EUROPEAN CENTRAL BANK
EUROSYSTEM

Working Paper Series

Donata Faccia, Franziska Hünnekes,
Petra Köhler-Ulbrich

What drives banks' credit standards? An analysis based on a large bank-firm panel

No 2902

Abstract

In this paper we build a unique dataset to study how banks decide which firms to lend to and how this decision depends on their own situation and the characteristics of their borrowers. We find that weaker capitalised banks adjust their credit standards more than healthier banks, especially for firms with a higher default risk. We also show how credit standards change in reaction to two specific macroeconomic developments, namely an increase in bank funding costs and a sudden deterioration in banks' corporate loan portfolios. Here we find that weaker banks respond more forcefully by tightening their credit standards more than better capitalised banks. This development is particularly pronounced when banks are linked to riskier firms. Insofar, we provide evidence of heterogeneity in the bank lending channel, depending on the situation of the lenders and the borrowers.

JEL codes: E44, E51, E52, G21

Key words: credit supply, bank lending channel, credit risk, monetary policy transmission

Non-technical summary

How do banks decide which firms to lend to and how does this decision depend on their own situation and firms' characteristics? It is not a priori clear how banks set their credit standards for firms and how this depends on their own characteristics and the characteristics of the firms to which they are connected. Healthy, well-capitalised banks may feel more comfortable in financing risky business, on account of their ability to absorb potential losses, compared with less healthy banks. The latter may be more risk sensitive, taking account of their more limited loss absorption capacity. On the contrary, weaker banks may be more prone to adopt looser credit standards, with the aim of increasing their revenues.

To answer these questions, we analyse the determinants of banks' credit standards, i.e., their internal guidelines or loan approval criteria applied when deciding on granting credit. Studying how banks set their credit standards is particularly important for understanding the evolution of financing conditions in a bank-based financial system like the euro area, as banks' credit standards are a key determinant of overall bank loan supply for firms.

For this purpose, we build a unique dataset by linking confidential bank-level information from the euro area bank lending survey (BLS) with bank and firm-level data. The confidential survey data refer to the bank-level replies underlying the aggregate euro area BLS results on the changes in banks' credit standards, demand for loans and the respective driving factors.[1] Our quarterly bank-firm panel dataset covers banks and firms from 10 euro area countries in the period from 2008 to 2020. On the bank side, we use the quarterly confidential individual bank lending survey (IBLS) data, augmented with publicly disclosed financial data (provided by SNL) to obtain bank-level capital ratios, CDS spreads and loan loss provisions. To construct the bank-firm panel, we rely on the annual Orbis Europe dataset provided by Bureau van Dijk (BvD). This dataset contains annual information on firm balance sheets and their profitability and information on the banks with which the firm maintains a client relationship. To our knowledge, this is the first paper which matches IBLS data with firm balance sheets in addition to bank financial information for an extended period of time.[2]

In the first part of the paper, we focus on which bank and firm characteristics generally matter for euro area banks' lending decisions to firms using our large bank-firm dataset. We provide evidence that euro

[1] See the euro area BLS on the ECB website: here.

[2] Altavilla et al. (2023) also merge IBLS data with firm and bank characteristics, but only for the pandemic period. In addition, they focus on a different research question and use data from the IBLS only as a control.

area banks tighten their credit standards more when linked to riskier firms, measured via firms' leverage and default risk. In other words, banks reflect the higher riskiness of the firms they are associated with in their loan approval criteria, in line with what banks also report themselves in the BLS. However, credit standards are tightened less by healthier banks. Specifically, a sound bank capital position implies less tightening of lending criteria, possibly reflecting the fact that banks can afford to adjust their credit standards more moderately.

Beyond our baseline analysis of the drivers of banks' credit standards, we also consider how changes to the macroeconomic environment, namely a change in bank funding costs and an adverse shock to firm health, affect banks' loan approval decisions.

First, we focus on the impact of a change in bank funding costs on banks' lending decisions, depending on heterogeneous bank and firm characteristics. Here we find that less healthy banks, which are less well-capitalised or have higher CDS spreads, tighten their credit standards more in reaction to an increase in their funding costs, especially if they are linked to weaker firms with higher leverage and higher default risk. Banks with a weaker capital position therefore appear more sensitive to an increase in interest rates, related to their more limited capacity to absorb potential losses. Consequently, weaker firms, especially when linked to weaker capitalised banks, are the ones which face a stronger deterioration of credit conditions in response to an increase in bank funding costs.

Second, we consider the sudden deterioration in the quality of banks' corporate loan portfolios during the COVID-19 pandemic. We assess how euro area banks adjusted their credit standards in response to the negative COVID-19 pandemic shock, after accounting for government support measures. We find that banks which were more exposed to sectors strongly affected by the pandemic, were more likely to tighten their credit standards, but that the effect was weaker for banks with a larger exposure to loans backed by pandemic-related government guarantees.

Overall, we provide evidence of heterogeneity in the bank lending channel, depending on the situation of the lenders and the borrowers. When deciding on their credit standards, banks assess risks based on both their own loss absorption capacity and the credit risk of their borrowers. This implies that both bank and firms' balance sheet health matter for bank lending conditions. Understanding the link between bank funding costs, the macroeconomic outlook and banks' lending policy is very important for conducting monetary policy. This is true especially in the current environment in which interest rates are

increasing from historically low levels in the context of central bank policy rate hikes, dampened euro area economic growth due to high uncertainty and inflation above the ECB's two percent target.

We see two important policy implications. First, while the stronger reaction of weaker banks to changes in their funding costs may indicate higher risk taking in a low interest rate environment, these banks may also be more prudent in their lending decisions when funding costs increase. Second, the results obtained for the pandemic period could potentially be generalised to other negative economic shocks, such as the war in Ukraine and the steep rise in energy prices in 2022. Again, fiscal support has helped firms – and banks – to cope with the adverse economic shock and the sudden deterioration of corporate balance sheets. Still, weaker firms which have borrowed from weaker capitalised banks are the ones which are likely most affected in their capacity to conduct their business and to generate revenues.

1 Introduction

How do banks decide which firms they lend to and how does this decision depend on their own situation and the characteristics of their borrowers? It is not a priori clear how banks set their credit standards for firms and how this depends on their own characteristics and the characteristics of the firms to which they are connected. Healthy, well-capitalised banks may feel more comfortable in financing risky business, on account of their ability to absorb potential losses, compared with less healthy banks. The latter may be more risk sensitive, taking account of their more limited loss absorption capacity. On the contrary, weaker banks may be more prone to adopt looser credit standards, with the aim of increasing their revenues.

To answer these questions, we build a unique dataset by linking confidential bank-level information from the euro area bank lending survey (BLS) with bank and firm-level data. In the BLS, which is aimed at gauging the developments in loan supply and demand in the euro area, banks report every quarter whether their credit standards – i.e., their internal guidelines or loan approval criteria applied when deciding on granting loans – tightened, remained unchanged or eased. Given the long existence of the BLS since 2003, we can study how firm and bank characteristics under different macroeconomic circumstances change the strictness of the criteria applied by euro area banks when granting loans. To our knowledge, this is the first paper which matches IBLS data with firm balance sheets in addition to bank financial information for an extended period of time.[3] Analysing the determinants of banks' credit standards is particularly important for understanding the evolution of financing conditions in a bank-based financial system like the euro area as they are a key determinant of overall bank loan supply for firms.

In the first part of the paper, we focus on which bank and firm characteristics generally matter for euro area banks' lending decisions to firms using our large bank-firm dataset. We provide evidence that euro area banks tighten their credit standards more when linked to riskier firms, measured via firms' leverage and default risk based on the Altman Z-score. In other words, banks reflect the higher riskiness of the firms they are associated with in their loan approval criteria, in line with what banks also report themselves in the BLS. However, credit standards are tightened less by healthier banks. A sound bank

[3] Altavilla et al. (2023) also match IBLS data with firm and bank characteristics, but only for the pandemic period. In addition, they focus on a different research question and use data from the IBLS only as a control.

capital position implies less tightening of lending criteria, possibly reflecting the fact that banks can afford to adjust their credit standards more moderately.

Beyond our baseline analysis of the drivers of banks' credit standards, we also consider how changes to the macroeconomic environment, namely a change in bank funding costs and an adverse shock to firm health, affect banks' loan approval decisions.

First, we focus on the impact of a change in bank funding costs on banks' lending decisions, depending on heterogeneous bank and firm characteristics. Here we find that less healthy banks, which are less well-capitalised or have higher CDS spreads, tighten their credit standards more in reaction to an increase in their funding costs, especially if they are linked to weaker firms with higher leverage and higher default risk. Banks with a weaker capital position therefore appear more sensitive to an increase in interest rates, related to their more limited capacity to absorb potential losses. Consequently, weaker firms, especially when linked to weaker capitalised banks, are the ones which face a stronger deterioration of credit conditions in response to an increase in bank funding costs. This is particularly relevant in the current environment, as the expected and realised policy rate hikes have led to a considerable increase in the funding costs of euro area banks. Euro area firms' balance sheets have been overall in a better shape in the current period, with lower leverage and a considerably lower interest payment burden, compared with the period of ECB interest rate hikes up to the global financial crisis. However, while coming from a historically low interest payment burden, corporate vulnerabilities have increased especially for those firms which have taken up high amounts of debt in the low interest rate environment and during the pandemic. Based on our results, this implies a stronger deterioration of their lending conditions compared with less vulnerable firms.

Second, we consider the sudden deterioration in the quality of banks' corporate loan portfolios during the COVID-19 pandemic. We assess how euro area banks adjusted their credit standards in response to the negative COVID-19 pandemic shock, after accounting for government support measures. We find that banks which were more exposed to sectors strongly affected by the pandemic, were more likely to tighten their credit standards, but that the effect was weaker for banks with a larger exposure to loans backed by pandemic-related government guarantees. This is in line with the role of government support measures such as loan guarantees mitigating banks' exposure to firms' credit risks as they shield banks from firms' increased credit risks. However, also here firm-specific risk matters as banks linked to highly

leveraged firms or to firms with higher default risk based on the Altman Z-score are more likely to tighten their credit standards.

Our results for the pandemic period can be generalised to other negative economic shocks. In particular, the negative consequences of the pandemic for firms' balance sheets were again aggravated as a consequence of the Russian war against Ukraine since February 2022. This led to a surge in energy costs for firms and will likely imply a deterioration in the quality of banks' corporate loan portfolio, heightening risks for the debt servicing capacity of the firms, especially if highly leveraged. Fiscal support has helped firms to cope with the substantial increase in production costs, potentially mitigating the negative impact on bank credit standards, as was the case during the pandemic.

Overall, our results show that weaker firms are the ones which are most affected by a deterioration of bank lending conditions, which can be due to either on the side of the lender an increase in bank funding costs or on the side of the borrowers a sudden deterioration of the corporate balance sheet situation.

2 Related literature

Our paper is closely related to studies analysing credit supply based on BLS indicators and the impact of monetary policy shocks on bank lending conditions in the euro area. For instance, Maddaloni and Peydró (2011) and Ciccarelli, Maddaloni, and Peydró (2013) analyse the transmission of monetary policy through the bank lending channel, highlighting the impact on economic performance and heterogeneity across euro area countries. In addition, inspired by the work of Bassett et al. (2014) and earlier work by Lown and Morgan (2006) on the US Senior Loan Officer Opinion Survey, Altavilla, Darracq Pariès, and Nicoletti (2019) construct a loan supply indicator based on the euro area BLS which they use to identify the impact of loan supply shocks on economic activity. Hempell and Kok (2010) disentangle pure loan supply based on the BLS factors and investigate the role played by such factors for loan growth. These studies provide important contributions to the analysis of bank loan supply within the bank lending channel in the euro area, based on direct information from the banks, and contribute to the analysis of heterogeneities in the monetary policy transmission. However, in contrast with our paper, the BLS data used in these studies cannot be linked to other individual bank data due to lacking knowledge of the bank identification.

To our knowledge, our study is one of the first papers which links confidential individual BLS data

not only to the situation of the banks, but also to the situation of the firms, based on granular bank-firm level data, for an extended period of time. This allows an in-depth view on how banks decide on their lending conditions and which bank and firm characteristics are most relevant for this decision.

Several other studies link confidential individual BLS data with actual bank-level data, but not firm data, allowing an analysis of bank characteristics relevant for bank lending conditions. Altavilla et al. (2021) link individual BLS data to bank-level data on banks' financial situation (mainly bank CDS spreads) to model the impact of a monetary policy shock on bank lending, depending on the financial situation of the banks. They find that a short-term interest rate shock decreases both loan supply and demand, but more for less healthy banks. Their findings are consistent with the results of our paper on the favourable impact of bank health on lending standards. However, instead of an increase in short-term interest rates, we consider an increase in banks' overall funding cost, which covers both short-term rates and also the impact of monetary policy measures on longer-term interest rates. Other papers, which link confidential BLS bank-level data with bank balance sheet data, focus on the impact of the ECB's unconventional monetary policy measures (e.g. Blaes, Kraaz, and Offermanns, 2019; Andreeva and García-Posada, 2021). Both papers tend to find no evidence of higher risk taking of banks as a result of accommodative monetary policy. In our paper, we find that weaker capitalised banks relax their credit standards more strongly than healthier banks when interest rates decrease, while also tightening them more strongly when rates increase. We interpret the stronger reaction of weaker banks on both sides, which reflects their loss absorption capacity relative to the change in the default risk of the firms, as an indication for higher risk taking in a low interest rate environment.

Our paper is also closely related to a broader strand of literature which investigates the transmission of monetary policy via the bank lending channel, in part by using individual data from national credit registers, focusing on the analysis of single countries. While credit register data for the whole euro area (AnaCredit) is available by now, this dataset only starts in 2018Q3 and thus covers only a few years. To perform an analysis over a longer time period, we therefore take a different approach and link the bank-level data to firm-level data via firms' reported bank relationships. Going back in time, our work is related to the early work by Holmstrom and Tirole (1997) on the role of bank and firm characteristics in the monetary policy transmission, who show that weaker firms are the ones which are most affected by a monetary policy tightening. In addition, it is related to the work by Kashyap and Stein (2000) who

investigate the impact of monetary policy on bank lending behaviour based on granular bank balance sheet data, showing that less liquid banks tend to react more strongly. More recent studies are based on confidential bank and firm-level data from national credit registers. Our results are in line with Jiménez et al. (2012) who focus on the bank-firm-relationship in Spain, based on credit register data. For a positive monetary policy shock, they find a reduction of the probability that a loan is granted, which is stronger for less well-capitalised banks. Correspondingly, in line with our results, Jiménez et al. (2014) show that less well-capitalised banks also appear to react more strongly when short-term interest rates decrease by granting more loans to ex ante riskier firms, which suggests higher risk taking in a low interest rate environment. Ferrero, Nobili, and Sene (2019) arrive at a corresponding conclusion on the risk-taking channel based on a confidential loan-level dataset of Italian banks. Based on bank-level and firm-level data from Italian credit registers, Bottero et al. (2019) show an expansionary impact of the low interest rate environment on credit supply, especially for ex ante riskier (based on the Altman Z-score and credit rating) and smaller firms. In addition, according to Ioannidou, Ongena, and Peydró (2015), based on Bolivian credit register data, lower interest rates fuel bank risk taking in the sense that especially banks with more liquid assets, lower capital ratios and higher non-performing loan (NPL) ratios grant more loans to weaker firms. By contrast, Caglio, Darst, and Kalemli-Özcan (2021) do not find evidence of a higher risk taking of banks in the U.S. as banks would not lend more to riskier firms when monetary policy is expansionary.

Our paper contributes to the discussion on bank risk taking in several aspects. First, we show that bank capitalisation matters for bank risk taking in the sense that weaker capitalised banks react more strongly to changes in interest rates than better capitalised banks. Second, we show that lower bank funding costs, encompassing both the short and longer-term maturity spectrum, fuel bank risk taking especially for weaker capitalised banks as they ease their credit standards more strongly, especially when linked to highly leveraged firms. Our measure covers deposit rates, bond yields and the cost of financing via central bank refinancing operations, including the ECB's targeted longer-term refinancing operations (TLTROs). Therefore, we cover the passthrough of the ECB's monetary policy to bank funding costs (see also Altavilla et al., 2022; Heider and Leonello, 2021 for the passthrough to deposit rates) and further to lending conditions. Banks' lending decisions reflect the lower risk of the firms in a low interest rate environment, which reduces the debt service burden of the firms (as long as rates remain low).

Finally, our paper is also related to papers which focus on the impact of a negative shock to corporate balance sheets on bank lending conditions, using the COVID-19 pandemic as a proxy for a sudden deterioration of firms' balance sheets. There are a few other papers on the impact of the COVID-19 pandemic on financing conditions. Ferrando and Ganoulis (2020) provide a very early assessment at the start of the pandemic on firms' expectations on their access to external finance based on firm-level data from the Survey on the Access to Finance of Enterprises (SAFE), which was conducted in March 2020, finding that the credit history of the firm and firms' debt-to-asset ratios played an important role for firms' expectations. The relevance of firms' balance sheet situation, in particular their leverage ratio, for the (expected) deterioration in firms' financing conditions is in line with our paper. Altavilla et al. (2023) also cover the early phase of the pandemic. They focus on policy support provided, specifically on monetary policy support (TLTROs) and supervisory capital relief measures while not covering the impact of government loan guarantees on bank lending. Some parallels can be drawn to our analysis in the sense that policy support has mitigated the tightening of bank lending conditions, in contrast to the experience during the global financial crisis, when credit standards tightened sharply. In addition, the paper is related to our finding of a stronger tightening of lending standards by weaker capitalised banks as Altavilla et al. (2023) find a stronger reduction in lending if the bank's capital ratio is closer to the minimum requirement, while a reduction of the bank's capital buffer is not particularly impactful in case of a solid capital buffer before the shock. In another paper, Altavilla, Boucinha, and Bouscasse (2022) disentangle credit demand and supply based on euro area credit register data (AnaCredit) for the period of the pandemic. According to their results, lending volumes were largely driven by firms' loan demand, while lending rates were mostly driven by credit supply and borrower risks. Our results emphasise the mitigating impact of government guarantees on a tightening of credit standards during the pandemic. This mitigating impact played a major role in loan demand and not credit supply being decisive for lending volumes during the pandemic. Insofar, we provide evidence of the likely reason why lending volumes were largely driven by loan demand during the pandemic, while credit supply did not act as a limiting force, despite severe containment measures which hit affected economic sectors strongly. Guerrieri et al. (2022) analyse the impact of the pandemic as a negative supply shock. Based on their model, accommodative monetary policy is part of the optimal policy mix, combined with social insurance. Finally, Chadha et al. (2021) assess, based on a macroeconomic model, the impact of the COVID-19 related de-

mand and supply shock on the US economy. According to their results, the complementarity of monetary and fiscal policy support in response to the negative demand and supply shocks has avoided a deeper fall in economic output. While the approach of this paper is fundamentally different to ours, we share the result of a beneficial impact of monetary policy (via the encompassing measure of bank funding cost) and fiscal policy support on the economy in response to the COVID-19 shock.

3 Data and empirical approach

3.1 Data

We set up a quarterly bank-firm panel dataset covering banks and firms from 10 euro area countries in the period from 2008 to 2020. The choice of the time period is related to the availability of firm-level data. On the bank side, we use the confidential individual bank lending survey (IBLS) data which provide the bank-level responses underlying the aggregate results of the BLS. This unique dataset provides bank-level information on the changes in euro area banks' credit standards, demand for loans and the respective driving factors.[4] We augment the IBLS dataset with publicly disclosed financial data (provided by SNL) to obtain bank-level capital ratios, CDS spreads and loan loss provisions. To construct the bank-firm panel, we rely on the annual Orbis Europe dataset provided by Bureau van Dijk (BvD). This dataset contains information on firm balance sheets and their profitability. In addition, it provides information on the banks with which the firm maintains a client relationship. We use this information to match the firms to their respective banks which participate in the BLS.

The matching is done in two steps. First, we use a mapping of the BLS bank identifiers to the bank identifiers provided by BvD to match the firms to the BLS banks. This is possible for a limited set of BLS banks as most banks reported by firms in Orbis Europe lack an identifier.[5] Second, to enlarge the matched dataset, we rely on name matching. Specifically, we clean the bank names reported by firms in Orbis and the names of the BLS banks by removing non-letter characters, accents, non-standard letters and harmonize the spelling of legal forms. Then we perform a direct string matching, only allowing matches between banks and firms located in the same country.[6] The matching is checked manually by

[4] See the euro area BLS on the ECB website: here.

[5] The identifiers come from another BvD dataset (Bankfocus) and are mapped by BvD internal. The low coverage results from differences in the underlying data sources for Bankfocus and the firm-bank relationships in Orbis Europe.

[6] This is done to avoid mismatches due to firms not reporting the appropriate name of foreign subsidiaries and since around

comparing the original (unadjusted) names for all matched name pairs and by manually going through the unmatched names to find any possible further matches. After some iterations, this procedure allows us to match 101 banks to around 1.8 million firms operating in the 10 euro area countries for which Orbis provides information on bank names.[7] This compares to 111 banks which are included in the BLS sample from these 10 countries, i.e., we find matches for around 90% of the BLS banks in these 10 countries.

For our analysis we focus on bank-firm observations with sufficient information on relevant bank and firm characteristics. Specifically, we require banks to have information on their common equity 1 (CET1) capital, a CDS spread and information on loan loss provisions. In our sample, 88 BLS banks have this information over several quarters. The biggest constraint of our sample comes from the firm side due to the limited coverage of some variables in Orbis Europe. Including information on the firms' return on assets (ROA), number of employees and leverage ratio (defined as current and non-current liabilities over total assets) lowers the number of firms to 432,290 and the number of banks matched to these firms to 54.

We also account for the different frequencies of our data sources. To keep the wealth of information available in the BLS, we run our analysis at the quarterly frequency of the survey. As firm data is only available at annual frequency, we merge to each quarter the most recent information available for the matched firms, i.e., the data from the previous year. For the bank-level CET1 ratio and loan loss provisions we proceed in the same way as they are also only available annually. Importantly, in all cases we use the values from the previous year to avoid including information not yet available to the banks when setting credit standards earlier in the year. For CDS spreads, by contrast, we use quarterly data.

Our main dependent variable are changes in credit standards from the BLS. This key BLS indicator reflects the internal guidelines or loan approval criteria of a bank, which are set ahead of the bank's actual decision on the acceptance or rejection of a loan application and the actual loan negotiations with the firms. Banks report at a quarterly frequency whether their credit standards have tightened, remained unchanged or eased in the past three months, see Table A.2 in the Appendix for details on the questions.[8]

90% of lending to firms in the euro area goes to firms from the same country.

[7] Bank names in Orbis are available for firms from Austria, Germany, Estonia, Spain, France, Ireland, Lithuania, Luxembourg, Netherlands, and Portugal. Notably, out of the four largest euro area countries only Italy is missing.

[8] The survey is run towards the end of each quarter. Banks are asked to report changes over the past three months and over the next three months. Therefore, the responses are interpreted as referring to the respective quarter.

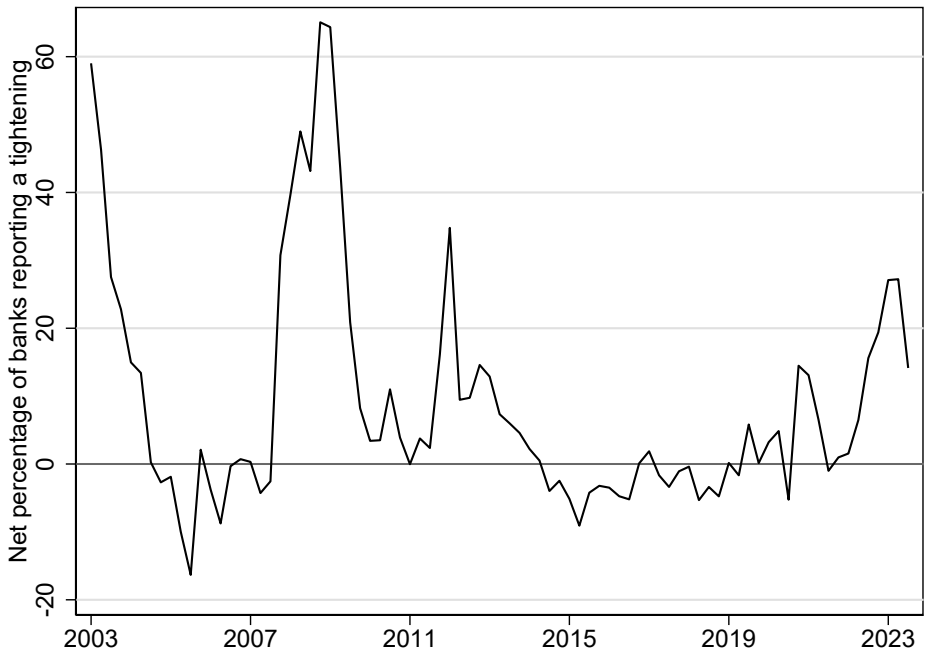
In principle, the survey distinguishes bank replies 'tightened considerably', 'tightened somewhat', 'remained basically unchanged', 'eased somewhat' and 'eased considerably'. However, banks rarely select the extreme responses on this 5-point scale, and the choice of the extent of tightening or easing is ultimately subjective. Therefore, the reporting on the BLS usually refers to 'net percentages', which are defined as the difference between the share of banks reporting a tightening and the share of banks reporting an easing of credit standards, independent of the extent of tightening.[9] Figure 1 shows the movement of the aggregate BLS net percentage indicator on credit standards, which is computed by weighting the country-level net percentages using outstanding loans. In recent times, credit standards tightened substantially during the COVID-19 pandemic, reflecting mainly increasing concerns about credit risk, and again more strongly since the start of the monetary policy tightening at the end of 2021 in line with the transmission of tighter monetary policy to bank lending. The strongest net tightening was observed during the great financial crisis, with a historical peak in the third quarter of 2008. When considering credit standards in the bank-firm level analysis, we mimic the net percentage approach and construct a discrete variable taking the value -1 if a bank reported that credit standards 'eased considerably or somewhat', the value 0 for 'remained basically unchanged', and the value 1 for 'tightened considerably or somewhat'. The descriptive statistics at the bank-firm level can be found in Table 1.

On the firm side, the key indicators are those capturing firm risk. Here we rely on two measures: the leverage ratio and the Altman Z-score (see e.g., Ferrando and Mulier, 2022).[10] The broader set of variables entering the Z-score means that this indicator is able to capture more broadly the riskiness of the firms. However, it is also a complex indicator making interpretation more difficult. We therefore also rely on the simple leverage ratio which captures similar risks. For cleaning the Orbis data, we follow the approaches described by Kalemli-Özcan et al. (2015). Descriptive statistics for the firm vulnerability measures, as well as the other key bank and firm characteristics used in the analysis are shown in Table 1 (in addition an overview of the definitions and data sources is provided in Table A.1 in the Appendix).

[9] See the ECB's reporting, e.g., here.

[10] As in Ferrando and Mulier (2022), we compute the Z-score for non-financial corporations using the following formula: 0.717 × (working capital/ total assets) + 0.847 × (retained earnings/total assets) +3.107 × (EBIT/ total assets) + 0.420 × (equity/debt) +0.998 × (sales/total assets).

Figure 1: Changes in credit standards for loans to firms in the euro area



Notes: The chart shows the net percentages of banks reporting a tightening of credit standards for loans to firms over time in the euro area.

Table 1: Descriptive statistics

	Mean	Std. Dev.	P10	P25	P50	P75	P90	Obs.
Panel (a): Banks								
Credit standards	0.064	0.364	0.000	0.000	0.000	0.000	1.000	15644157
CET1 ratio	11.453	4.631	6.366	8.831	11.668	12.899	14.162	15644157
Change in funding costs	-0.002	0.999	-0.600	-0.238	-0.032	0.233	0.737	15644157
Loan loss provisions	0.231	0.267	0.006	0.076	0.186	0.336	0.421	15644157
Panel (b): Firms								
Leverage ratio	0.605	0.348	0.181	0.367	0.598	0.795	0.945	15630081
Z-score	3.116	5.102	0.613	1.408	2.374	3.597	5.249	14700432
Return on assets (ROA)	0.034	0.135	-0.068	0.001	0.024	0.077	0.160	15644157
No. of employees	101.4	2456.9	2.0	4.0	12.0	37.0	116.0	14944589

Notes: Descriptive statistics for the bank-firm sample included in the regression analysis. For details on variable definitions and data source see Table A.1 in the Appendix.

3.2 Empirical approach

In this section, we lay out our baseline empirical model. Further extensions are discussed in the sections below. To analyse the impact of bank and firm characteristics on banks' credit standards, we estimate the following model

$$CS_{b,t} = \alpha_{b,i} + \beta_1 X_{b,t} + \beta_2 X_{i,t-1} + \beta_3 X_{b,i,t-1} + \gamma_c + \gamma_t + u_{b,i,t} \quad (1)$$

where $CS_{b,t}$ is the quarterly change in credit standards for loans to firms reported by bank b in quarter t. Given the numerical values associated with the three answer categories considered (-1 for 'eased considerably or somewhat', 0 for 'remained unchanged', and 1 for 'tightened considerably or somewhat'), a positive coefficient of the explanatory variables can be interpreted as an increase in that variable leading to tighter credit standards. $X_{b,t}$ refers to the bank-specific variables we include. These include our variables of interest measuring bank health, namely the log of the CET1 capital ratio, the share of loan loss provisions in total lending and the change in the CDS spread of the bank. In addition, we include further BLS responses on the factors contributing to changes in credit standards as controls: the impact of the general economic situation on changes in bank credit standards and the impact of competition from other banks, non-banks and market finance on changes in bank credit standards. These variables are coded in the same fashion as the credit standards themselves.[11] Importantly, we can also directly control for the demand for loans by firms, which banks also report in the BLS.[12]

$X_{i,t-1}$ refers to the annual firm-specific characteristics reported in the previous year and includes our key measures of firm risk, namely either the leverage ratio or the Altman Z-score. In addition, we control for firm profitability via the return on assets and for firm size by including the number of employees. Importantly, we also consider the possibility that the impact of firm risk depends on the situation of the bank itself, which would imply some non-linearity in the impact of firm risk on loan approval depending on the situation of the bank (in line with results by Jiménez et al. (2012), who find interactions between

[11] Specifically, we use the following coding: -1 for 'contributed considerably or somewhat to easing', 0 for 'contributed to keeping credit standards basically unchanged', and 1 for 'contributed considerably or somewhat to a tightening'. For competition, we aggregate the three sub-questions as follows: if at least one of the three responses is 'contributed considerably or somewhat to easing' and none is for 'contributed considerably or somewhat to a tightening', we consider competition as contributing to an easing; if at least one of the three responses is 'contributed considerably or somewhat to tightening' and none is for 'contributed considerably or somewhat to easing', we consider competition as contributing to a tightening. The remaining cases are consider as contributing to no change. For details on the questions see Table A.2 in the Appendix.

[12] For the question on loan demand, the survey distinguishes 'increased considerably', 'increased somewhat', 'remained basically unchanged', 'decreased somewhat' and 'decreased considerably'.

bank and firm characteristics matter for bank lending). Therefore, some specifications also include interactions between the key bank characteristics and the firm risk measures ($X_{b,i,t-1}$). All regressions include a constant ($\alpha_{b,i}$), country fixed effects (γ_c), and time fixed effects (γ_t). In some robustness specifications we also add bank fixed effects. Finally, we cluster standard errors at the bank level to reflect the fact that we include multiple bank-firm relationships per bank.

4 The impact of bank and firm characteristics on credit standards

We start by considering the role of bank characteristics in banks' lending decisions. Column (1) of Table 2 shows our baseline results for bank characteristics: higher capital ratios lead to relatively easier credit standards, and an increase in the bank's CDS spread leads to tighter credit standards. Specifically, a one standard deviation increase in the CET1 ratio leads to 0.2 standard deviations lower credit standards, i.e., easier credit standards. This means that banks with less capacity to absorb losses, reflected in lower capital ratios, and higher riskiness associated with the existing balance sheet are more restrictive when setting their credit standards.

One caveat of our estimations is that we only observe the bank's overall credit standards to firms in their loan portfolio, meaning there is no variation at the bank-firm level. To ensure this does not affect our results, we also estimate our model excluding firm variables in a pure bank panel. Table A.3 in the Appendix shows the results of consecutively including the different bank variables.

Focusing on the specification including all relevant variables in Column (4) of Table A.3, we find similar effects as in the main regression. However, the size of the impact is somewhat smaller than in the firm-bank sample, which may also point to an omitted variable bias when not including the firm controls (note all results are standardised, such that the coefficients represent the change in terms of standard deviations of the dependent variable in response to a one standard deviation change in the respective explanatory variable).[13] In addition, the level of loan loss provisions leads to a significant easing of credit standards in the bank-only sample. While the sign remains the same when also including firms, it

[13] In this model, we also include the responses of banks on the role of firm creditworthiness and firm-specific factors for the change in credit standards to account for the lack of firm variables in Table 2. While the impact of this variable is significant, it may not completely capture the firm information available in the actual data. In addition, the sample composition differs as we do not restrict ourselves to banks for which we have information on the firms which they lend to. The similarity of the results implies that the relationship between bank health and credit standards is not specific to the sample of banks considered in the main analysis.

Table 2: Bank and firm-level determinants of credit standards

	Measure of firm vulnerability: Firm leverage					Firm Z-score	
Dependent variable: bank credit standards	(1) Unweighted	(2) Weighted	(3) Interactions	(4) Bank FE	(5) Employee weights	(6) Weighted	(7) Interactions
Ln CET1 ratio	-0.2021**	-0.2002**	-0.1755**	-0.2892**	-0.0894*	-0.2147**	-0.2219**
	(0.078)	(0.076)	(0.078)	(0.136)	(0.047)	(0.085)	(0.085)
Change in CDS spread	0.1166***	0.1162***	0.1071***	0.1151***	0.0836	0.1146***	0.1167***
	(0.033)	(0.034)	(0.036)	(0.034)	(0.054)	(0.033)	(0.033)
Loan loss provisions	-0.0737	-0.0714	-0.0544	-0.0517	-0.0240	-0.0720	-0.0757
	(0.045)	(0.045)	(0.041)	(0.042)	(0.043)	(0.045)	(0.046)
General economic outlook, easing	-0.5039***	-0.4937***	-0.4930***	-0.3932**	-0.2514	-0.5067***	-0.5062***
	(0.151)	(0.146)	(0.146)	(0.148)	(0.150)	(0.155)	(0.155)
General economic outlook, tightening	1.0930***	1.0975***	1.0962***	1.0963***	1.3438***	1.0722***	1.0713***
	(0.122)	(0.126)	(0.126)	(0.147)	(0.168)	(0.125)	(0.125)
Competition, easing	-0.4338***	-0.4511***	-0.4506***	-0.3394***	-0.8908***	-0.4158***	-0.4154***
	(0.138)	(0.134)	(0.135)	(0.120)	(0.211)	(0.138)	(0.139)
Competition, tightening	0.4266	0.4432	0.4407	0.5307*	0.4744**	0.4138	0.4120
	(0.294)	(0.292)	(0.291)	(0.295)	(0.212)	(0.311)	(0.311)
Loan demand, decline	0.2870***	0.2834***	0.2829***	0.3189***	0.2058***	0.2894***	0.2891***
	(0.059)	(0.057)	(0.057)	(0.084)	(0.064)	(0.061)	(0.061)
Loan demand, increase	0.0744	0.0837	0.0834	0.1198	0.1824***	0.0663	0.0661
	(0.112)	(0.107)	(0.107)	(0.099)	(0.065)	(0.113)	(0.113)
Firm, leverage	-0.0010	-0.0005	0.1033**	0.1244***	0.0888***		
	(0.001)	(0.001)	(0.043)	(0.043)	(0.030)		
Firm, ROA	0.0017	0.0014	0.0018	0.0021	-0.0018	0.0019	0.0024
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Firm, number of employees	-0.0002	-0.0002	-0.0002	-0.0002	-0.0001	-0.0002	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln CET1 ratio × Firm, leverage ratio			-0.0972**	-0.1205***	-0.0870***		
			(0.041)	(0.042)	(0.028)		
Change in CDS spread × Firm, leverage ratio			0.0103*	0.0098	0.0214***		
			(0.006)	(0.006)	(0.006)		
Loan loss provisions × Firm, leverage ratio			-0.0214*	-0.0163*	-0.0206		
			(0.012)	(0.010)	(0.014)		
Firm, Z-Score						-0.0004	-0.0907**
						(0.001)	(0.036)
Ln CET1 ratio × Firm, Z-Score							0.0863**
							(0.034)
Change in CDS spread × Firm, Z-Score							-0.0049**
							(0.002)
Loan loss provisions × Firm, Z-Score							0.0099
							(0.007)
Observations	15,644,121	15,643,942	15,643,942	15,643,942	14944553	14832219	14832219
No. banks	54	54	54	54	54	54	54
R^2	0.53	0.53	0.53	0.56	0.5	0.53	0.53
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank FE	No	No	No	Yes	No	No	No
Weights	None	Assets	Assets	Assets	Employees	Assets	Assets

Notes: The table shows the results of regressing banks' changes in credit standards on bank and firm characteristics in the bank-firm panel, see equation 1 for details. We measure firm vulnerability in two way: in columns 1 to 5 we use the leverage ratio and columns 6 and 7 we use the Z-score. Coefficients represent impact of a one standard deviation change of the explanatory variable in terms of standard deviation of the dependent variable. Standard errors clustered at the bank level in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

is no longer significant, possibly since loan loss provisions also reflect the quality of the firms the banks are linked to. Another issue to consider is the heterogeneity in the number of firm relationships per bank included in our sample.

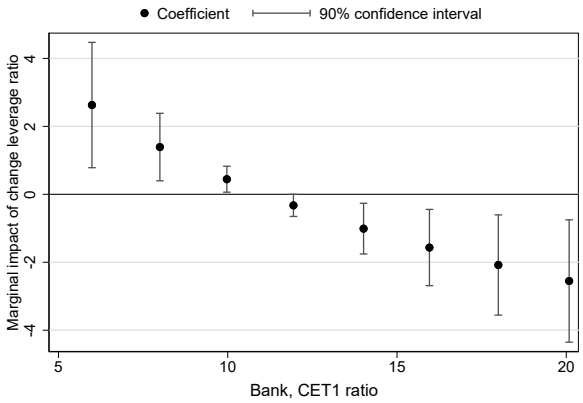
In order to ensure that our results are not driven by banks linked to many – but possibly small – firms, we estimate our model also using the firms' total asset as weights. Results in Column (2) of Table 2 are quite similar to the ones based on the unweighted regression. Given that this specification controls for firm size, we continue our analysis using asset weights as our preferred specification. Both Columns (1) and (2) of Table 2 also include the additional BLS variables mentioned above. These are included as indicator variables with the baseline category being the response 'no change' in each case. The signs of the respective coefficients are in line with expectations, i.e., an easing contribution of the two factors contributing to credit standards have a negative coefficient and a tightening contribution has a positive impact. However, there is some asymmetry regarding significance. While the general economic situation contributes significantly in both directions, competition appears to be more relevant when it contributes to an easing credit standards. At the same time, weaker loan demand is associated with tighter credit standards which may reflect some simultaneity in the responses of the banks, as tighter credit standards should also lower demand. This highlights the importance of controlling for loan demand.

Turning to the firm variables included in the model, we find no significant impact of either leverage, ROA or the number of employees in the specifications shown in Columns (1) and (2) of Table 2. This is however related to not considering an important non-linearity: adding the interaction between firm leverage and the three measures of bank health reveals that higher firm leverage does lead to tighter credit standards, but the impact depends on the situation of the bank. Specifically, the results in Column (3) of Table 2 which include the interaction terms described in model (1), show that a one standard deviation increase in firm leverage leads to a 0.1 standard deviation tightening of credit standards. This is impact is smaller when the firm is linked to a bank with higher capital ratios, higher loan loss provisions or a decline in its CDS spread.

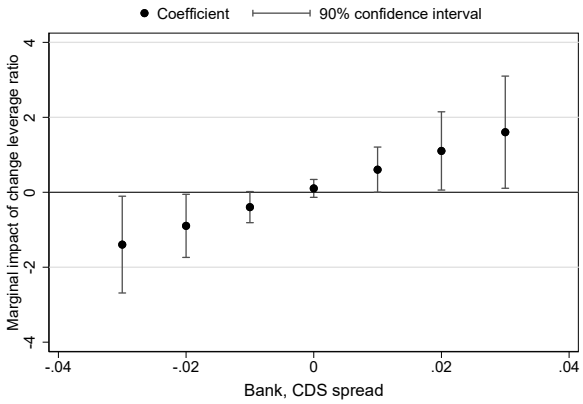
Figure 2 illustrates the impact of a change in the firm's leverage ratio for different levels of the bank characteristics. Focusing on our main variable of interest, the capital ratio, we find that an increase in leverage leads to tighter credit standards for low capital ratios. At the same time, for very high capital ratios the effect is reversed, pointing to banks with high loss absorption capacity being more willing to

Figure 2: Marginal effect on credit standards of change in firm leverage ratio by level of bank characteristics

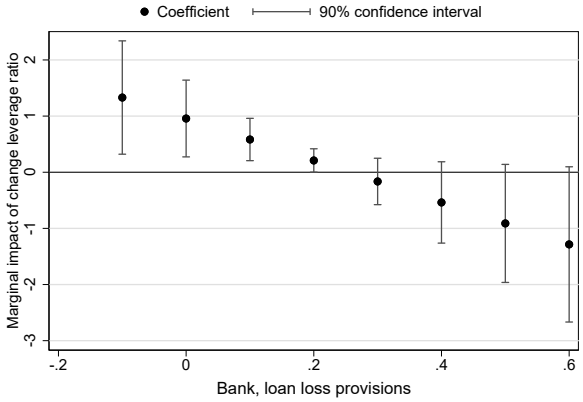
(a) CET1 ratio



(b) CDS spread



(c) Loan loss provisions



Notes: Chart shows impact of firms' leverage ratios on banks' credit standards for different levels of bank characteristics, based on results from column (3) of Table 2. Coefficients represent impact of a one standard deviation change of firm leverage ratios in terms of standard deviations of credit standards. In each case, the bank characteristics interacted with leverage but not varied are assumed to be at the mean. Therefore the effect when the CDS or loan loss provisions equal 0 is not equal the coefficient of leverage alone.

lend to riskier firms since they ease their credit standards when associated with more leveraged firms. Similar results are observed for the CDS spread and loan loss provisions.

We also run some more robustness checks. Specifically, we include bank fixed effects (Column 4 in Table 2) and use the number of employees instead of total assets as a weight in the regression (Column 5). This does not materially change the results for leverage and capital. However, the interaction terms with loan loss provisions and the CDS spreads each turn insignificant in one of the two additional specifications.

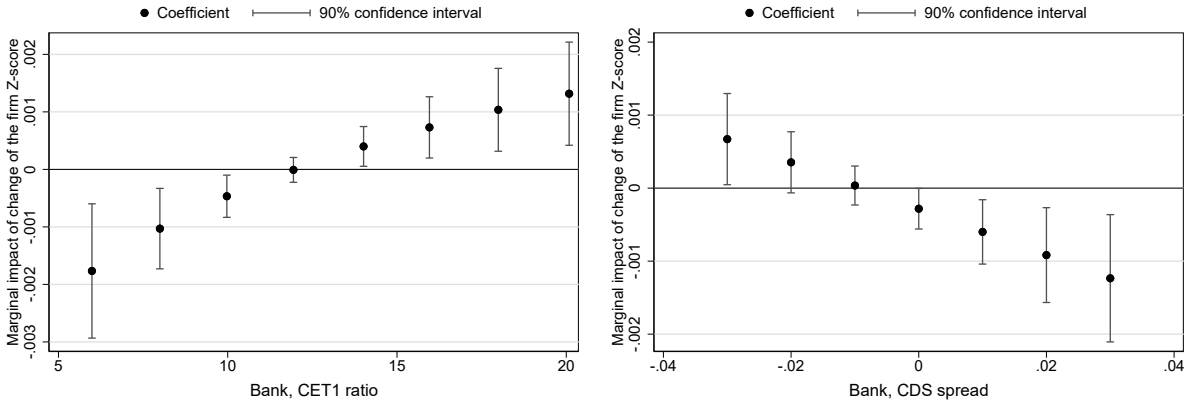
Turning to the more encompassing measure of firm risk, namely the Altman Z-score, we find very

similar results, see Columns (6) and (7) of Table 2. Banks linked to firms with lower Z-scores (higher risk) set tighter credit standards, when the situation of the bank itself is taken into account. At the same time a higher capital ratio counteracts this effect while a higher CDS spread reinforces it. We also illustrate these non-linear effects in Figure 3.

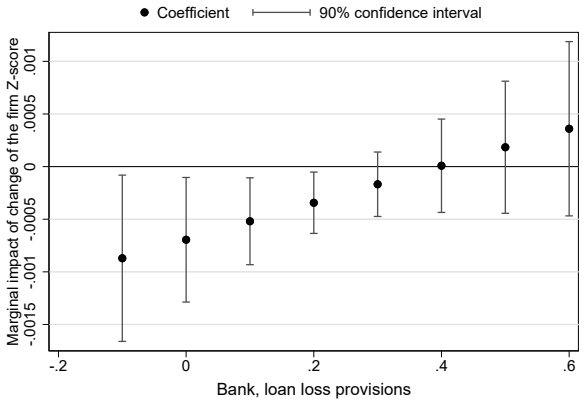
Figure 3: Marginal effect of change in firm Z-score by level of bank characteristics

(a) CET1 ratio

(b) CDS spread



(c) Loan loss provisions



Notes: Chart shows impact of firms' Z-score on banks' credit standards for different levels of bank characteristics, based on results from column (7) of Table 2. Coefficients represent impact of a one standard deviation change of firms' Z-scores in terms of standard deviations of credit standards. In each case, the bank characteristics interacted with leverage but not varied are assumed to be at the mean. Therefore the effect when the CDS or loan loss provisions equal 0 is not equal the coefficient of the Z-score alone.

5 Bank funding costs and credit standards

After establishing how banks' credit standards depend on the financial situation of the banks and the situation of their corporate borrowers, we consider how lending decisions change in response to changes

in the macroeconomic environment, specifically a change in bank funding costs.

We analyse the impact of changes in bank funding costs, including deposit rates, bond yields and cost of central bank borrowing. For this purpose, we construct an encompassing bank funding cost measure covering the full maturity spectrum of bank liabilities, instead of focusing only on short-term rates. In this way, we capture the impact of conventional monetary policy, unconventional monetary policy measures, such as asset purchases or targeted longer-term refinancing operations (TLTROs) as well as other macroeconomic developments impacting the yield curve. Specifically, we measure bank funding costs as the weighted average of bank bond yields, new business deposit rates and ECB refinancing rates, using outstanding amounts of bank liabilities as weights. For banks which do not issue bonds, we only include deposit rates and ECB refinancing rates. We then extend equation (1) by introducing the change in the bank funding cost measure ($\Delta \text{cfi}_{b,t}$) as well as interaction between this measure and bank and firm characteristics:

$$\begin{aligned} CS_{b,t} = {} & \alpha_{b,i} + \beta_1 X_{b,t} + \beta_2 X_{i,t-1} + \beta_3 \Delta \text{cfi}_{b,t-1} + \beta_4 \Delta \text{cfi}_{b,t-1} X_{b,t} + \beta_5 \Delta \text{cfi}_{b,t-1} X_{i,t-1} \\ & + \beta_6 Y_{c,t-1} + \gamma_t + \gamma_c + u_{b,i,t} \end{aligned} \tag{2}$$

This model also includes lagged GDP growth, the unemployment rate and inflation at the country level ($Y_{c,t-1}$) as well as time and country fixed effects (γ_t, γ_c) to control for macroeconomic drivers of funding costs. Thus, we capture the impact of differences in bank funding costs not determined by the level of euro area short-term market rates and by cross country differences in yields.

We find that banks tighten their credit standards in response to a positive shock to their funding costs, but less if the bank is healthier in terms of its capital position and has a lower CDS spread. Table 3 shows the results. In Column (1) we focus on the impact of funding costs alone. As expected, higher bank funding costs lead to tighter credit standards, i.e., banks become more restrictive in their lending policy when faced with higher funding costs given that this increases the cost of lending. Specifically, a one standard deviation increase in bank funding costs (equivalent to a one percentage point change), leads to 0.1 standard deviation tighter credit standards. This implies that higher interest rates do not only constrain credit by raising the cost of credit for borrowers but also by making banks less willing to lend to riskier borrowers.

Given the results in Section 4, we further consider how a change in funding costs interacts with

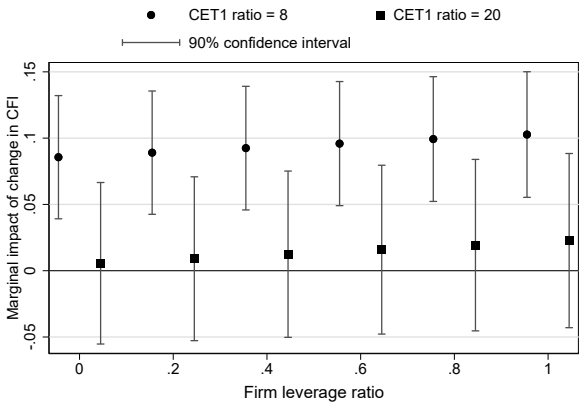
Table 3: Impact of a change in the average cost of funds on credit standards

Dependent variable: Credit standards	(1) Change in CFI	(2) Inter., CET1	(3) Inter., lev.	(4) Inter., CET1+lev.	(5) Triple, CET1
Change in funding costs, t-1	0.1150***	0.3572**	0.0992***	0.3416**	0.3552**
	(0.033)	(0.167)	(0.032)	(0.168)	(0.167)
Change in funding costs, t-1		-0.2415		-0.2398	-0.2536*
× Ln CET1 ratio, t		(0.147)		(0.147)	(0.146)
Change in funding costs, t-1			0.0180***	0.0159***	
× Firm, leverage ratio, t-1			(0.005)	(0.005)	
Change in funding costs, t-1					0.0162***
× Firm, lev., t-1 × Ln CET1, t					(0.005)
GDP growth, t-1	0.0722	0.0761	0.0722	0.0761	0.0760
	(0.059)	(0.060)	(0.058)	(0.060)	(0.060)
Unemployment rate,	0.1919	0.1900	0.1918	0.1900	0.1900
t-1	(0.176)	(0.174)	(0.176)	(0.174)	(0.174)
HICP inflation, t-1	-0.0187	-0.0162	-0.0188	-0.0163	-0.0163
	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)
Ln CET1 ratio, t	-0.2018***	-0.2071***	-0.2017***	-0.2070***	-0.2070***
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Change in CDS spread	0.1256***	0.1221***	0.1257***	0.1222***	0.1222***
	(0.036)	(0.035)	(0.036)	(0.035)	(0.035)
Loan loss provisions	-0.0675	-0.0666	-0.0675	-0.0666	-0.0666
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
General economic	-0.4856***	-0.4859***	-0.4856***	-0.4859***	-0.4859***
outlook, easing	(0.144)	(0.144)	(0.144)	(0.144)	(0.144)
General economic	1.0919***	1.0911***	1.0919***	1.0911***	1.0911***
outlook, tightening	(0.128)	(0.128)	(0.128)	(0.128)	(0.128)
Competition, easing	-0.4477***	-0.4393***	-0.4476***	-0.4393***	-0.4393***
	(0.132)	(0.130)	(0.132)	(0.130)	(0.130)
Competition,	0.2412	0.2088	0.2406	0.2086	0.2086
tightening	(0.256)	(0.252)	(0.256)	(0.252)	(0.252)
Loan demand, decline	0.2675***	0.2625***	0.2672***	0.2623***	0.2623***
	(0.046)	(0.044)	(0.046)	(0.044)	(0.044)
Loan demand,	0.0711	0.0704	0.0711	0.0705	0.0705
increase	(0.108)	(0.107)	(0.107)	(0.107)	(0.107)
Firm, leverage, t-1	-0.0002	-0.0003	0.0010	0.0008	0.0010
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm, ROA	0.0018	0.0018	0.0018	0.0018	0.0018
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm, number of	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
employees	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	15,621,078	15,621,078	15,621,078	15,621,078	15,621,078
No. banks	54	54	54	54	54
R^2	0.54	0.54	0.54	0.54	0.54
Time FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Weights	Assets	Assets	Assets	Assets	Assets

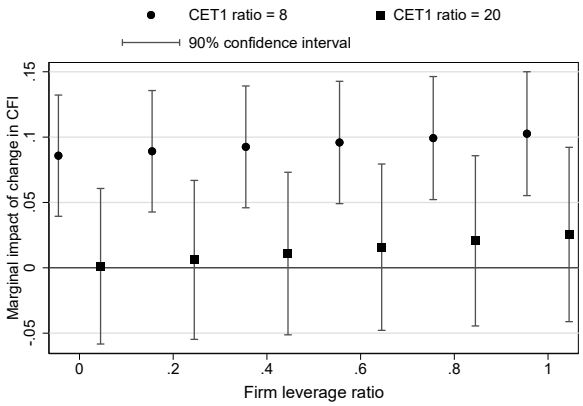
Notes: The table shows the results of regressing banks' changes in credit standards on bank funding costs, as well as bank and firm characteristics and macro variables in the bank-firm panel, see equation 2 for details. Coefficients represent impact of a one standard deviation change of the explanatory variable in terms of standard deviation of the dependent variable. Standard errors clustered at the bank level in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Figure 4: Marginal effect of change in banks cost of funds by CET1 ratio and firm leverage ratio

(a) Simple interaction



(b) Triple interaction



Notes: Chart shows impact of changes in bank funding costs on banks' credit standards for different levels of bank capitalisation and firm leverage ratios, based on results from columns (4) and (5) of Table 3. Coefficients represent impact of a one standard deviation change in bank funding costs in terms of standard deviations of credit standards.

bank and firm characteristics. We start with bank capital ratios in Column (2) of Table 3. While the coefficient of the interaction is negative, it is not significant. This indicates that banks with different balance sheet strength do not react significantly different to a rise in bank funding costs. Next, we introduce an interaction between bank funding costs and firms' leverage ratio. Results in Column (3) indicate that banks linked to riskier borrowers tighten credit standards more in response to an increase in funding costs. This implies that in times of rising bank funding costs banks more exposed to riskier borrowers restrict their lending policy more strongly than those linked to less risky borrowers. Finally, we also consider interactions between bank funding costs and bank and firm health jointly. First in Column (4), we add both interactions to the model. Again, the interaction with banks' capital ratio is insignificant, while the one with the leverage rate is significant and negative. Finally, in Column (5) we consider an interaction of all three variables, since we saw in Section 4 the importance of the interplay between firm and bank characteristics. In fact, in this case, the interaction between bank capital ratios and bank funding costs is significant negatively, pointing to healthier banks changing their lending policy less strongly in response to higher funding costs. The triple interaction on the other hand is significant positive. To ease the interpretation of these results, we illustrate the results from Columns (4) and (5) of Table 3 in Figure 4, for two levels of capital (representing the lower and upper end of the capital distribution in our sample) and for several levels of leverage ratios. The chart illustrates that for banks with high capital levels, higher funding costs do not have a significant impact on banks' credit standards

across the distribution of leverage ratios, while for low capital banks higher funding costs lead to a significant tightening of credit standards.

6 The impact of a sudden deterioration in firm health on credit standards: the case of the COVID-19 pandemic

In this section, we study the impact of a sudden deterioration in banks' loan portfolio on their credit standards, using the COVID-19 pandemic as a proxy for a negative shock to the balance sheets of the euro area corporate sector owing to the severe decline in economic activity.[14]

To do so, we expand our dataset with the following information. First, given that our firm-bank dataset does not cover the pandemic period due to the long reporting lag of Orbis Europe, we retrieve data on changes in sectoral activity of euro area firms since 2019Q4 at the country and 2-digit NACE Rev. 2 level from Eurostat's short-term business statistics (STS), and we merge it to our firm-bank confidential dataset using the sector classification available in Orbis Europe.[15] Second, to account for the role played by public support measures in shielding euro area firms from the economic impact of the pandemic, we complement our dataset with information on the importance of public loan guarantee schemes for banks based on two measures: the actual uptake of pandemic-related government guaranteed loans at country level as well as a novel measure relying on bank-specific information from the BLS on the importance of the uptake of loans with government guarantees. We consider these two measures due to limited data on the individual bank's actual exposure to loans with government guarantees.

More specifically, we rely on information on the share of government guaranteed loans in total new lending at country level, which is an updated version of the data compiled by Falagiarda, Prapiestis, and Rancoita (2020). The drawback of this measure is its lack of bank level information as it implicitly assumes that guarantees are equally relevant for banks operating in the same country. To alleviate this concern, we construct a second measure of the relative importance of government guarantees for each individual bank based on a BLS ad-hoc question, which was introduced in the BLS questionnaire on a bi-annual basis from the first half of 2020 until the end of 2021 (see Table A.4 in the Appendix). Specifically, banks were asked to report the change in their credit standards for loans to firms separately

[14] Euro area GDP growth contracted by -6.1% in 2020, with a low of -14.2% in 2020 Q2 (annual percentage change).
[15] Depending on the economic sector, information on economic activity in based on turnover or production.

for loans with COVID-19 related government guarantees and loans without such guarantees. This allows us to develop an indicator for the importance of loans with government guarantees for overall credit standard changes. The measure is based on the assumption that the overall credit standards reported by the bank in the standard questionnaire should be a weighted average of the two separate items reported in the ad hoc question. Defining overall credit standards as CS^O (two-quarter average to account for the different frequencies) as the weighted average of the reported change in credit standards for loans with guarantees (CS^G) and in credit standards for loans without guarantees (CS^{NG}), the importance, a, of guaranteed loans can be written as

$$a = \left\{ \begin{array}{ll} \frac{CS^O - CS^{NG}}{CS^G - CS^{NG}} & \text{if } CS^G \neq CS^{NG} \\ -|CS^O - CS^G| & \text{if } CS^G = CS^{NG} \text{ and } CS^G \neq CS^O \\ 0.5 & \text{if } CS^G = CS^{NG} = CS^O \end{array} \right\} \tag{3}$$

This results from rewriting the weighted average ($CS^O = aCS^G + (1-a)CS^{NG}$) to back out the weight a, and making some additional assumptions for cases where banks report the same credit standards for guaranteed and non-guaranteed loans (which render the definition undefined). Specifically, in the case of banks reporting the same credit standards for loans with and without guarantees but different overall credit standards ($CS^G = CS^{NG}$ and $CS^G \neq CS^O$), we set $a = -|CS^O - CS^G|$, i.e., a will be larger the more different the change in credit standards for guaranteed/non-guaranteed loans and the overall credit standards. This ensures the ordering of a remains such that larger values imply closer relationship between guaranteed loans and overall responses. In the case that banks report the same response for all three questions, we assume equal weights for guaranteed and non-guaranteed loans, i.e., $a = 0.5$.

This definition implies that for smaller values of a, guaranteed loans are less well reflected in the overall responses, while they are more reflected in overall response (relative to non-guaranteed loans) in the case of larger values. Therefore, the indicator reflects the importance of guaranteed loans for the overall credit standards. We take this importance in the overall credit standards as an indication for the bank's exposure to loans with government guarantees.[16] Using this information, we extend model (1) as

[16]Note that not all banks actual report answers in line with the weighted average described above. However, this does not matter for our definition. If banks report answers yielding an a below 0, this means that they reported overall credit standards even further away from the response for guaranteed loans than from the one for non-guaranteed loans, implying low importance of guaranteed loans in line with the low value of a. Contrarily, if banks report answers yielding an a above 1, this means their overall credit standards are even more in the direction of the response for guaranteed loans than the one for non-guaranteed loans, implying an important role for guaranteed loans, in line with the high value for a.

follows:

$$CS_{b,t} = \alpha_{b,i} + \beta_1 X_{b,t} + \beta_2 X_{i,t-1} + \beta_3 \text{ Cov19}_{i,t} + \beta_4 \text{ Guar}_{b,t} + \beta_5 \text{ Cov19}_{i,t} \times \text{Guar}_{b,t} + \gamma_c + \gamma_t + u_{b,i,t} \quad (4)$$

where $\text{Cov19}_{i,t}$ indicates the change in sector activity since the fourth quarter of 2019 (corresponding to pre-COVID-19 crisis levels), measured at the country-2-digit NACE Rev. 2 sector level, while $\text{Guar}_{b,t}$ indicates banks' exposure to government guaranteed loans, with the latter measured using one of the two approaches described above. For the estimation, we consider the period from the second quarter of 2020 to the first quarter of 2021, which corresponds to the height of the COVID-19 pandemic.[17]

Table 4 reports our main findings. Columns (2) to (4) display the results obtained using the measure of the share of government guaranteed loans in all new loans to firms at the country level, developed by Falagiarda, Prapiestis, and Rancoita (2020). Here, we find that banks particularly exposed to COVID-19 affected sectors tightened their credit standards more strongly at the height of the pandemic than less exposed banks. However, the significant interaction term between $\text{Cov19}_{i,t}$ and $\text{Guar}_{b,t}$ in Column (3) shows that this tightening effect was much weaker for banks exposed to such sectors but operating in countries with a higher share of government guaranteed loans. Again, we also illustrate this result based on marginal effects (Panel (a) in Figure A.1 in the Appendix). This result is expected, as by (partially) guaranteeing loan repayments in case of firm defaults, government guarantees mitigate banks' exposure to firms' credit risks.

Beyond the exposure to COVID-19 affected sectors and the role of government guarantees, the inherent riskiness of banks' loan portfolios continued to matter for the determination of their credit standards. Indeed, as shown by the triple interaction in Column (4) banks linked to highly leveraged firms continued to tighten more their credit standards compared to the rest of the banks.[18] Although the differences due to leverage are quantitatively smaller than those due to the COVID-19 impact, as illustrated by the marginal effects in Panel (a) of Figure 5. The results also hold when we use the alternative, bank-specific measure of the role of government guaranteed loans, based on BLS responses (Columns (5) to (7) of Table 4 and Panels (b) in Figures A.1 and 5). In addition, the mitigating impact of public support measures also holds

[17] In Europe, the rollout of the COVID-19 vaccination campaign accelerated in the second quarter of 2021.

[18] The results discussed here are robust to alternative measures of firm riskiness, such as the use of the Altman Z-scope instead of firm leverage.

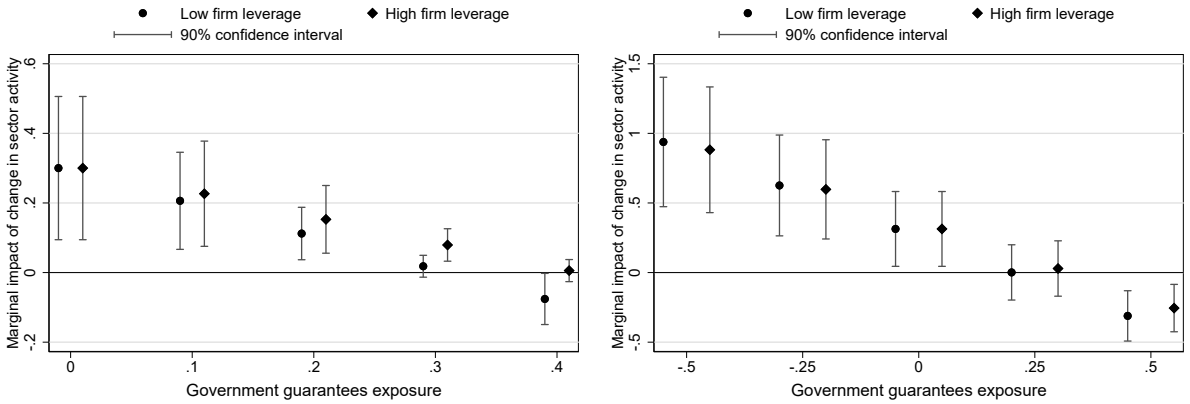
Table 4: Pandemic crisis, government support and credit standards

		Govt. guarantees: uptake in new loans, country level			Govt. guarantees: proxy from BLS, bank level		
Dependent variable: credit standards	(1) Baseline	(2) Add guar.	(3) Inter., guar	(4) Triple inter.	(5) Add guar.	(6) Inter., guar	(7) Triple inter.
Covid impact, sector	0.0007	0.0036	0.0831**	0.0828**	0.0007	0.0852*	0.0865*
	(0.009)	(0.004)	(0.035)	(0.035)	(0.009)	(0.045)	(0.045)
Govt. guarantees		-0.0938	-0.0369	-0.0374	-0.3149***	-0.2221**	-0.2231**
		(0.243)	(0.236)	(0.236)	(0.092)	(0.087)	(0.087)
Covid impact, sector × Govt. guarantees			-0.0859**	-0.1089**		-0.2108***	-0.2343***
			(0.039)	(0.047)		(0.047)	(0.052)
Covid impact, sector × Firm, lev. × Govt. guar.				0.0384**			0.0332*
				(0.017)			(0.017)
Ln CET1 ratio	0.2750**	0.2759**	0.2769**	0.2768**	0.1519*	0.1507*	0.1505*
	(0.118)	(0.119)	(0.119)	(0.119)	(0.086)	(0.085)	(0.085)
Change in CDS spread	0.0202	0.0194	0.0241	0.0249	-0.0204	-0.0095	-0.0091
	(0.231)	(0.231)	(0.230)	(0.230)	(0.232)	(0.224)	(0.224)
Loan loss provisions	-0.0007	0.0002	0.0003	0.0003	-0.0177	-0.0202	-0.0203
	(0.032)	(0.032)	(0.032)	(0.032)	(0.023)	(0.023)	(0.023)
General economic outlook, easing	1.7944**	1.6836*	1.6900*	1.6892*	1.7796*	1.6535*	1.6519*
	(0.872)	(0.886)	(0.889)	(0.889)	(0.940)	(0.898)	(0.898)
General economic outlook, tightening	1.2760***	1.2745***	1.2731***	1.2730***	1.0704***	1.0569***	1.0563***
	(0.236)	(0.235)	(0.233)	(0.233)	(0.261)	(0.251)	(0.250)
Competition, easing	-0.7804	-0.8117	-0.8215	-0.8207	-0.7622	-0.7191	-0.7183
	(0.770)	(0.704)	(0.705)	(0.705)	(0.739)	(0.717)	(0.718)
Competition, tightening	-0.3629	-0.3667	-0.3722	-0.3702	-0.4819	-0.4346	-0.4335
	(0.672)	(0.636)	(0.638)	(0.638)	(0.631)	(0.604)	(0.604)
Loan demand, decline	0.1652	0.1568	0.1575	0.1573	0.1641	0.1641	0.1641
	(0.110)	(0.112)	(0.111)	(0.111)	(0.103)	(0.103)	(0.103)
Loan demand, increase	-0.2156	-0.1907	-0.1917	-0.1916	-0.1777	-0.1738	-0.1740
	(0.217)	(0.211)	(0.209)	(0.208)	(0.197)	(0.190)	(0.190)
Firm, leverage	-0.0004	-0.0005	-0.0008	-0.0178**	0.0014	0.0002	-0.0058
	(0.002)	(0.002)	(0.002)	(0.007)	(0.001)	(0.001)	(0.004)
Firm, ROA	-0.0002	-0.0002	-0.0004	-0.0004	0.0002	-0.0002	-0.0003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm, number of employees	-0.0005*	-0.0005*	-0.0006**	-0.0006**	-0.0003	-0.0003	-0.0003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	759816	759728	759728	759728	759333	759333	759333
No. banks	45	42	42	42	44	44	44
R^2	0.50	0.51	0.51	0.51	0.53	0.55	0.55
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	No	No	No
Weight	Assets	Assets	Assets	Assets	Assets	Assets	Assets

Notes: The table shows the results of regressing banks' credit standards on the impact of the Covid-19 pandemic on firms and measures of banks' exposure to Covid-19 related government guaranteed loans as well as bank and firm characteristics and macro variables in the bank-firm panel, see equation 4 for details. Coefficients represent impact of a one standard deviation change of the explanatory variable in terms of standard deviation of the dependent variable. Banks' exposure to Covid-19 related government guaranteed loans is measured via the share of guaranteed loans in new loans at the country level in columns 2 to 4 and via an indicator derived from bank-level responses in the BLS (see equation 3) in columns 5 to 7. The Standard errors clustered at the bank level in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Figure 5: Marginal effect of change sector activity during pandemic by exposure to guarantees and firm leverage ratio

(a) Govt. guarantees: uptake in new loans, country level (b) Govt. guarantees: proxy from BLS, bank level



Notes: Chart shows how the the impact of the Covid-19 pandemic on firms affected banks' credit standards for different levels of banks' exposure to Covid-19 related government guaranteed loans and different levels of firm leverage ratios, based on results from columns (4) and (7) of Table 4. 'Low firm leverage' refers the marginal effect at firm leverage ratio equal to 25% and 'high firm leverage' refers the marginal effect at firm leverage ratio equal to 75%.

when we control for a broader set of public support measures at country level during 2020, including immediate fiscal impulse measures such as short term unemployment schemers and deferrals of taxes and social security contributions. The latter result is based on a public dataset provided by Bruegel and are expressed as a share of 2019 GDP.[19]

7 Conclusions and policy implications

In this paper, we investigate how banks decide on their credit standards and to what extent their own situation and the situation of the firms to which they lend matter. In the first part of our paper, we show that both bank and firm characteristics play a role when banks decide on their credit standards. In particular, we find that weaker capitalised banks adjust their credit standards more compared with healthier banks, especially for firms with a higher default risk. In the second part of the paper, we consider how credit standards change in reaction to two specific macroeconomic developments, namely an increase in bank funding costs and a sudden deterioration in banks' corporate loan portfolio. Here we find that weaker banks respond more forcefully to an increase in their funding costs and to a deterioration

[19]The data compiled by Bruegel can be accessed here.

in the quality of their loan portfolio by tightening their credit standards more than better capitalised banks. This development is particularly pronounced when banks are also linked to riskier firms.

Insofar, we provide evidence of heterogeneity in the bank lending channel, depending on the situation of the lenders and the borrowers. In their lending decisions, banks assess risks based on both their own loss absorption capacity and the credit risk of their borrowers. This implies that both bank and firms' balance sheet health matter for banks' credit standards.

Understanding the link between bank funding costs, the macroeconomic outlook and banks' lending policy is very important for the conduct of monetary policy. This is true especially in the current environment in which interest rates are increasing from historically low levels in the context of central bank policy rate hikes and as euro area economic growth is dampened by high uncertainty and inflation above the ECB's two percent target.

We draw two important policy implications. First, while the stronger reaction of weaker banks to changes in their funding costs may indicate higher risk taking in a low interest rate environment, these banks may also be more prudent in their lending decisions when funding costs increase. Second, the results obtained for the pandemic period can potentially be generalised to other negative economic shocks, such as the war in Ukraine and the steep rise in energy prices in 2022. Again, fiscal support has helped firms – and banks – to cope with the adverse economic shock and the sudden deterioration of corporate balance sheets. Still, weaker firms which have borrowed from weaker capitalised banks are the ones which are likely most affected in their capacity to conduct their business and to generate revenues.

Future work, which is beyond the scope of the current paper, could investigate how banks' actual lending conditions, such as loan margins and interest rates, differ across banks and firms depending on their specific characteristics.

References

Altavilla, Carlo, Francesca Barbiero, Miguel Boucinha, and Lorenzo Burlon. 2023. "The Great Lockdown: Pandemic response policies and bank lending conditions." *European Economic Review* 156:104478.

Altavilla, Carlo, Miguel Boucinha, and Paul Bouscasse. 2022. "Supply or demand: What drives fluctuations in the bank loan market?" *ECB Working Paper No. 2646* .

Altavilla, Carlo, Miguel Boucinha, Sarah Holton, and Stephen Ongena. 2021. "Credit Supply and Demand in Unconventional Times." *Journal of Money, Credit and Banking* 53 (8).

Altavilla, Carlo, Lorenzo Burlon, Mariassunta Giannetti, and Sarah Holton. 2022. "Is there a zero lower bound? The effects of negative policy rates on banks and firms." *Journal of Financial Economics* 144:885–907.

Altavilla, Carlo, Matthieu Darracq Pariès, and Giulio Nicoletti. 2019. "Loan supply, credit markets and the euro area financial crisis." *Journal of Banking & Finance* 109.

Andreeva, Desislava C and Miguel García-Posada. 2021. "The impact of the ECB's targeted long-term refinancing operations on banks' lending policies: The role of competition." *Journal of Banking & Finance* 122.

Bassett, William F., Mary Beth Chosak, John C. Driscoll, and Egon Zakrajšek. 2014. "Changes in bank lending standards and the macroeconomy." *Journal of Monetary Economics* 62:23–40.

Blaes, Barno A., Björn Kraaz, and Christian J. Offermanns. 2019. "The effects of the Eurosystem's APP on euro area bank lending: Letting different data speak." *Deutsche Bundesbank Discussion Paper No. 26/2019* .

Bottero, Margherita, Camelia Minoiu, José-Luis Peydró, Andrea Polo, Andrea F. Presbitero, and Enrico Sette. 2019. "Negative Monetary Policy Rates and Portfolio Rebalancing: Evidence from Credit Register Data." *IMF Working Paper No. 19/44* .

Caglio, Cecilia R., R. Matthew Darst, and Şebnem Kalemli-Özcan. 2021. "Risk-taking and monetary

policy transmission: Evidence from loans to SMEs and large firms." *NBER Working Paper Series No. 28685* .

Chadha, Jagjit, Luisa Corrado, Jack Meaning, and Tobias Schuler. 2021. "Monetary and fiscal complementarity in the COVID-19 pandemic." *ECB Working Paper No. 2588* .

Ciccarelli, Matteo, Angela Maddaloni, and José-Luis Peydró. 2013. "Heterogeneous transmission mechanism: monetary policy and financial fragility in the eurozone." *Economic Policy* 28 (75):459–512.

Falagiarda, Matteo, Algirdas Prapiestis, and Elena Rancoita. 2020. "Public loan guarantees and bank lending in the COVID-19 period." *Economic Bulletin Box, Issue 6/2020* .

Ferrando, Annalisa and Ioannis Ganoulis. 2020. "Firms' expectations on access to finance at the early stages of the COVID-19 pandemic." *ECB Working Paper No. 2446* .

Ferrando, Annalisa and Klaas Mulier. 2022. "The real effects of credit constraints: Evidence from discouraged borrowers." *Journal of Corporate Finance* 73:102171.

Ferrero, Giuseppe, Andrea Nobili, and Gabriele Sene. 2019. "Credit risk-taking and maturity mismatch: the role of the yield curve." *Bank of Italy Temi di Discussione (Working Paper) No. 1220* .

Guerrieri, Veronica, Guido Lorenzoni, Ludwig Straub, and Iván Werning. 2022. "Macroeconomic implications of COVID-19: Can negative supply shocks cause demand shortages?" *American Economic Review* 112 (5):1437–74.

Heider, Florian and Agnese Leonello. 2021. "Monetary policy in a low interest rate environment: Reversal rate and risk-taking." *ECB Working Paper No. 2593* .

Hempell, Hannah Sabine and Christoffer Kok. 2010. "The impact of supply constraints on bank lending in the euro area-crisis induced crunching?" *ECB Working Paper No. 1262* .

Holmstrom, Bengt and Jean Tirole. 1997. "Financial intermediation, loanable funds, and the real sector." *The Quarterly Journal of Economics* 112 (3):663–691.

Ioannidou, Vasso, Steven Ongena, and José-Luis Peydró. 2015. "Monetary policy, risk-taking, and pricing: Evidence from a quasi-natural experiment." *Review of Finance* 19 (1):95–144.

Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina. 2012. "Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications." *American Economic Review* 102 (5):2301–2326.

———. 2014. "Hazardous times for monetary policy: What do twenty-three million bank loans say about the effects of monetary policy on credit risk-taking?" *Econometrica* 82 (2):463–505.

Kalemli-Özcan, Şebnem, Bent E. Sørensen, Carolina Villegas-Sanchez, Vadym Volosovych, and Sevcan Yesiltas. 2015. "How to construct nationally representative firm level data from the orbis global database: New facts on SMEs and aggregate implications for industry concentration." *CEPR Discussion Paper No. 10829* .

Kashyap, Anil K. and Jeremy C. Stein. 2000. "What do a million observations on banks say about the transmission of monetary policy?" *American Economic Review* 90 (3):407–428.

Lown, Cara and Donald P. Morgan. 2006. "The credit cycle and the business cycle: new findings using the loan officer opinion survey." *Journal of Money, Credit and Banking* 38 (6):1575–1597.

Maddaloni, Angela and José-Luis Peydró. 2011. "Bank risk-taking, securitization, supervision, and low interest rates: Evidence from the Euro-area and the US lending standards." *The Review of Financial Studies* 24 (6):2121–2165.

A Additional figures and tables

Table A.1: Variable definitions and data sources

	Definition	Source
Panel (a): Banks		
Credit standards	Indicator for change loan approval criteria (values -1 = 'easing', 0 = 'no change', 1 = 'tightening', details in Table A.2	BLS
CET1 ratio	Common Equity Tier 1 in % of risk-weighted assets	SNL
Change in funding costs	Quarterly change in funding costs (weighted average of cost of bank bonds, deposits and central bank funding), in p.p.	IBSI
Loan loss provisions	Change in loan loss provisions as share of total loans, in p.p.	SNL
Panel (b): Firms		
Leverage ratio	Sum of current and non-current liabilities over total assets, share	Orbis Europe
Z-score	Following Ferrando and Mulier (2022) computed as 0.717 × (working capital/ total assets) + 0.847 × (retained earnings/total assets) +3.107 × (EBIT/ total assets) + 0.420 × (equity/debt) +0.998 × (sales/total assets)	Orbis Europe
Return on assets (ROA)	Profit/loss before tax over total assets, in %	Orbis Europe
No. of employees	Number of employees, in units	Orbis Europe

Table A.2: BLS standard questions

Variable	Question	Answer options
Credit standards	Over the past three months, how have your bank's credit standards as applied to the approval of loans or credit lines to enterprises changed?	- Tightened considerably; - Tightened somewhat; - Remained basically unchanged; - Eased somewhat; - Eased considerably;
General economic outlook	Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises? - General economic situation and outlook	- Contributed considerably to tightening of credit standards; - Contributed somewhat to tightening of credit standards; - Contributed to keeping credit standards basically unchanged; - Contributed somewhat to easing of credit standards; - Contributed considerably to easing of credit standards;
Borrower creditworthiness	Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises? - Industry or firm-specific situation and outlook/borrower's creditworthiness	- Contributed considerably to tightening of credit standards; - Contributed somewhat to tightening of credit standards; - Contributed to keeping credit standards basically unchanged; - Contributed somewhat to easing of credit standards; - Contributed considerably to easing of credit standards;
Competition from banks	Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises? - Pressure from competition: competition from other banks	- Contributed considerably to tightening of credit standards; - Contributed somewhat to tightening of credit standards; - Contributed to keeping credit standards basically unchanged; - Contributed somewhat to easing of credit standards; - Contributed considerably to easing of credit standards;
Competition from non-banks	Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises? - Pressure from competition: competition from non-banks	- Contributed considerably to tightening of credit standards; - Contributed somewhat to tightening of credit standards; - Contributed to keeping credit standards basically unchanged; - Contributed somewhat to easing of credit standards; - Contributed considerably to easing of credit standards;
Competition from market financing	Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises? - Pressure from competition: competition from market financing	- Contributed considerably to tightening of credit standards; - Contributed somewhat to tightening of credit standards; - Contributed to keeping credit standards basically unchanged; - Contributed somewhat to easing of credit standards; - Contributed considerably to easing of credit standards;
Loan demand	Over the past three months (apart from normal seasonal fluctuations), how has the demand for loans or credit lines to enterprises changed at your bank? Please refer to the financing need of enterprises independent of whether this need will result in a loan or not.	- Decreased considerably; - Decreased somewhat; - Remained basically unchanged; - Increased somewhat; - Increased considerably;

Notes: The current (as of April 2022) BLS questionnaire can be found on the ECB website.

Table A.3: Determinants of credit standards, BLS and bank balance sheet variables

Dependent variable: Credit standards	(1) BLS only	(2) CET1 ratio	(3) CDS spread	(4) LLP
General economic outlook, easing	-0.4739***	-0.2834**	-0.4242**	-0.4152**
	(0.140)	(0.143)	(0.163)	(0.170)
General economic outlook, tightening	0.8227***	0.8257***	0.8022***	0.7991***
	(0.061)	(0.078)	(0.090)	(0.093)
Borrower creditworthiness, easing	-0.4688***	-0.6123***	-0.4768**	-0.4510**
	(0.158)	(0.176)	(0.216)	(0.220)
Borrower creditworthiness, tightening	0.4411***	0.4482***	0.4801***	0.4701***
	(0.065)	(0.084)	(0.094)	(0.096)
Competition, easing	-0.6163***	-0.6524***	-0.5663***	-0.5846***
	(0.076)	(0.092)	(0.093)	(0.094)
Competition, tightening	0.7271***	0.6354***	0.5371***	0.5340***
	(0.123)	(0.155)	(0.179)	(0.178)
Loan demand, decline	0.0266	0.0630*	0.1098***	0.1161***
	(0.032)	(0.036)	(0.035)	(0.037)
Loan demand, increase	-0.0851***	-0.0621*	-0.0903*	-0.0886*
	(0.030)	(0.036)	(0.048)	(0.049)
Ln CET1 ratio		-0.0655**	-0.0488	-0.0725**
		(0.026)	(0.030)	(0.031)
Change in CDS spread			0.0835***	0.0843***
			(0.027)	(0.027)
Loan loss provisions				-0.0566**
				(0.022)
Observations	6439	4507	3106	3033
No. banks	145	127	89	88
R^2	0.43	0.41	0.41	0.41
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Notes: Coefficients represent impact of a one standard deviation change of the explanatory variable in terms of standard deviation of the dependent variable.
Standard errors clustered at the bank level in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

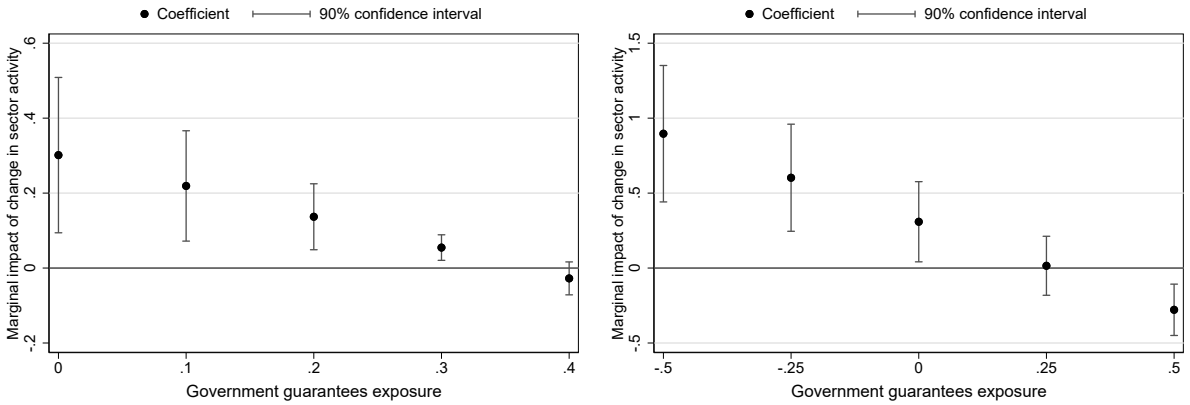
Table A.4: BLS adhoc questions on the impact of COVID-19 related government guarantees

Variable	Question	Answer options
Credit standards for loans with guarantees	How have your bank's credit standards changed? Please describe the changes over the past six months - For loans or credit lines to enterprises with COVID-19 related government guarantees	- Tightened considerably; - Tightened somewhat; - Remained basically unchanged; - Eased somewhat; - Eased considerably;
Credit standards for loans with guarantees	How have your bank's credit standards changed? Please describe the changes over the past six months - For loans or credit lines to enterprises without government guarantees	- Tightened considerably; - Tightened somewhat; - Remained basically unchanged; - Eased somewhat; - Eased considerably;

Notes: Details on the adhoc questions are also included in the Annex of the relevant BLS reports on the ECB website, e.g., the report for 2021 Q4.

Figure A.1: Marginal effect of change sector activity during pandemic by exposure to guarantees

(a) Govt. guarantees: uptake in new loans, country level (b) Govt. guarantees: proxy from BLS, bank level



Notes: Based on results from columns (3) and (6) of Table 4.

Acknowledgements

We thank Philip Lane, Carlo Altavilla, the members of the ECB's MPC Task Force on Banking Analysis, and the anonymous referee of the ECB Working Paper series for useful comments and suggestions.
The views expressed in this paper are those of the authors and do not necessarily reflect those of the European Central Bank or the Eurosystem.

Donata Faccia
European Central Bank, Frankfurt am Main, Germany; email: donata.faccia@ecb.europa.eu

Franziska Hünnekes
European Central Bank, Frankfurt am Main, Germany; email: franziska.huennekes@ecb.europa.eu

Petra Köhler-Ulbrich
European Central Bank, Frankfurt am Main, Germany; email: petra.koehler-ulbrich@ecb.europa.eu

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

PDF 978-92-899-6382-4 ISSN 1725-2806 doi:10.2866/945749 QB-AR-24-019-EN-N