

$$\frac{\sum_i \sum_a^N \Delta L_{i,a,t}^{\%,0}}{N} = \overline{\Delta L_t}^{\%,0} = \frac{\sum_i \sum_a^N \Delta L_{i,a,t}^{\%}}{N} - \beta_1 \frac{\sum_i \sum_a^N Sup_{i,a,t}^{tight}}{N} - \beta_2 \frac{\sum_i \sum_a^N Sup_{i,a,t}^{ease}}{N} \tag{E.4}$$

$\frac{\sum_i \sum_a^N Sup_{i,a,t}^{tight}}{N}$ is the share of bank-areas that tighten their supply. $\frac{\sum_i \sum_a^N Sup_{i,a,t}^{ease}}{N}$ is the *population* share of bank-areas that ease their supply. The *sample* counterpart of (E.4) is:

$$\widehat{\overline{\Delta L_t}}^{\%,0} = \frac{\sum_i \sum_a^N \Delta L_{i,a,t}^{\%}}{N} - \hat{\beta}_1 \frac{\sum_i \sum_a^n Sup_{i,a,t}^{tight}}{n} - \hat{\beta}_2 \frac{\sum_i \sum_a^n Sup_{i,a,t}^{ease}}{n} \tag{E.5}$$

The first term on the right-hand side of the last equation is known. $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimates of β_1 and β_2 from the baseline model. The last two terms are assumed to be a non-biased estimate of:

$$\begin{aligned} \frac{\sum_i \sum_a^N Sup_{i,a,t}^{tight/ease}}{N} &= \\ \left(\frac{n}{N} \frac{\sum_i \sum_a^n Sup_{i,a,t}^{tight/ease}}{n}\right) &+ \\ \left(\frac{N-n}{N} \frac{\sum_i \sum_{a\ n+1}^N Sup_{i,a,t}^{tight/ease}}{N-n}\right) & \end{aligned} \tag{E.6}$$

In relation to $\hat{\beta}_2 = 0$, the estimated *individual average effect* of the *actual change* in supply is equivalent to the estimated *average effect* of the *actual tightening* in supply (given that $\hat{\beta}_2 = 0$, only the tight side is relevant for the calculation):

$$\underbrace{\hat{\beta}_1}_{\text{how much}} \underbrace{\frac{1}{n} \sum_i \sum_a^n Sup_{i,a,t}^{tight}}_{\text{how many}} \tag{E.7}$$

Nevertheless, Equation E.7 is the average contribution and not the *overall* supply contribution. Simple algebra shows that the *overall population* growth rate of loans is given by:

$$\begin{aligned} \Delta L_t^{\%} = \frac{\Delta L_t}{L_{t-1}} = \frac{\sum_i \sum_a^N \Delta L_{i,a,t}}{\sum_i \sum_a^N L_{i,a,t-1}} = \sum_i \sum_a^N \frac{\Delta L_{i,a,t}}{L_{i,a,t-1}} \frac{L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} &= \\ \sum_i \sum_a^N \Delta L_{i,a,t}^{\%} \frac{L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} & \end{aligned} \tag{E.8}$$

By using the previous results, I get Equation E.10 and Equation E.11:

$$
\begin{aligned}
& \Delta L_t^{\%,0} = \\
& 100\frac{\Delta L_t^0}{L_{t-1}} = 100\frac{\sum_i \sum_a^N \Delta L_{i,a,t}^0}{\sum_i \sum_a^N L_{i,a,t-1}} = \\
& 100 \sum_i \sum_a^N \frac{\Delta L_{i,a,t}^0}{L_{i,a,t-1}} \frac{L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} = \\
& \sum_i \sum_a^N \Big[\Delta L_{i,a,t}^{\%} - \\
& \underbrace{\left(\Delta L_{i,a,t}^{\%,1,tight} - \Delta L_{i,a,t}^{\%,0,tight}\right)}_{\beta_1} Sup_{i,a,t}^{tight} - \\
& \underbrace{\left(\Delta L_{i,a,t}^{\%,1,ease} - \Delta L_{i,a,t}^{\%,0,ease}\right)}_{\beta_2} Sup_{i,a,t}^{ease}\Big] \frac{S_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}}
\end{aligned} \tag{E.9}
$$

$$
\Delta L_t^{\%,0} = \Delta L_t^{\%} - \beta_1 \sum_i \sum_a^N Sup_{i,a,t}^{tight} \frac{L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} - \beta_2 \sum_i \sum_a^N Sup_{i,a,t}^{ease} \frac{L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} \tag{E.10}
$$

$$
\widehat{\Delta L}_t^{\%,0} = \Delta L_t^{\%} - \hat{\beta}_1 \sum_i \sum_a^n Sup_{i,a,t}^{tight} \frac{L_{i,a,t-1}}{\sum_i \sum_a^n L_{i,a,t-1}} - \hat{\beta}_2 \sum_i \sum_a^n Sup_{i,a,t}^{ease} \frac{L_{i,a,t-1}}{\sum_i \sum_a^n L_{i,a,t-1}} \tag{E.11}
$$

$\Delta L_t^{\%}$ is known, $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimates of β_1 and β_2 from the baseline model and the no bias assumption works for:

$$
\begin{aligned}
& \sum_i \sum_a^N Sup_{(i,a),t}^{tight/ease} \frac{L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} = \\
& \left(\frac{\sum_i \sum_a^n L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} \sum_i \sum_a^n Sup_{i,a,t}^{tight/ease} \frac{L_{i,a,t-1}}{\sum_i \sum_a^n L_{i,a,t-1}}\right) + \\
& \left(\frac{\sum_i \sum_{a\ n+1}^N L_{i,a,t-1}}{\sum_i \sum_a^N L_{i,a,t-1}} \sum_i \sum_{a\ n+1}^N Sup_{i,a,t}^{tight/ease} \frac{L_{i,a,t-1}}{\sum_i \sum_{a\ n+1}^N L_{i,a,t-1}}\right)
\end{aligned} \tag{E.12}
$$

In relation to $\hat{\beta}_2 = 0$, the estimated *overall contribution* of the *actual change* in supply is equivalent to the estimated *overall contribution* of the *actual tightening* in supply (given that $\hat{\beta}_2 = 0$, only the tight side is relevant for the calculation):

$$
\underbrace{\hat{\beta}_1}_{\substack{\text{how}\\\text{much}}} \ \underbrace{Sup_{i,a,t}^{tight}}_{\substack{\text{how}\\\text{many}}} \underbrace{\frac{L_{i,a,t-1}}{\sum_i \sum_a^n L_{i,a,t-1}}}_{\substack{\text{individual impact}\\\text{factor}}} \tag{E.13}
$$

Inspection of Equations (E.6) and (E.12) and of Expressions (E.7) and (E.13) yields some insights. First, the *individual average* suffers from sample bias potentially more than the *overall contribution*. In fact, a great number of small banks are usually not sampled, but the biggest banks are almost always sampled (this is not the case in the RBLS). Second, Equation (E.11) suggests a method for performing the calculation using three ingredients: the market loan growth rate, $\hat{\beta_4}$ and a simple loan-lagged-weighted average of the tightening indicators.

Allowing for a heterogeneous $\hat{\beta_1}$, Expression E.13 reads as follows (g indices groups):

$$\sum_g \left[\hat{\beta}_1^g \sum\nolimits_{i \in g} \sum\nolimits_{a \in g}^{n_g} Sup_{i,a,t}^{tight} \frac{L_{i,a,t-1}}{\sum_i \sum_a^n L_{i,a,t-1}} \right] \tag{E.14}$$

Appendix F. Heterogeneity: individual estimates

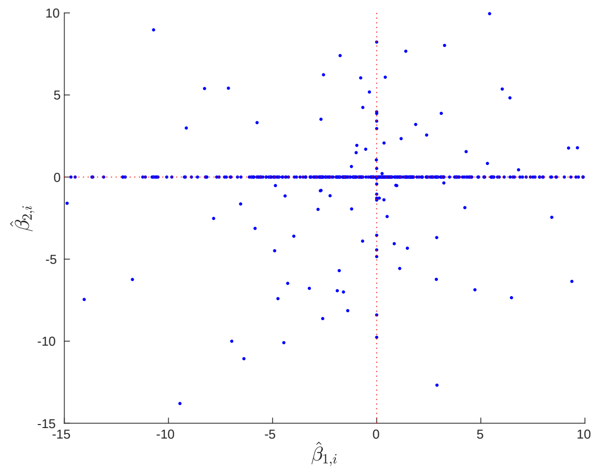

Figure F.8: Individual estimates (supply side). X-axis tightening, Y-axis easing. 74 estimates are out of range. The estimates are the outcome of a regression with supply, demand, semester and year-dummies over the available time series for each bank-area. 47 percent of tight coefficients have a strictly negative sign. 13 percent of easing coefficients have a strictly positive sign. Unbalanced panel of 420 banks.

Appendix G. Balance-sheet indicators: distributions

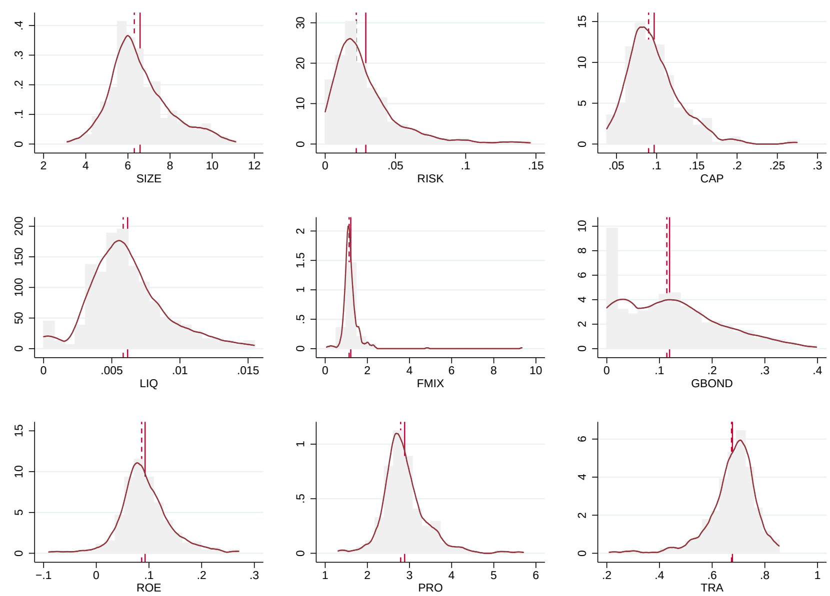

Figure G.9: Balance-sheet indicators. Distributions. Indicators are from a simple 2005-2006 average. For two banks some balance-sheet data refers end-2007. Values above the 1^{st}-99^{th} percentile are not displayed. Median: dashed vertical line (for TRA the 40^{th} percentile substitutes the median). Mean: solid vertical line. SIZE: logarithm of total assets. RISK: bad debts to total loans. CAP: capital and reserves to total assets. LIQ: cash to total assets. FMIX: deposits and bank bonds over total loans. GBOND: government bonds over total asset. ROE: net profit over capital and reserves. EFF: gross income over personnel costs. TRA: net interest income over gross income. Unbalanced panel of 413 banks.

Appendix H. C-Lasso: supply details

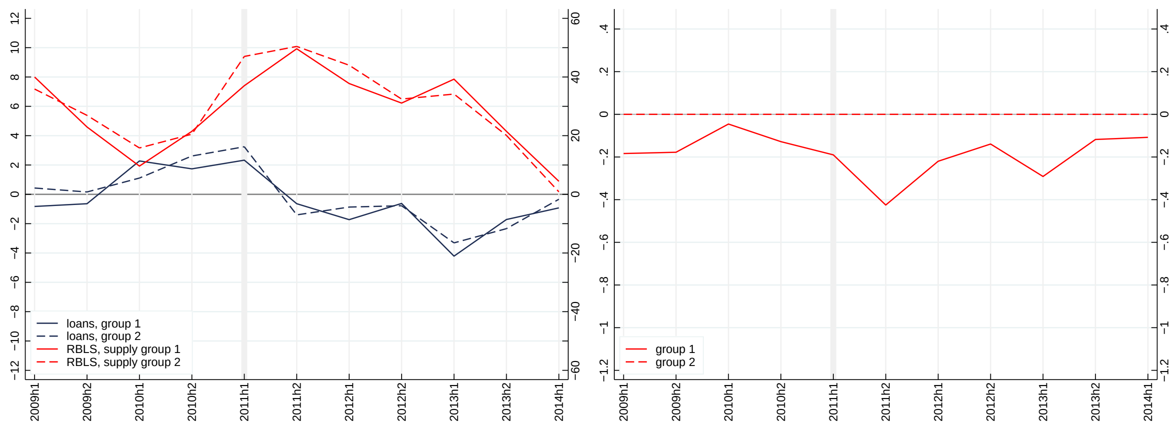

Figure H.10: Right-hand panel: growth rates of loans to non-financial corporations (left-hand scale, percentage points; growth rates adjusted—securitizations, reclassifications and other variations that are not a result of ordinary transactions—at the area-bank level) and RBLS net percentages for non-financial corporations (right-hand scale, percentage points) by C-Lasso groups. Thick vertical lines indicate statistical significance (at least 10 percent) of the difference in net percentages (two-sided Welch test). The supply net percentage is the simple difference between the share of banks reporting a tightening in credit standards and the share of those reporting an easing. Balanced panel of 301 banks. Left-hand panel: overall supply contributions of banks to the dynamics of loans to non-financial corporations by C-Lasso groups (percentage points; this quantity parallels the last Column of Table 4 in Section 8). Tightening coefficients are used at face value. Easing coefficients are set to zero. Group 1 supply contributions are almost always zero due to light-handed changes in supply, not to the absence of supply changes. Thick vertical lines indicate statistical significance (at least 10 percent) of the difference in net percentages (two-sided Welch test). To avoid mechanical differences between groups due to their size, the weighting scheme works inside each group. Balanced panel of 301 banks. See Appendix E.

Table H.13: Composition and balance-sheet indicators by C-Lasso groups.

	COMPOSITION			BALANCE SHEET			
	GROUP-1	GROUP-2	*p-values*		GROUP-1	GROUP-2	*p-values*
	(1)	(2)			(3)	(4)	
NORTH	0.556	0.603	0.191	SIZE	6.7765	6.5169	0.131
MAREAS	0.267	0.231	0.224	RISK	0.0221	0.0221	0.507
GRU	0.444	0.363	0.064*	CAP	0.0856	0.0855	0.516
TOP	0.126	0.120	0.430	LIQ	0.0054	0.0055	0.430
MUT	0.519	0.560	0.223	FMIX	1.1563	1.1248	0.131
				GBOND	0.1132	0.1010	0.399
				ROE	0.0926	0.0886	0.399
				EFF	2.8156	2.7752	0.246
				TRA	0.6748	0.6876	0.045**

* p <0.10, ** p <0.05, *** p <0.01. Composition: mean. One-sided Welch test. NORTH: dummy equal to one for North-West and North-East. MAREAS: dummy equal to one for operations in three or four area. GRU: dummy equal to one for banking-group membership. TOP: dummy equal to one for top-five banking-group membership. MUT: dummy equal to one for mutual banks (mutual banks are small non-profit community banks). Two-sided tests produce similar results but statistical significance for GRU is lost. Balance sheet indicatoris: median, 2005-2006 average. For two banks some balance-sheet data refers to end-2007. The configuration of the groups refers to end-2008. *p-values* are from a non-parametric test of equality of medians, one-sided Fisher exact (values equal to the median assigned to below group). SIZE: logarithm of total assets. RISK: bad debts to total loans. CAP: equity to total assets. LIQ: cash to total assets. FMIX: deposits and bank bonds over total loans. GBOND: government bonds over total asset. ROE: net profit over equity. EFF: gross income over personnel costs. TRA: net interest income over gross income. The outcome is robust to using banking-group level data. The ratio of net interest income over total asset produces similar insights to TRA but the difference is statistically significant at the 1 per cent level. Two-sided tests produce similar results. Balanced panel of 301 banks.

Appendix I. C-Lasso: technical details

Data have been treated by first balancing the panel.[64] Second, each variable is transformed in its residuals after a regression on a full set of bank-area, area-year and semester dummies and, third, all variables are standardized at the bank-area level: the C-Lasso is scale variant and this is the procedure suggested by Su et al. [68]. Here C-Lasso and post C-Lasso are sign restricted.[65] The Information Criterion (IC) of Su et al. [68] finds two homogeneous groups.[66] Once groups are identified, I conveniently report post C-Lasso estimates for the non-standardized variables. Figure I.11 shows IC details.

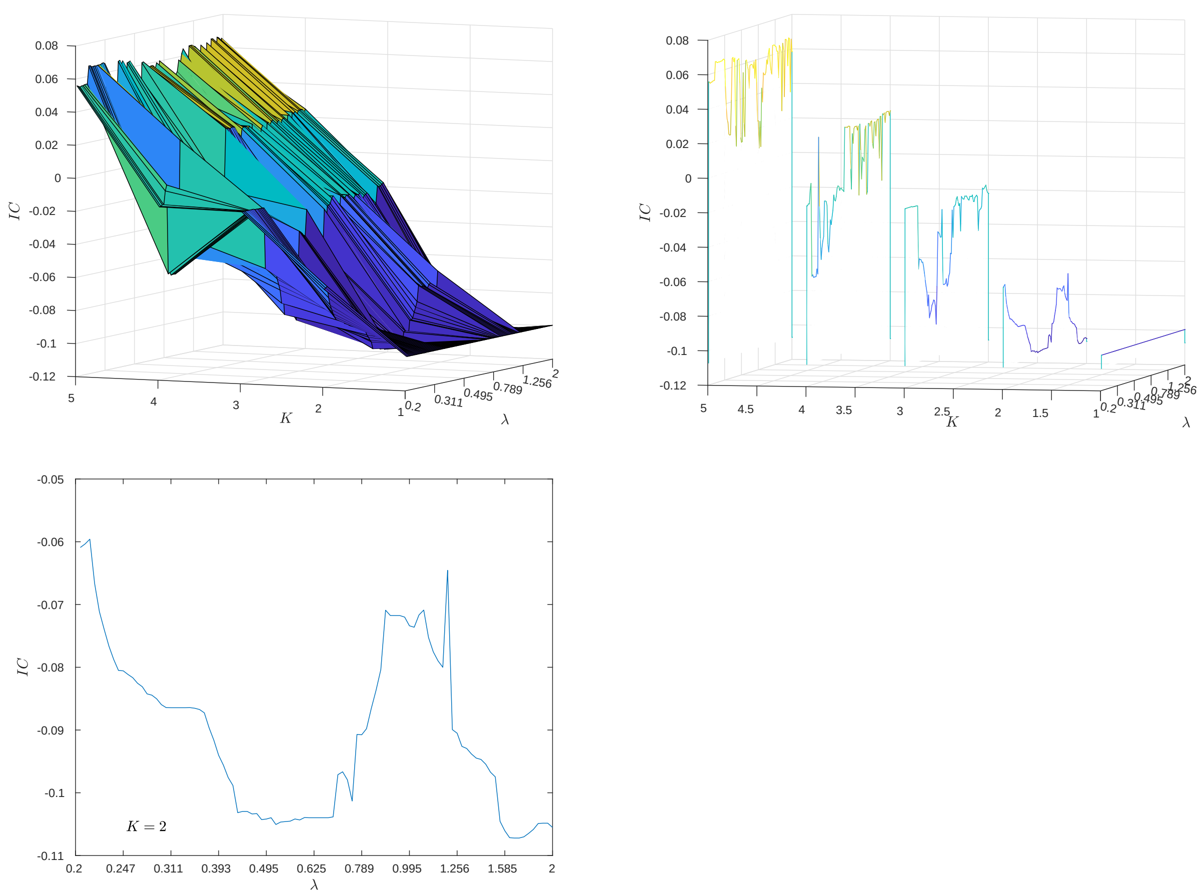

Figure I.11: Information criterion (IC) of Su et al. [68]. The maximum value of K (groups) is 5. The tuning parameter λ ranges from 0.2 to 2 with a grid of 100 points. The optimal values are: $K = 2$ and $\lambda = 1.6604$.

[64] The unbalanced panel is made up of 420 banks and 621 bank-area observations, the balanced one of 301 banks and 369 bank-area observations.

[65] $\beta_1, \beta_3 \leq 0$ (tight in supply and decrease in demand) and $\beta_2, \beta_4 \geq 0$ (easing in supply and increase in demand). The C-Lasso works on both supply and demand coefficients.

[66] The number of groups ranges from 1 to 5. The tuning parameter ranges from 0.2 to 2 with a grid of 100 points. The starting values are the slope parameters from the individual bank-area regressions. Matlab codes are available upon request. The composition of the groups appears to be sensitive to small changes in the sample. My estimates exploit the entire sample.

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