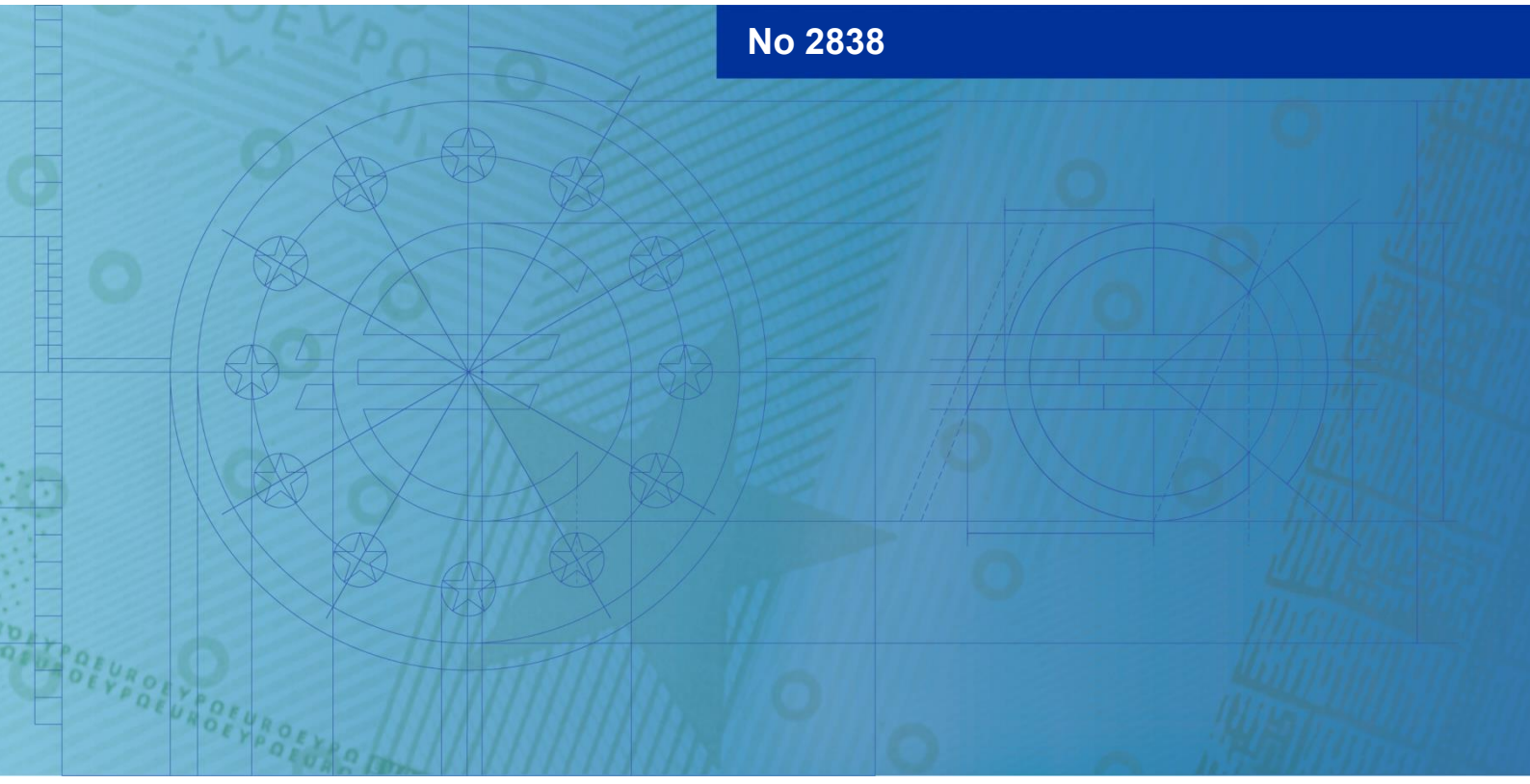
EUROPEAN CENTRAL BANK
EUROSYSTEM

Working Paper Series

Annalisa Ferrando, Caterina Forti Grazzini

Monetary policy shocks and firms' bank loan expectations

No 2838



Abstract

We provide new evidence on how ECB's monetary policy decisions affect firms' bank loan expectations in the euro area. We use firm-level data derived from the ECB Survey on the Access to Finance of Enterprises for the period 2009 to 2022 and identify the impact of monetary policy by comparing the responses of firms interviewed shortly before and after monetary policy shocks. Our results are as follows. First, we find that firms' bank loan expectations react to monetary policy, with a contractionary shock leading to a downward revision of expectations. Second, we show that firms' response depends on the size and the sign of the shock, with only large and contractionary shocks having a significant negative effect on expectations. Third, we observe that the different components of central bank communication (i.e. the pure monetary policy shock and the central bank information shock) have different impacts on firms' beliefs. Fourth, we find that conventional and unconventional QE shocks have opposite effects on expectations, with the impact of QE policies mainly being driven by the central bank information component of the related announcements. Finally, we document that the response to monetary policy differs along firms' structural characteristics.

JEL-Classification: C83, D22, D84, E58.

Keywords: Monetary policy, firms' expectations, survey data.

Non-technical summary

Expectations of firms are just as important as those of households or financial markets for the propagation of shocks and policies to the economy. Nevertheless, due to the relative unavailability of data, there is still little empirical research on how firms form their expectations and to what extent monetary policy can influence them.

In this paper we provide novel evidence on the impact of the European Central Bank (ECB)'s monetary policy on bank loan expectations of euro area firms. We use data from 2009 to 2022 gathered from the Survey on the Access to Finance of Enterprises (SAFE), a large bi-annual euro area firm-level survey. The SAFE includes not only information on expectations on the short-term evolution of the availability of bank loans, but it also contains information regarding characteristics, financial position, and the assessment of factors that affect bank financing of each responding enterprise. By exploring this information, our analysis centers around three main goals: the first one is to assess to what extent bank loan expectations react to monetary policy shocks; the second one is to understand whether the nature and characteristics of the shocks (large versus small; contractionary versus accommodative; conventional versus unconventional) and the information content of the monetary policy announcements (pure monetary policy versus central bank information shocks) impact the way firms update their bank loan availability beliefs; the third one is to investigate if firms' characteristics drive heterogeneous reactions to a monetary policy change.

The major novelty of this paper is the identification of the causal relationship between monetary policy and firms' bank loan expectations. We exploit the information provided by the survey on the exact date in which firms respond to the SAFE questionnaire and compare expectations of those firms that respond shortly before and after monetary policy shocks, so to minimize the likelihood that bank loan expectations change due to macroeconomic developments other than the monetary policy shocks themselves. In a nutshell, the measure of the impact of the monetary policy shocks is given by the difference in expectations across the two groups of firms, after controlling for a large set of firm-specific characteristics.

Our results can be summarized as follows. First, we show that monetary policy shocks have a sizeable impact on bank loan expectations and that their effect is stronger during the Covid 19 pandemic. Second, we find that only large and contractionary shocks significantly impact expectations. Third, enterprises clearly react to pure monetary policy shocks, i.e. shocks that

capture genuine monetary policy changes. By contrast, the analysis shows that, on average, it is difficult for firms to understand how news related to the current state of the economy revealed by the ECB's monetary announcements themselves –the so-called central bank information shocks– may impact bank loan availability, so to update their expectations accordingly. Nonetheless, this last result does not hold if the shocks are related to unconventional quantitative easing (QE) monetary policy tools. In fact, a fourth set of results shows that both conventional monetary policy shocks and QE shocks have significant impact on expectations, but while the impact of the former is in line with the received wisdom about the monetary transmission mechanism, i.e. a positive (thus, contractionary) shock decreases expectations, the impact of QE shocks is mainly driven by the central bank information component and delivers the opposite effect. Finally, we show that heterogeneous firms' characteristics drive different responses. Monetary actions appear to be especially impactful on the expectations of bank loans when firms perceive a worsening economic environment and are already financially weak. The impact, though, seems to be less effective for younger and financially constrained enterprises.

1 Introduction

In recent years, research on how firms form their expectations and to what extent monetary policy can influence them has received increasing attention. After all, central banks' goal to maintain price stability depends on firms' pricing and business decisions in terms of investment and employment. To form these decisions, firms ultimately rely on their expectations about future economic conditions, including monetary policy and variables directly affected by central banks' actions. Measuring these expectations and understanding how monetary policy can influence them is therefore fundamental for monetary policymakers. Nonetheless, due to the lack of quantitative information on firms' macroeconomic expectations, there is still little empirical evidence about what influences firms' beliefs, or to what extent monetary policy is able to affect them. Most of the available literature uses survey data and focuses on how firms form expectations (see, among the others, Bryan et al., 2015; Coibion and Gorodnichenko, 2015; Boneva et al., 2020; Coibion et al., 2018; Balduzzi et al., 2020; Ferrando and Ganoulis, 2020; Candia et al., 2021; Ferrando et al., 2022), and only a handful of papers overcome the issue of the endogeneity of agents' economic expectations and the absence of clear sources of identifying variation to make causal statements on how expectations affect firms' decisions (Boneva et al., 2020; Coibion et al., 2018, 2020; Ferrando et al., 2022; Enders et al., 2021). Very few papers directly relate monetary policy conduct to firms' beliefs (Enders et al., 2019; Bottone and Rosolia, 2019; Ferrando et al., 2022; Eminidou and Zachariadis, 2022), and, despite the importance of the topic, only two papers, Dunkelberg and Scott (2009) and Ferrando et al. (2022) focus on the relationship between central banks' policies and firms' credit access expectations. In particular, Ferrando et al. (2022), the work closest to ours, evaluate the impact of three unconventional policies by the European Central Bank (ECB): the outright monetary transactions (OMT) programme, the introduction of negative interest rates, and the corporate sector purchase programme (CSPP) on euro area firms' credit access expectations. Nonetheless, due to the choice of focusing on few selected monetary policy tools and the chosen monetary policy identification strategy, Ferrando et al. (2022) do not draw conclusions on the average elasticity of firms' expectations on credit access to central banks' actions.

In this paper we provide new evidence on how monetary policy affects firms' bank loan expectations. In particular, our goals are to assess to what extent these expectations react to monetary policy changes, whether different types of monetary policy shocks trigger different

updates of beliefs and whether different firm's characteristics drive heterogeneous reactions to a monetary policy change.

Specifically, we evaluate the impact of the ECB's monetary policy between 2009 and 2022 on euro area enterprises using data from the Survey on the Access to Finance of Enterprises, a bi-annual euro area firm-level survey. Our identification strategy relies on the information on the exact date in which firms are interviewed. This information allows us to compare expectations of those firms that respond to the survey questionnaire in a narrow window before and after the monetary policy shocks, so to minimize the likelihood that bank loan expectations change due to macroeconomic developments other than the monetary policy shocks themselves. We follow Nakamura and Steinsson (2018) and construct monetary policy shocks as the first principle component of the change in yields of risk-free rates at different maturities in a small window of time around the ECB Governing Council meetings, using all scheduled announcements from 3 January 2002 to 14 April 2022.

Our main findings are as follows. First, as in Dunkelberg and Scott (2009), Enders et al. (2019), Bottone and Rosolia (2019), Ferrando et al. (2022) and Eminidou and Zachariadis (2022), we find that monetary policy has a significant effect on firms' beliefs. In line with conventional wisdom, we show that contractionary monetary policy shocks decrease bank loan expectations. We also find that the effect is considerably stronger when we focus on the Covid 19 period. Second, we document that only large and contractionary shocks have a significant impact on expectations, suggesting that the attention that firms pay to monetary policy decisions is endogenous to the size and the sign of the shocks. Third, we find that the information content and nature of shocks matter. We follow the recent literature that argues that financial market movements around central banks' monetary policy decisions might be interpreted in two different ways (Jarociński and Karadi, 2020; Miranda-Agrippino and Ricco, 2021; Andrade and Ferroni, 2021) and we partition the constructed shocks into pure monetary shocks and the central bank information shocks –the latter capturing the possible impact on expectations of news of the current state of the economy revealed by the ECB during its monetary policy announcements. Both shocks have the expected sign —a positive (contractionary) pure monetary policy shock decreases expectations, while a positive central bank information shock increases them-– but the effect of the latter is weak. These results suggest that, on average, monetary policy decisions impact firms' expectations on the availability of bank loans directly through changes in the monetary policy stance and their expected impact on bank loan conditions. By contrast, it might be not

trivial for firms to understand how the current state of the economy revealed by a monetary policy announcement itself might impact bank loan conditions so to update their expectations accordingly. Nonetheless, this last finding does not apply to unconventional quantitative easing (QE) shocks. In fact, a fourth set of results shows that, while conventional contractionary monetary policy shocks have a negative and significant impact on firms' bank loan availability beliefs, contractionary shocks related to the announcements and the implementation of different ECB's asset purchase programmes (APP) deliver what might be perceived as a counter-intuitive positive impact on expectations. A further partition of QE shocks into their pure monetary policy and central bank information components brings us to conclude that firms' responses to QE shocks are mainly driven by the information content of the related announcements. Finally, in line with the literature that finds that monetary policy has an heterogeneous effect on firms' investment and financial decisions along different firms' structural and financial features (see, among the others, Cloyne et al., 2018; Durante et al., 2022; Ottonello and Winberry, 2020; Casiraghi et al., 2021), we show that the response to monetary policy is heterogeneous and depends on firms' characteristics. Monetary actions appear to be especially impactful on bank loan expectations when firms perceive a worsening economic environment and are financially weak. The impact, though, seems to be less effective for younger and financially constrained enterprises.

We also perform a number of robustness checks related to our choice of sample selection and empirical model. First, we use different windows around the monetary policy shocks. Second, we cluster standard errors at the country level, at the sector level, and at the country-sector level, so to account for different possible levels of correlation over time. Third, we employ probability models instead of linear models. In all cases the baseline results are confirmed.

The remainder of this paper is structured as follows. The next Section introduces our data and identification strategy. Section 3 presents results for the analysis of the impact of monetary policy on firms' bank loan expectations. Section 4 shows the results of different robustness checks. The final Section concludes.

2 Data and identification strategy

At the heart of the paper is a sound identification strategy that allows us to better isolate the effect of monetary policy shocks on firms' bank loan expectations. This identification strategy

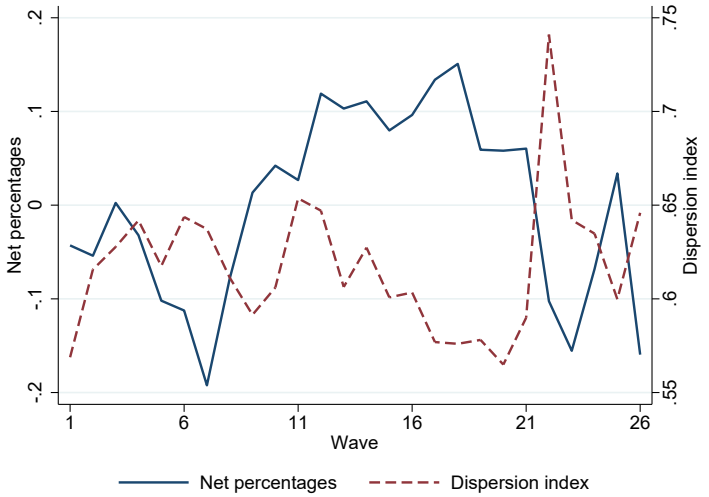
relies on the datasets that we employ and that we briefly describe in what follows. First we provide some details on the SAFE data, from which we obtain information on firms' bank loan expectations and other characteristics. Second, we turn to the construction of the monetary policy shocks. Finally, we describe in more details the identification strategy.

2.1 Firms' bank loan expectations

The analysis is based on the Survey on the Access to Finance of Enterprises (SAFE), a large-scale bi-annual firm survey run jointly by the ECB and the European Commission.[1] It contains detailed information on each respondent firm's characteristics (ownership structure, age, size, financial position) and assessment of recent development of the firm's financing conditions, needs and access to finance, together with some questions on assessing the general economic environment. Moreover, to our knowledge, the SAFE is the only survey containing information on firms' expectations about short-term evolution of the availability of different sources of financing. The survey contains only non-financial firms across the four largest industries (manufacturing, construction, trade and services) and excludes firms in agriculture, public administration, and financial services. We include enterprises located in Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, The Netherlands and Portugal over the period April 2009 to April 2022 (wave 1 to 26). Firms are interviewed in the last 4 to 6 weeks of each survey round (or wave), the so called "field-work" period. Backward-looking questions refer to the previous six months and forward-looking questions look at the next six months. Moreover, for each round the survey reports information on the exact date in which firms respond to the SAFE questionnaire, which is the crucial feature on which our monetary policy identification strategy relies on. The dependent variable of the analysis, *firms' bank loan expectations*, is derived from the answers to the question: "*Looking ahead, please indicate whether the availability of bank loan (excluding overdraft or credit lines) to your enterprise will improve, remain unchanged or will deteriorate over the next 6 months*". Importantly, the survey asks firms about perceptions regarding their own future bank loan availability and not about future bank loan access in general. The answers are used to create two variables, (1) a trichotomous variable, which contains all three possible answers; (2) a dummy variable equal to 1 if the firm believes that bank loan availability will improve in the next six months and equal to 0 if it will decrease (thus, excluding all firms

[1]The survey main results and micro-data by wave are published on the ECB's website every six months. For more information, see http://www.ecb.europa.eu/stats/money/surveys/sme/html/index.en.html.

Figure 1: Firms' bank loan expectations net percentages and dispersion over time



Notes: net percentages are calculated as the difference between the percentage of enterprises reporting an increase of bank loans and the percentage reporting a decrease. The dispersion index is calculated as the the cross-sectional weighted standard deviation of the survey responses. Sample period from wave 1 to 26 (2009 to 2022). Source: ECB and European Commission SAFE.

answering that the availability of bank loans over the next six months will remain unchanged).

Figure 1 depicts the answers in terms of net percentages and dispersion from survey round 1 to 26.[2] Net percentages fluctuate considerably over time, reaching their minimum around the peak of the sovereign debt crisis (second and third quarter of 2012, captured by wave 7), the Covid 19 crisis (from March to September 2020, captured by waves 21 and 22), and the Russian invasion of Ukraine (February 2022, captured by wave 26). To the contrary, the dispersion of expectations remained relatively stable throughout the sample, to increase sensibly during the Covid 19 crisis. From Figure 1 it emerges a negative correlation between net percentages and the dispersion index, suggesting that when there is higher level of optimism regarding future bank loan availability, firms tend to answer in a more homogeneous way.

In addition, we use the qualitative answers to different SAFE questions to construct several control variables, which can be divided in different control blocks: firms' characteristics (ownership structure, age, size), to account for the structural components; firms' financial position (own capital, own turnover, and own debt-to-asset ratio), to account for the impact of observable

[2]The dispersion index of expectations based on qualitative survey data is calculated as in Bachmann et al. (2013), $Dispersion_t = \sqrt{Frac^+ + Frac^- - (Frac^+ - Frac^-)^2}$, where $Frac^+$ and $Frac^-$ are the fraction of positive and negative responses in each month, respectively.

firm-level heterogeneity; firms' perception of factors affecting financing (own credit history, own bank loan availability, and own financial constraints), to better control for credit demand (so to make sure to disentangle it from credit supply) and for current credit access; finally, the general environment covariate (economic outlook), to control for firms' perception of the state of the economy that are likely to affect expectations. All control variable, with the exception of *family owned*, *young*, *small-medium enterprises* (SME) and *financially constrained*, are constructed starting from questions having a similar answer structure to the question on bank loan expectations, and firms face three possibilities: improved, unchanged and decreased. Accordingly, we code the answers as trichotomous variables.[3] The variable *family owned* is a dummy that takes value 1 if the largest stake in the enterprise is still owned by family or entrepreneurs and 0 otherwise. The variable *young* is a dummy that takes value 1 if the firm is less than 10 years old and 0 otherwise. The dummy *SME* is equal to 1 if the firm has less than 250 employees and 0 otherwise. Finally, the dummy *financially constrained* is constructed by combining different SAFE questions and is coded as a dummy variable equal to 1 if the firm's application for a bank loan or credit line in the past 6 months was not approved, if the firm received less than 75 percent of the requested loan, if the firm itself rejected the loan offer because the borrowing costs were too high or if the firm did not apply for a loan for fear of rejection (i.e. discouraged borrowers), and 0 otherwise. Details on how SAFE questions and their answers are used to create all variables employed in the empirical analysis are reported in Table A1 in the Appendix.

2.2 Monetary policy shocks

We identify monetary policy shocks using a high frequency identification technique (see, among the others, Kuttner 2001, Gürkaynak et al. 2005, Nakamura and Steinsson 2018, Altavilla et al. 2019, Jarociński and Karadi 2020). Applied to the euro area, these methodologies look at high-frequency movements in the overnight-index-swap (OIS) interest rates in a small window of time around ECB Governing Council's meetings and they assume that interest rate fluctuations that occur around monetary policy announcements are driven only by the unexpected, or surprise, component of the announcements themselves.

We adopt the method of Nakamura and Steinsson (2018) and construct our measure of

[3] We do not create a dummy version of the control variables because excluding the "unchanged" answer would dramatically reduce the estimation sample.

monetary policy shocks as the first principle component of the changes in seven yields of risk-free rates at different maturities spanning from 1-month to 10-year, as in Altavilla et al. (2019). We obtain the data underlying our high frequency identification approach from the Euro Area Monetary Policy Event-Study Database (EA-MPD) constructed by Altavilla et al. (2019) and published on the ECB's website.[4] The EA-MPD gathers intra-day changes in a broad set of financial market variables around the time at which the ECB Governing Council communicates its monetary policy decisions. We use all scheduled announcements from 3 January 2002 to 14 April 2022. For maturities longer than 2-year high-frequency data on the OIS rates is only available after August 2011, thus prior to that date we use German sovereign yields a proxy for the risk-free rates. Finally, we re-scale the obtained monetary policy shock series such that its effect on the 3-month OIS is equal to one (as in Jarociński and Karadi 2020).

The key advantage of constructing a measure of monetary policy shocks using a broad set of OIS maturities is that it captures both conventional and unconventional monetary policy, as research has shown that different monetary dimensions affect different segments of the yield curve (Altavilla et al., 2019; Rostagno et al., 2021). Figure A1 depicts the obtained monetary policy shock series. By construction, positive increases correspond to contractionary shocks. Importantly, the classification between contractionary and accommodative shocks is not driven by the nature or the purposes of the specific decision or tool announced by the ECB, but rather by the distance between the announcement itself and markets' expectations on it.[5] Finally, the EA-MPD gathers financial market intra-daily changes only around scheduled ECB Governing Council's meetings.[6]

2.3 Identification strategy

Our identification strategy relies on comparing expectations of those firms that respond to the survey questionnaire in a narrow window before and after monetary policy shocks, so to minimize the likelihood that changes in expectations are due to macroeconomic developments other than

[4]The EA-MPD can be found at the following link: https://www.ecb.europa.eu/pub/pdf/annex/Dataset_EA-MPD.xlsx.

[5]In principle, even the announcement of an increase in policy rates, the most classical example of contractionary measure, can be registered in our series as an accommodative shock if the actual interest rate change was lower than what markets were expecting (and had priced in) right before the announcement.

[6]All announcements held outside the scheduled events are not reflected in our shock series, including the "Whatever it takes" speech by former ECB President Mario Draghi and the announcement on March 18 2020 of the Pandemic Emergency Purchase Programme (PEPP), the tool designed to cushion the economic effects of the Covid 19 pandemic.

the monetary policy shocks themselves. We consider answers obtained in the 4 working days before and after monetary policy announcements and we discard observations on the days of the monetary events. Moreover, given the frequency and the structure of the SAFE, we can include in the analysis only ECB's announcements that happen during the field-work period. Usually one shock per survey round is available, although also zero or two are possible. In case there is no announcement, the survey round is discarded. One crucial point for the analysis is that there are enough observations before and after the announcements to perform the estimation. Figure 2 depicts the distribution of daily responses to the SAFE around the ECB's announcements included in the analysis and shows that, when pooling together all waves, the distribution of SAFE daily responses to the questionnaire has quite some mass around announcement days. Nonetheless, a closer look at the daily response distribution per survey round (Figure A2 in the Appendix) shows that in some cases the number of observations before or after the announcement is very small; these waves are also excluded from the analysis.

The final sample includes 29,819 observations and covers survey rounds from 2 to 26, with the exclusion of waves 14, 18 and 19.[7] Table A2 includes summary statistics of the estimation sample. We are able to include in analysis a total of 29 monetary shocks, plotted in Figure 3. The list of the ECB's announcements corresponding to the included shocks as well as their summary statistics are reported in Tables A3 and A4 in the Appendix, respectively.

3 Results

3.1 Baseline results

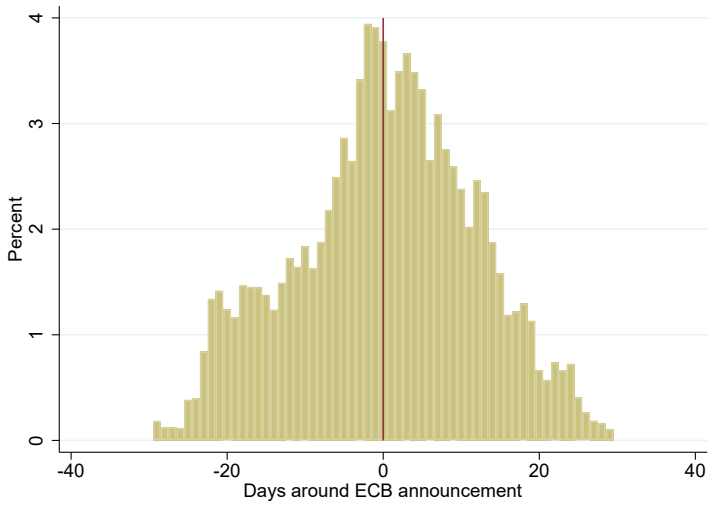
In order to analyse the impact of monetary policy on bank loan expectations of firms we pool observations across survey rounds and estimate the following model:

$$Y_{i,t} = \beta_0 + \beta_1 D_{i,m}\varepsilon_m + \beta_2 X_{i,t} + \alpha_{c,t} + \gamma_{s,t} + \upsilon_{i,t}, \tag{1}$$

where $Y_{i,t}$ is the bank loan availability expectation reported by firm i at time t. Time is measured in survey rounds. We use ε_m to indicate the monetary policy shocks constructed in Section

[7] The choice of starting from survey round 2 is driven by the possibility to retrieve information on the exact date in which firms answer to the SAFE questionnaire only from that survey round onwards. The exclusion of survey rounds 14, 18 and 19 is driven by either the absence of announcement or by the number of observations before or after the announcement being smaller than 50.

Figure 2: Distribution of daily responses to the SAFE questionnaire around ECB's announcement days



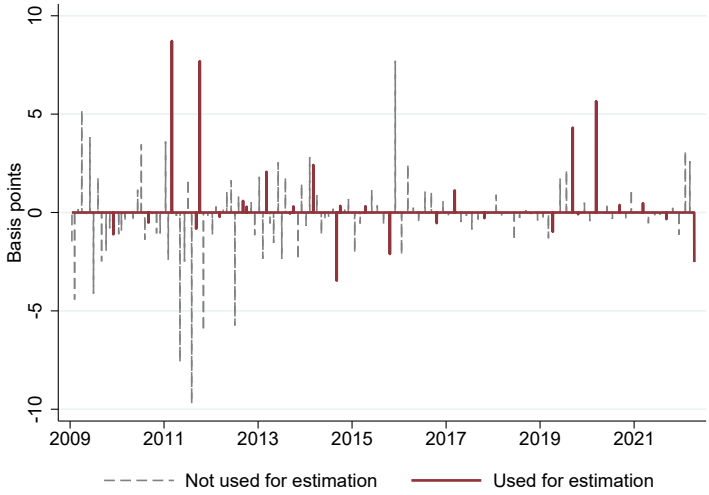
Notes: distribution of daily responses of firms around ECB's monetary policy announcements across survey rounds. Sample period from 2009 to 2022 (from survey rounds 1 to 26, excluding 14, 18 and 19). Source: ECB and European Commission SAFE.

2.2. $D_{i,m}$ is a dummy variable equal to 0 if firm i responded in the 4 working days prior to the monetary shock m and equal to 1 if it responded in the 4 working days after that event. We do not consider observations outside this 8-day window or on the day of the shock. $X_{i,t}$ is a matrix including all firm-specific controls listed in Table A2 and described in Section 2.1. We include two sets of fixed-effects: $\alpha_{c,t}$ is the country-time (i.e. survey round) fixed effect, to control for variation that are common to all firms in country c at time t; $\gamma_{s,t}$ is the sector-time fixed effect, so to net out the variation in expectations that are in common to all firms belonging to the same sector s at time t. The coefficient of interest is β_1, which captures the change in expectations due to a unit change of monetary policy shock. The model is estimated using OLS; standard errors are clustered at the firm level.

Table 1 reports the main results of the analysis.[8] Columns 1 to 3 refer to different estimation samples. In all three cases the the dependent variable is trichotomous, i.e. coded on an ordinal scale with three outcomes –improved, remain unchanged, or deteriorated (see Section 2.1). Column 1 reports the estimate when considering the whole sample (survey rounds 2 to 26), while

[8]For the extended version of Table 1 reporting the estimates of all included controls, please see Table A5 in the Appendix.

Figure 3: Monetary policy shocks



Notes: the shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. The shocks are scaled to have unit impact on the 3-month OIS. Positive values correspond to contractionary shocks. The shocks in red are those included in the empirical analysis.

columns 2 and 3 show pre-Covid 19 and Covid 19 estimates, obtained by splitting the data into two sub-samples (survey rounds 2 to 21 and 22 to 26, respectively). The effect of a 1 basis point contractionary monetary policy shock is significant and negative, implying that, in line with the received wisdom about monetary policy transmission mechanism, a contractionary shock lowers firms' bank loan expectations. Moreover, the comparison of columns 2 and 3 shows that the monetary policy effect on expectations is more than double in the Covid 19 period, suggesting that firms are particularly responsive to monetary policy in times of crisis.

In order to quantitatively interpret the effect on monetary policy shocks on expectations, we express the dependent variable as dummy equal to 1 if the firm believes that bank loan availability will improve in the next six months and equal to 0 if it will decrease. This dependent variable allows us to quantify the probability of an outlook revision from positive to negative (or vice-versa). We then re-estimate Model 1 using the binary dependent variable, and this time the estimated coefficients correspond to the impact of a 1 basis point contractionary monetary policy shock on the probability of an upward revision of expectations. The outcome, reported in column 4 of Table 1, is in line with column 1: a contractionary shock decreases the likelihood that a given firm increases its expectation on bank loan availability for the following six months

by 0.70 percentage points.

Table 1: Monetary policy and firms' bank bank loan expectations - baseline results

	Dependent variable: firms' bank loan expectations			
	Trichotomous			Binary
	Baseline	Pre-Covid 19	Covid 19	Baseline
	(1)	(2)	(3)	(4)
MP shock	-0.784***	-0.587**	-1.418**	-0.702***
	(0.248)	(0.275)	(0.565)	(0.269)
Controls	yes	yes	yes	yes
Country-Wave FE	yes	yes	yes	yes
Sector-Wave FE	yes	yes	yes	yes
Adjusted R^2	0.199	0.204	0.172	0.358
Observations	29,819	23,232	6,587	11,711

Notes: the table presents estimates of the impact of a 1 bp contractionary shock on firms' bank loan expectations. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB' monetary policy announcements; answers of firms interviewed on the days of the ECB's announcements are discarded. In columns 1-3, the dependent variable is trichotomous and takes values 1, 0 or -1 if firms expect an improvement, no changes or a deterioration in bank loan availability over the next 6 months. In column 4 the dependent variable is a dummy that takes values 1 or 0 if the firm believes that the availability of bank loans will improve or deteriorate over the next 6 months. The monetary policy shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. The shocks are scaled to have unit impact on the 3-month OIS. Positive values correspond to contractionary shocks. Controls, not reported here, include all variables listed in Table A2. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). The models are estimated using OLS. Standard errors (in parenthesis) are clustered at the firm level. Coefficients are multiplied by 100. * indicates significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level.

3.2 Nonlinear and asymmetric effects

Figure 3 shows that it exists quite some heterogeneity in the magnitude and sign of the monetary policy shocks. Against this background, it appears possible that the linear estimates presented in the previous Section mask some heterogeneity in the way firms update their expectations after a shock, possibly driven by the size and the sign of the shocks themselves. To investigate this possibility we rely on the following modified version of Model 1,

$$Y_{i,t} = \beta_0 + \beta_1 D_{i,m}\varepsilon_m * I_m + \beta_2 X_{i,t} + \alpha_{c,t} + \gamma_{s,t} + \upsilon_{i,t}, \quad (2)$$

where the dependent variable (in this case we use the binary version), the monetary policy shock variable, the controls and the fixed effects are the same as in Model 1, but this time the variable capturing the impact of monetary policy is also interacted with the variable I_m. I_m is alternatively a dummy equal to 1 if the shock ε_m is larger than 1 standard deviation (corresponding to 2.3 basis points, see Table A4) and 0 otherwise, or a dummy equal to 1 if the shock is accommodative and 0 if it is contractionary. Also in this case the model is estimated using OLS and standard errors are clustered at the firm level.

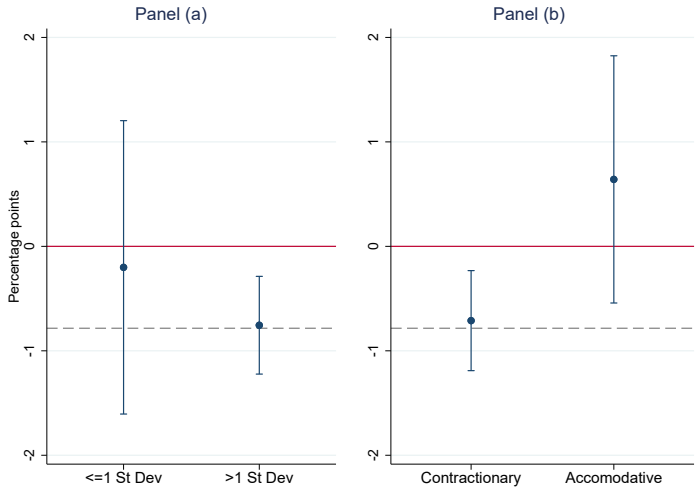
Figure 4 shows the results. We display the effect of monetary policy shocks on expectations conditional on the size of the shock (panel a) and the sign of the shock (panel b). In both panels, the dotted grey line indicates the baseline estimate for reference (Table 1, column 1) while the blue vertical lines indicate 90% confidence bounds. The figure shows that monetary policy significantly affects the expectations of firms as long as the shocks are large and contractionary.

These findings suggest that the attention that firms pay to the ECB's monetary policy decisions depends on the size and the sign of the shocks. Firms may pay little attention to monetary policy if the news content is moderate or perceived positive for bank loan availability, but as long as the shocks become bigger and deliver what is perceived as negative news, i.e. a deterioration in credit conditions, firms start paying attention and update their bank loan expectations accordingly. It is also important to note that the asymmetric effect of monetary policy might be a consequence of its non-linearity, as the accommodative shocks in our estimation sample are on average smaller than the contractionary ones, with only very few accomodative shocks being larger, in absolute value, than 1 standard deviation (see Table A4 in the Appendix).

3.3 Differentiating between pure monetary policy shocks and central bank information shocks

We turn next to the recent literature that argues that financial market movements around central banks' monetary policy decisions might be interpreted in two different ways: as the response to a genuine monetary policy change –the so called pure monetary policy shocks– or as driven by some unexpected revelation of the current state of the economy –the so called central bank (CB) information shocks (Jarociński and Karadi, 2020; Miranda-Agrippino and Ricco, 2021; Andrade and Ferroni, 2021), with the two shocks having opposite impact on financial markets. In fact, previous empirical literature highlights the importance of information effects when evaluating the impact of monetary policy on price and production expectations of firms (Enders et al.,

Figure 4: Monetary policy and firms' bank loan expectations - nonlinear and asymmetric impact



Notes: the figure presents estimates of the impact of a 1 bp shock on firms' bank loan expectations. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB's monetary policy shocks; answers of firms interviewed on the days of the shocks are discarded. Panel (a) compares the impact on firms' bank loan expectations of a contractionary shock smaller/larger than 1 standard deviation (corresponding to 2.3 basis points, see Table A4). Panel (b) compares the impact on firms' bank loan expectations of a contractionary versus accommodative monetary policy shock. The dependent variable is a dummy that takes value 1 or 0 if the firm believes that the availability of bank loans will improve or deteriorate over the next 6 months. Monetary policy shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. All regressions include all variables listed in Table A2, as well as country-wave and sector-wave fixed effects. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). The models are estimated using OLS. Standard errors are clustered at the firm level. Grey dotted horizontal lines represents estimate based on linear specification (Table 1, column 1). Blue vertical lines indicate 90% confidence bounds. Coefficients are multiplied by 100.

2019). In order to partition the monetary policy shocks constructed in Section 2.2 into these two dimensions, we follow Jarociński and Karadi (2020) and compare the sign of each constructed monetary policy shock with the sign of the surprise in the stock market index evaluated in the same short window around the corresponding ECB Governing Council's meeting.[9] The intuition is simple: pure monetary policy shocks should push interest rates and stock prices in opposite directions, while any positive co-movement between the two can only be driven by new information about the economy released during the monetary policy event in question, and is indicative of a central bank information shock. Practically, the two shock series are constructed as follows. *Pure MP shock* is equal to *MP shock* if the surprise in the EURO STOXX 50 Index

[9]We obtain the EURO STOXX 50 Index data from the Altavilla et al. (2019)'s Area Monetary Policy Event-Study Database.

Table 2: Monetary policy and firms' bank loan expectations - pure monetary policy shocks versus central bank information shocks

	Dependent variable: firms' bank loan expectations					
	Trichot.	Binary	Trichot.	Binary	Trichot.	Binary
	(1)	(2)	(3)	(4)	(5)	(6)
Pure MP shock	-0.973***	-0.887***			-0.975***	-0.890***
	(0.261)	(0.277)			(0.261)	(0.277)
CB information shock			1.454*	2.043*	1.474*	2.057*
			(0.827)	(1.078)	(0.827)	(1.078)
Controls	yes	yes	yes	yes	yes	yes
Country-Wave FE	yes	yes	yes	yes	yes	yes
Sector-Wave FE	yes	yes	yes	yes	yes	yes
Observations	29,819	11,711	29,819	11,711	29,819	11,711
Adjusted R^2	0.199	0.358	0.198	0.358	0.199	0.358

Notes: the table presents estimates of the impact of a 1 bp contractionary shock on firms' bank loan expectations. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB's monetary policy shocks; answers of firms interviewed on the days of the shocks are discarded. In columns 1, 3, and 5 the dependent variable is trichotomous and takes values 1, 0 and -1 if the firm expects an improvement, no changes or a deterioration in bank loan availability over the next 6 months. In columns 2, 4, and 6 the dependent variable is a dummy that takes values 1 or 0 if the firm expects an improvement or a deterioration in bank loan availability over the next 6 months. The shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022 and then partitioned into pure monetary policy shocks and CB information shocks by comparing their sign with the sign of the surprise in the stock market index (EURO STOXX 50 Index) evaluated in the same short window around the corresponding ECB Governing Council's meeting. If the two signs diverge, the shock is classified as a pure monetary policy shock. If the two signs converge, the shock is classified as central bank information shock (for more details, see Section 3.3). The shocks are scaled to have unit impact on the 3-month OIS. Controls include all variables listed in Table A2. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). The models are estimated using OLS. Standard errors (in parenthesis) are clustered at the firm level. Coefficients are multiplied by 100. * indicates significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level.

calculated in the same very short window around the corresponding ECB's monetary policy announcement has the opposite sign, and 0 otherwise. *CB information shock* is equal to *MP shock* if the surprise in the EURO STOXX 50 Index has the same sign, and 0 otherwise. The two newly constructed shocks are depicted in Figure A3 in the Appendix.

We re-estimate Model 1 including the *pure MP shock* and the *CB information shock* first one at the time and then together. All controls and model features are identical to the baseline analysis in Section 3.1. Table 2 reports the results. Columns 1, 3, and 5 report results for the trichotomous dependent variable, columns 2, 4, and 6 for the binary dependent variable. Both shocks have the expected sign –a positive (contractionary) pure monetary policy shock decreases

expectations, while a positive central bank information shock increases them– but the impact of the latter is weak, as the effect is only marginally significant. To robustify our findings, we repeat the analysis employing different measures of pure monetary policy and central bank information shocks. First, we follow the procedure explained above but restrict furthermore the construction of the monetary policy variables by keeping only non-zero shocks.[10] Second, we follow once more Jarociński and Karadi (2020) and disentangle pure monetary policy shocks from central bank information shocks using high-frequency data on stock prices and interest rates in a structural VAR identified via sign restrictions. The results of these additional analyses, reported in Table A6 in the Appendix, confirm the significant impact of pure monetary policy shocks, while they blur even more the already marginal effect of CB information shocks on expectations, as only two coefficients out of six are now found to be significant.

The only marginally significant impact of the CB information shocks might have more than one explanation. A first possibility is that, even for shocks classified as CB information shocks, it might be hard for some firms to disentangle between the different components of the central bank announcement, resulting in some firms reacting to the monetary policy component and some others to the revealed news about the state of the economy. As a result, the information effect and the conventional interest rate effect partially offset each other. A second possibility is that, although firms register the information component of the ECB's announcements, they are either not able to capture to what extent this new information will affect bank loan availability (so to update expectations on it), or they believe that the revealed state of the economy will affect bank loan availability beyond the SAFE six month horizon. Finally, Figure A3 shows that on average, CB information shocks are smaller than pure MP shocks and only in one case above the 1 standard deviation threshold that discriminates between significant and insignificant results (Section 3.2).

To sum up, these results suggest that ECB's decisions impact firms' expectations on the availability of bank loans directly on the monetary policy stance and through their expected impact on bank loan conditions, while it might be not trivial for firms to understand how the current state of the economy revealed by the monetary policy announcement affects bank loan availability so to update expectations accordingly.

[10] In this case the two shock series are constructed as follows. *Pure MP shock* is equal to *MP shock* if the surprise in the EURO STOXX 50 Index has the opposite sign , i.e. discarding all other shocks instead of setting them equal to 0. The *CB information shock* is equal to *MP shock* if the surprise in the EURO STOXX 50 Index has the same sign, also in this case discarding all other shocks instead of setting them equal to 0. This procedure restricts sensibly the number of observations in the estimation samples.

3.4 Differentiating between conventional and unconventional monetary policy shocks

For the baseline analysis in Section 3.1 we use a measure of monetary policy, *MP shock*, that encompasses both conventional and unconventional shocks. In this Section we seek to account for the possibility that the relationship between monetary policy and firms' bank loan expectations varies depending on the type of the monetary tools deployed by the ECB. To do so we rely on the decomposition of monetary policy shocks by Altavilla et al. (2019), who use the high-frequency data that they collect in the the EA-MPD database and a factor model to construct four different monetary policy shock series, each of them capturing unexpected changes in four different dimensions of the ECB's monetary policy. Here we make use of two of the four shocks series, namely the target shock and the quantitative easing shock (QE). The former captures the unexpected component of a change in the official rates (thus, measuring conventional monetary policy shocks), while the latter measures the reaction of financial markets to news regarding the introduction and implementation of different APP (thus, unconventional monetary policy shocks).[11] The two shock series are depicted in Figure A4 in the Appendix.

The first four columns of Table 3 presents the point estimates of Model 1 whereby we estimate the impact of a target and QE shock on firms' bank loan expectations one at the time (columns 1-3) and then all together (column 4). We make use of both the trichotomous and binary dependent variables only when evaluating the impact of target shocks (colums 1 and 2). When assessing the impact of QE shocks alone (column 3) and of the two shocks together (column 4), the estimation period starts in September 2014 (the Eurosystem began purchasing securities under the APP in October 2014), and only the trichotomous version of the dependent variable is used. As before, throughout the table the coefficients reflect the effect of a 1 basis point contractionary (conventional or unconventional) monetary policy shock on expectations, all else being equal.

The data rejects the hypothesis of no mean effect of target shocks (columns 1, 2 and 4). The coefficient is negative, in line with findings described in Section 3.1 and with the received wisdom that a contractionary monetary policy decreases firms' bank loan expectations. To the contrary, columns 3 and 4 show that the impact of contractionary QE shocks is weak, in the sense that

[11] The APP consist of the corporate sector purchase programme (CSPP), the public sector purchase programme (PSPP), the asset-backed securities purchase programme (ABSPP) and the third covered bond purchase programme (CBPP3).

it is only marginally significant in one of the two estimates (column 3). Moreover, the sign of the estimates suggests that after a contractionary QE shock, firms increase their bank loan expectations. To rationalize this result, we note that large asset purchases are state-dependent programmes usually activated and conducted in times of economic and financial distress, and that their announcement might reveal information about the current state of the economy. As a result, the pure monetary policy component of any news related to QE might be partly or completely offset by the central bank information component of the related announcements. To analyse in depth this possibility, we partition the variable *QE shock* into *QE pure shock* and *QE CB information shock* by comparing it with the surprises in the EURO STOXX 50 Index around the correspondent ECB's announcements, as explained in Section 3.3.

Results are reported in the last three columns of Table 3. While the variable *QE pure MP shock* has a negative impact on expectations, the *QE CB information component* has a significant and positive effect on expectations. These findings suggest that in the case of QE shocks, firms are not only attentive to the monetary policy announcements, but they are also able to disentangle the different components of the news provided by the ECB's communication. In light of these additional findings we conclude that the expectation revision of firms after QE shocks in Table 3 is mainly driven by the information effect. These results are in line with the notion that monetary policy communication induces enterprises (and other economic agents) to update their views not only about monetary policy, but also about the economy more in general. In addition, our findings can be explained through the lens of the composition of our estimation sample, as most of the firms included in the analysis are smaller-sized firms that do not issue bonds. On average, these firms are not directly affected by the purchases under the corporate arm of the ECB quantitative easing, the corporate sector purchase programme (CSPP), leading them to respond to the CB information component of the APP announcements rather than to the pure monetary policy part. Finally, it is important to notice that our results are not in contrast with the conclusions of Ferrando et al. (2022) that the CSPP led to an upward revision of firms' funding expectations, because our findings do not exclude the effectiveness (or the direction of the expectations' revision) of one specific announcement, but they rather capture the average effect of all shocks related to APP.

Table 3: Monetary policy and firms' bank loan expectations - conventional and unconventional shocks

	Dependent variable: firms' bank loan expectations						
	Trichotomous	Binary	Trichotomous	Trichotomous	Trichotomous	Trichotomous	Trichotomous
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Target shock	-0.709***	-0.413*		-0.566**			
	(0.224)	(0.234)		(0.275)			
QE shock			0.696*	0.147			
			(0.364)	(0.415)			
QE pure MP shock					-1.907*		-1.871*
					(1.070)		(1.070)
QE CB information shock						0.992***	0.984***
						(0.383)	(0.383)
Controls	yes	yes	yes	yes	yes	yes	yes
Country-Wave FE	yes	yes	yes	yes	yes	yes	yes
Sector-Wave FE	yes	yes	yes	yes	yes	yes	yes
Adjusted R^2	0.199	0.358	0.211	0.220	0.211	0.211	0.211
Observations	29,819	11,711	16,114	16,114	16,114	16,114	16,114

Notes: the table presents estimates of the impact of a 1 bp contractionary shock on firms' bank loan expectations. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB's monetary policy shocks; answers of firms interviewed on the days of the shocks are discarded. In columns 1, 3, 4, 5,6, and 7 the dependent variable is trichotomous and takes values 1, 0 and -1 if the firm expects an improvement, no changes or a deterioration in bank loan availability over the next 6 months. In columns 2 the dependent variable is a dummy that takes values 1 or 0 if the firm expects an improvement or a deterioration in bank loan availability over the next 6 months. The shock series *target shock* and *QE shock* are constructed following Altavilla et al. (2019). The variables *QE pure shock* and *QE CB information shock* are constructed partitioning the variable *QE shock* by comparing it with the surprises in the EURO STOXX 50 Index around correspondent ECB's announcements. Controls include all variables listed in Table A2. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19) in columns 1-2. The estimation period is from 2014 to 2022 (survey rounds 12 to 26, excluding 14, 18 and 19) in columns 3 to 7. The models are estimated using OLS. Standard errors (in parenthesis) are clustered at the firm level. Coefficients are multiplied by 100. * indicates significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level.

3.5 The impact across firms' characteristics

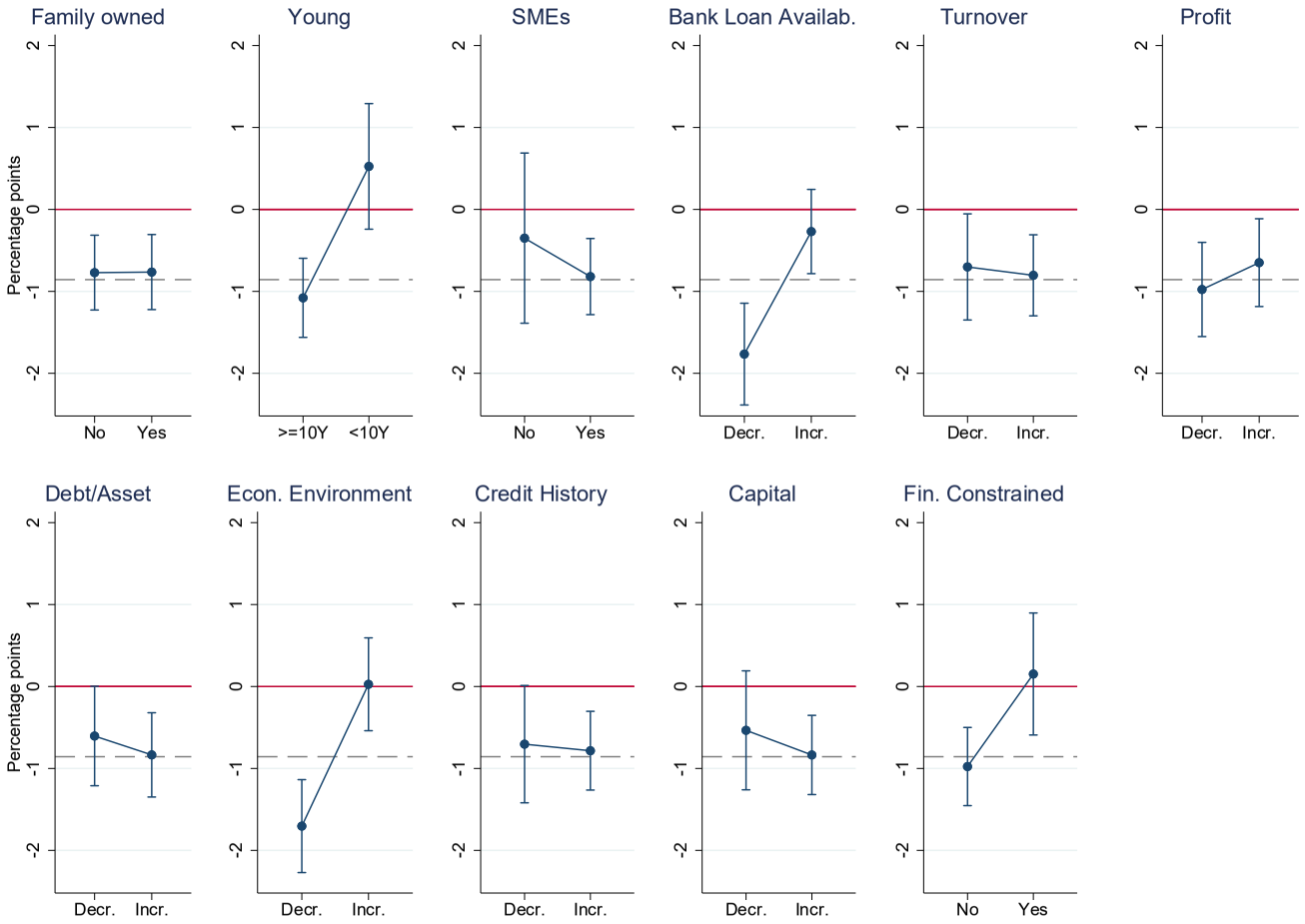
In this Section we intend to establish which firms are more sensitive to monetary policy shocks. To do so, we interact our monetary policy shock variable with all firms' characteristics in separate regressions using the following model:

$$Y_{i,t} = \beta_0 + \beta_1 D_{i,m}\varepsilon_m * x_{i,t} + \beta_2 X_{i,t} + \alpha_{c,t} + \gamma_{s,t} + \upsilon_{i,t} \tag{3}$$

where the dependent and independent variables, the fixed effects, the estimation set up and the sample selection are the same as in Model 1, and $x_{i,t}$ is a column of the matrix $X_{i,t}$ that includes all controls. For this particular empirical exercise we employ the dummy dependent variable; also all specific controls, if not already dummies, are expressed as binary variables equal to 1 if the firm answered "Will remain unchanged" or "Will improve" in response to the related question, and equal to zero if it responded "Will deteriorate". The choice of employing binary control variables simplifies the comparison of firms' behaviour, while the decision of retaining all zeros in their construction is driven by the very low of number of observations that dropping them would have implied.

Figure 5 reports the results. When grouping by structural characteristics, we see that both age and size matter for the heterogeneous response to monetary policy. Young firms, defined as firms with age lower than 10 year, are found not to update their expectations following a contractionary monetary policy shock. This result might be seen in contrast with recent papers finding that younger firms are the most affected by any monetary-policy driven tightening of credit conditions (Cloyne et al., 2018; Durante et al., 2022). It is important, though, to highlight that this work considers as young those firms that are less than 10 years old, while in the above-mentioned papers the young category includes often more mature enterprises. More in line with the literature, we see that small-sized firms are more sensitive to changes in monetary policy. In addition, we find that firms' financial position matters to a limited extent for their response to monetary policy, both in terms of turnover, profits, and debt-to-asset ratio. By contrast, firms with a worsen perceived economic environment have a significant response to contractionary shocks, in contrast to a muted response of firms reporting an unchanged or more favourable environment. Moreover, firms that experienced a decreased bank loan availability in the previous 6 months are also more affected by contractionary shocks. Finally, the analysis finds that financially constrained firms seem not to respond to monetary policy shocks, suggesting

Figure 5: Impact of contractionary monetary policy shocks along firms' characteristics



Notes: the figure presents estimates of the impact of a 1 bp contractionary shock on firms' bank loan expectations along firms' characteristics. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB's monetary policy shocks; answers of firms interviewed on the days of the shocks are discarded. The dependent variable is a dummy that takes value 1 or 0 if the firm believes that the availability of bank loans will improve or deteriorate over the next 6 months. Monetary policy shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. All regressions include all variables listed in Table A2, as well as country-wave and sector-wave fixed effects. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). The models are estimated using OLS. Standard errors are clustered at the firm level. Grey dotted horizontal line represents estimate based on linear specification (Table 1, column 1). Blue vertical lines indicate 90% confidence bounds. Coefficients are multiplied by 100.

that not having access to finance or being already discouraged make enterprises insensitive to changes in monetary policy conditions.

4 Robustness checks to the baseline results

In this section we perform a number of robustness checks related to our choice of sample selection and empirical model for the baseline analysis (Section 3.1). Results are obtained re-estimating Model 1 and reported for both the trichotomous and the binary dependent variables (unless else specified).

In a first set of robustness checks we use different windows around the monetary policy shocks, and in particular 2 working days before/after and 8 working days before/after (and excluding responses obtained on the days of the shocks). Results, reported in the columns 1-4 of Table A7 show that the choice of length of the window does not affect much the results (see column 1 in Table 1 for comparison).

In a second set of robustness checks, we alternatively cluster standard errors at the country level, at the sector level, and at the country-sector level, so to account for different possible levels of correlation over time. Columns 5 to 10 of Table A7 show that the choice of standard error clustering largely does not affect the precision of our estimates (see column 1 in Table 1 for comparison).

Finally, to make sure that our results are robust to estimating a probability models, we estimate Model 1 using a ordered probit model (for the trichotomous dependent variable) and a probit model (for the binary dependent variable). Figure A5 shows the estimated marginal effects of monetary policy at the 90% confidence level evaluated at sample means of the (not reported) covariates. Panel (a) reports the results from the ordered probit estimation. The marginal effect of a contractionary monetary policy is positive for the first possible answer (deteriorated), but negative for the other two (unchanged and improved). This suggests that a 1 basis point contractionary monetary policy shock is associated with firms having higher probability of expecting lower bank loan availability (+0.50 percentage points) and a lower probability of expecting unchanged or improved bank loan availability (-0.02 and -0.40 percentage points, respectively). Panel (b) reports the result of the probit model estimation. The marginal effect is negative and significant, suggesting that a 1 basis point contractionary monetary policy shock is associated with a decrease of 0.60 percentage points in the probability of expecting

higher bank loan availability in the next six months. These outcomes are in line with the baseline results (see column 1 and 4 in Table 1 for comparison) and we conclude that the choice of the empirical model does not drive our results.

5 Conclusion

In this paper we have examined whether ECB's monetary policy shocks affect euro area firms' bank loan expectations. This issue is of particular importance as firms base investment and employment decisions on their expectations about future economic conditions taking into consideration monetary policy and variables directly affected by central banks' actions. Measuring these expectations and understanding how monetary policy can influence them is therefore fundamental for monetary policymakers.

We use the SAFE data, which collects information on euro area firms' characteristics and bank loan expectations. Our sample runs from 2009 to 2022. One crucial characteristic of the data is that it contains the information on the exact day in which firms respond to the survey questionnaire. We use this information to compare expectations of those firms that respond shortly before and after monetary policy shocks, so to be able to robustly identify the impact of monetary policy on expectations while minimizing the likelihood that expectations change due to macroeconomic developments other that the ECB's decisions themselves.

The main results are as follows. First, we show that monetary policy shocks have a significant and sizeable impact on expectations. The direction of the impact is in line with conventional wisdom, with contractionary shocks leading to a downward revision of bank loan availability expectations. The analysis also shows that the monetary policy impact is considerably stronger during the Covid 19 crisis. Second, we find that the size and the sign of the monetary policy decision matter, with firms only responding to large and contractionary shocks. Third, when we follow the recent literature and differentiate between pure monetary policy shocks and central bank information shocks (Jarociński and Karadi, 2020), the empirical results suggest that monetary policy decisions affect firms' expectations on the availability of bank loans directly through changes to the monetary policy stance, while the evidence on the impact of central bank information shocks is inconclusive. This leads us to conclude that not all firms are able to understand how information about the current state of the economy revealed by the monetary policy announcements might impact bank loan conditions so to form expectations on them. This

last set of results, however, does not hold when focusing only on QE shocks. In fact, the analysis also shows that while firms' response to conventional monetary policy shocks is consistent with conventional wisdom (i.e. contractionary shocks have a negative impact on firms' bank loan availability beliefs), the response to news related to QE is mainly driven by the central bank information content of these unconventional shocks. Finally, we document that firms' responses to monetary policy shocks are heterogeneous along different firm characteristics. In particular, while firms' financial positions (in terms of turnover, profits and debt-to-asset ratio) matter to a limited extend, structural characteristics, financial constraints, bank loan availability and different perceptions of the economic environment drive firms' different response to monetary policy shocks.

References

Altavilla, C., Brugnolini, L., Gürkaynak, R. S., Motto, R., and Ragusa, G. (2019). Measuring euro area monetary policy. *Journal of Monetary Economics*, 108:162–179.

Andrade, P. and Ferroni, F. (2021). Delphic and odyssean monetary policy shocks: Evidence from the euro area. *Journal of Monetary Economics*, 117:816–832.

Bachmann, R., Elstner, S., and Sims, E. R. (2013). Uncertainty and economic activity: Evidence from business survey data. *American Economic Journal: Macroeconomics*, 5(2):217–249.

Balduzzi, P., Brancati, E., Brianti, M., and Schiantarelli, F. (2020). The economic effects of covid-19 and credit constraints: Evidence from Italian firms' expectations and plans. *IZA Discussion Paper No. 13629*.

Boneva, L., Cloyne, J., Weale, M., and Wieladek, T. (2020). Firms' price, cost and activity expectations: Evidence from micro data. *The Economic Journal*, 130(627):555–586.

Bottone, M. and Rosolia, A. (2019). Monetary policy, firms' inflation expectations and prices: causal evidence from firm-level data. *Bank of Italy Temi di Discussione No. 1218*.

Bryan, M. F., Meyer, B., and Parker, N. (2015). The inflation expectations of firms: What do they look like, are they accurate, and do they matter? *FRB Atlanta Working Paper No. 2014-27a*.

Candia, B., Coibion, O., and Gorodnichenko, Y. (2021). The inflation expectations of us firms: Evidence from a new survey. *National Bureau of Economic Research*, Working Paper 28836.

Casiraghi, M., McGregor, T., and Palazzo, B. (2021). Young firms and monetary policy transmission. *IMF Working Paper*, 2021: Issue 063.

Cloyne, J., Ferreira, C., Froemel, M., and Surico, P. (2018). Monetary policy, corporate finance and investment. *National Bureau of Economic Research*, Working Paper 25366.

Coibion, O. and Gorodnichenko, Y. (2015). Information rigidity and the expectations formation process: A simple framework and new facts. *American Economic Review*, 105(8):2644–78.

Coibion, O., Gorodnichenko, Y., and Kumar, S. (2018). How do firms form their expectations? New survey evidence. *American Economic Review*, 108(9):2671–2713.

Coibion, O., Gorodnichenko, Y., and Ropele, T. (2020). Inflation expectations and firm decisions: New causal evidence. *The Quarterly Journal of Economics*, 135(1):165–219.

Dunkelberg, W. C. and Scott, J. A. (2009). The response of small business owners to changes in monetary policy. *Business Economics*, 44(1):23–37.

Durante, E., Ferrando, A., and Vermeulen, P. (2022). Monetary policy, investment and firm heterogeneity. *European Economic Review*, 148:104251.

Eminidou, S. and Zachariadis, M. (2022). Firms' expectations and monetary policy shocks in the euro area. *Journal of International Money and Finance*, 122:102556.

Enders, Z., Hünnekes, F., and Müller, G. J. (2019). Monetary policy announcements and expectations: Evidence from German firms. *Journal of Monetary Economics*, 108:45–63.

Enders, Z., Hünnekes, F., and Müller, G. J. (2021). Firm expectations and economic activity. *ECB working paper No 2621*.

Ferrando, A. and Ganoulis, I. (2020). Firms' expectations on access to finance at the early stages of the covid-19 pandemic. *ECB working paper No. 2446*.

Ferrando, A., Popov, A., and Udell, G. F. (2022). Unconventional monetary policy, funding expectations, and firm decisions. *European Economic Review*, 149:104268.

Gürkaynak, R. S., Sack, B. P., and Swanson, E. T. (2005). Do actions speak louder than words? the response of asset prices to monetary policy actions and statements. *International Journal of Central Banking*, 1(1):55–93.

Jarociński, M. and Karadi, P. (2020). Deconstructing monetary policy surprises—the role of information shocks. *American Economic Journal: Macroeconomics*, 12(2):1–43.

Kuttner, K. N. (2001). Monetary policy surprises and interest rates: Evidence from the fed funds futures market. *Journal of Monetary Economics*, 47(3):523–544.

Miranda-Agrippino, S. and Ricco, G. (2021). The transmission of monetary policy shocks. *American Economic Journal: Macroeconomics*, 13(3):74–107.

Nakamura, E. and Steinsson, J. (2018). High-frequency identification of monetary non-neutrality: the information effect. *The Quarterly Journal of Economics*, 133(3):1283–1330.

Ottonello, P. and Winberry, T. (2020). Financial heterogeneity and the investment channel of monetary policy. *Econometrica*, 88(6):2473–2502.

Rostagno, M., Altavilla, C., Carboni, G., Lemke, W., Motto, R., and Guilhem, A. S. (2021). Combining negative rates, forward guidance and asset purchases: Identification and impacts of the ECB's unconventional policies. *ECB Working Paper No. 2564*.

Appendix

Table A3: List and description of the ECB's monetary policy announcements included in the analysis

Date	Monetary policy decision, if any
3 December 2009	
2 September 2010	Extension of FRFA conditions for refinancing operations up to 11 January 2011
3 March 2011	Extension of FRFA conditions for refinancing operations up to 12 July 2011
8 September 2011	
6 October 2011	Eurosystem to conduct two LTROs with maturities of 12-13 months; new Covered Bond Purchase Programme (CBPP2), starting November 2011
8 March 2012	
4 April 2012	
6 September 2012	
4 October 2012	
7 March 2013	
5 September 2013	
2 October 2013	ECB's swap arrangements with the Bank of Canada, the Bank of Japan, the Federal Reserve, the Swiss National Bank (and the Bank of England) converted to standing arrangements until further notice
6 March 2014	
4 September 2014	
2 October 2014	Multiple decisions: • Interest rate cut by 10 bps in MRO rate (down to 0.05%), in MLF rate (down to 0.30%) and in DF rate (to -0.20%) • Purchase of non-financial private sector assets starting in October 2014: Asset-Backed Securities purchase programme (ABSPP); Covered bond purchase programme (CBPP3)
15 April 2015	
22 October 2015	
20 October 2016	
9 March 2017	
26 October 2017	Multiple decisions: • As of January 2018, extension of APP until September 2018 with a monthly pace of purchases of €30 billion • the MROs and the three-month LTROs will continue to be conducted at FRFA, at least until the end of the last reserve maintenance period of 2019

Continued on next page

Table A3 – Continued from previous page

Date	Monetary policy decision, if any
10 April 2019	
12 September 2019	Multiple decisions: • Interest rate cut by 10 bps in DR rate (down to -0.50%). MRO and MLF unchanged at 0.00% and 0.25% respectively • Restart net purchases under APP: Monthly pace of €20 billion as from 1 November 2019; possibility of purchases below DF rate if necessary, including CBPP3, ABSPP, CSPP;Run for as long as necessary • TLTRO III • Two-tier system for reserve remuneration
24 October 2019	
12 March 2020	Multiple decisions: • Net purchases extended by €120 billion in 2020, in addition to ongoing purchases of €20 billion per month and reinvestments • LTROs: End in June 2020; FRFA applies; Interest rate set at DF rate • TLTRO III: Interest rate for all TLTROs between June 2020 to June 2021 set at the average rate applied in MROs over the life of the respective TLTRO - 25bps, and at DF rate -25bps if eligible net lending exceeds a benchmark; early repayment after 1 year; maximum total amount that counterparties are entitled to borrow raised to 50% of their stock of eligible loans
10 September 2020	
11 March 2021	PEPP: Purchases over second quarter to be conducted at significantly higher pace than during the first months of 2021
22 April 2021	
9 September 2021	PEPP: Purchases over fourth quarter to be conducted at moderately lower pace than in the previous two quarters
14 April 2022	

Table A1: SAFE questions and variable construction

Variable	Question	Answer codification
Bank loan expectations	"Looking ahead, please indicate whether the availability of bank loan (excluding overdraft or credit lines) to your enterprise will improve, remain unchanged or will deteriorate over the next 6 months"	Improved [1]; Unchanged [0]; Decreased [-1]
Bank loan availability	"Would you say that bank loans availability has improved, remained unchanged or deteriorated for your enterprise over the past six months?"	Improved [1]; Unchanged [0]; Decreased [-1]
Family owned	"Can you confirm that the largest stake in your enterprise is still owned by family or entrepreneurs?"	Yes [1]; No [0]
Young	"Approximately, how old is your enterprise?"	<10 years [1]; >10 years [0]
SME	"What is the approximate number of employees? "	<250 [1]; >250 [0]
Turnover	"Has turnover decreased, remained unchanged or increased over the past six months?"	Increased [1]; Unchanged [0]; Decreased [-1]
Profit	"Has profit decreased, remained unchanged or increased over the past six months?"	Increased [1]; Unchanged [0]; Decreased [-1]
Debt/Asset	"Has Debt compared to assets decreased, remained unchanged or increased over the past six months?"	Increased [1]; Unchanged [0]; Decreased [-1]
Economic environment	"Would you say that the general economic outlook have improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged [0]; Decreased [-1]
Credit History	" Would you say that your enterprise's credit history have improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged [0]; Decreased [-1]
Capital	" Would you say that your enterprise's own capital have improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged [0]; Decreased [-1]
Financially constrained	The firm's application for a bank loan or credit line in the past 6 months was not approved; the firm received less than 75 percent of the loan amount it requested; the firm itself rejected the loan offer because the borrowing costs were too high or the firm did not apply for a loan for fear of rejection	Yes [1]; No [0]

Notes: most recent formulation and answer codification of SAFE questions. Only answer possibilities that are considered and included in the analysis are shown in the table. Specifically, we discard all observations if the answer is "*Question not relevant for the firm*" or "*Does not know/NA*". Source: ECB and European Commission SAFE.

Table A2: Summary statistics

Variable	Mean	Standard deviation	Min	Max	Observations
Bank Loan Expectations	-0.020	0.626	-1	1	29,819
Bank Loan Availability	-0.022	0.606	-1	1	29,819
Family owned	0.814	0.389	0	1	29,819
Young	0.167	0.373	0	1	29,819
SME	0.905	0.294	0	1	29,819
Turnover	0.061	0.840	-1	1	29,819
Profit	-0.160	0.826	-1	1	29,819
Debt/Asset	-0.054	0.729	-1	1	29,819
Economic Environment	-0.214	0.725	-1	1	29,819
Credit History	0.122	0.623	-1	1	29,819
Capital	0.094	0.660	-1	1	29,819
Financially Constrained	0.144	0.351	0	1	29,819

Notes: the table presents the summary statistics of all variables included in the empirical analysis. Source: ECB and European Commission SAFE.

Table A4: Summary statistics of the included monetary policy shocks

	Full sample	Contractionary shocks	Accomodative shocks
Mean	0.733	2.323	-0.971
Standard deviation	2.735	2.895	1.021
Min	-3.462	0.160	-3.462
Max	8.717	8.717	-0.054
Num. of shocks	29	15	14

Notes: the shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. The shocks are scaled to have unit impact on the 3-month OIS. Positive values correspond to contractionary shocks.

Table A5: Monetary policy and firms' bank loan expectations - baseline results

	Dependent variable: firms' bank loan expectations			
	Trichotomous			Binary
	Baseline	Pre-Covid19	Covid19	Baseline
	(1)	(2)	(3)	(4)
MP shock	-0.784***	-0.587**	-1.418**	-0.702***
	(0.248)	(0.275)	(0.565)	(0.269)
Bank Loan Availability	0.253***	0.247***	0.277***	0.194***
	(0.007)	(0.008)	(0.016)	(0.007)
Family owned	-0.019**	-0.018*	-0.024	-0.030***
	(0.009)	(0.010)	(0.018)	(0.010)
Young	0.016*	0.015	0.022	0.015
	(0.0101)	(0.010)	(0.026)	(0.010)
SME	-0.009	-0.016	0.012	-0.014
	(0.012)	(0.013)	(0.024)	(0.014)
Turnover	0.009	0.013**	-0.009	0.015**
	(0.005)	(0.006)	(0.012)	(0.006)
Profit	0.035***	0.036***	0.034***	0.040***
	(0.005)	(0.006)	(0.013)	(0.006)
Debt/Asset	-0.019***	-0.016***	-0.031***	-0.011**
	(0.005)	(0.006)	(0.011)	(0.005)
Economic Environment	0.124***	0.121***	0.134***	0.129***
	(0.006)	(0.007)	(0.012)	(0.006)
Credit History	0.055***	0.058***	0.044***	0.046***
	(0.007)	(0.007)	(0.016)	(0.007)
Capital	0.048***	0.046***	0.059***	0.048***
	(0.006)	(0.007)	(0.015)	(0.007)
Financially Constrained	-0.038***	-0.040***	-0.0315	-0.017*
	(0.011)	(0.012)	(0.029)	(0.0101)
Constant	0.035***	0.058***	-0.034	0.568***
	(0.012)	(0.014)	(0.026)	(0.015)
Country-Wave FE	yes	yes	yes	yes
Sector-Wave FE	yes	yes	yes	yes
Adjusted R^2	0.200	0.207	0.170	0.360
Observations	29,819	23,232	6,587	11,711

Notes: the table presents estimates of the impact of a 1 bp contractionary shock on firms' bank loan expectations. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB's monetary policy shocks; answers of firms interviewed on the days of the shocks are discarded. In columns 1-3, the dependent variable is trichotomous and takes values 1, 0 or -1 if firms expect an improvement, no changes or a deterioration in bank loan availability over the next 6 months. In column 4 the dependent variable is a dummy that takes values 1 or 0 if the firm believes that the availability of bank loans will improve or deteriorate over the next 6 months. The monetary policy shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). The models are estimated using OLS. Standard errors (in parenthesis) are clustered at the firm level. Coefficients are multiplied by 100. * indicates significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level.

Table A6: Monetary policy and firms' bank loan expectations - pure versus CBI information shocks, additional results

	Dependent variable: firms' bank loan expectations									
	Trichot. (1)	Binary (2)	Trichot. (3)	Binary (4)	Trichot. (5)	Binary (6)	Trichot. (7)	Binary (8)	Trichot. (9)	Binary (10)
Restricted pure MP shock	-0.846**	-0.890**								
	(0.333)	(0.355)								
Restricted CB information shock			1.275	2.025*						
			(0.926)	(1.221)						
JK pure MP shock					-0.568***	-0.433***			-0.533***	-0.418***
					(0.141)	(0.147)			(0.150)	(0.159)
JK CB information shock							0.642**	0.471	0.179	0.0702
							(0.283)	(0.307)	(0.300)	(0.330)
Observations	13,748	5,508	16,070	6,196	29,819	11,711	29,819	11,711	29,819	11,711
Adjusted R^2	0.194	0.345	0.203	0.370	0.199	0.358	0.198	0.358	0.199	0.358

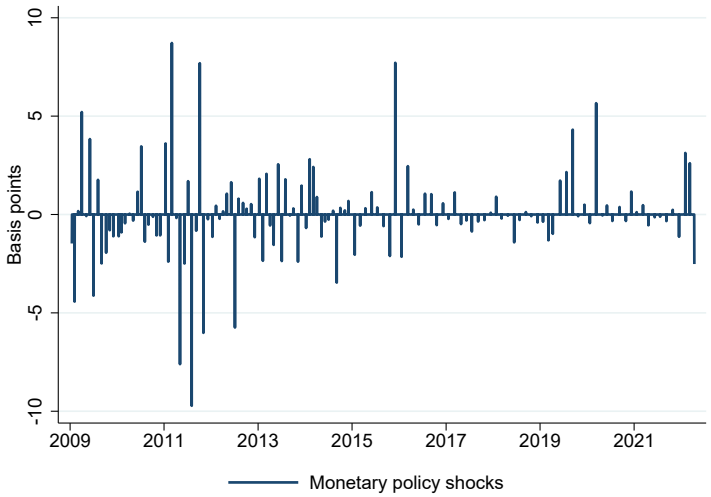
Notes: the table presents estimates of the impact of a 1 bp contractionary shock on firms' bank loan expectations. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB's monetary policy shocks; answers of firms interviewed on the days of the shocks are discarded. In odd columns the dependent variable is trichotomous and takes values 1, 0 or -1 if firms expect an improvement, no changes or a deterioration in bank loan availability over the next 6 months. In even columns the dependent variable is a dummy that takes values 1 or 0 if the firm believes that the availability of bank loans will improve or deteriorate over the next 6 months. In columns 1-4, the shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022 and then partitioned into pure monetary policy and CB information shocks by comparing their sign with the sign of the surprise in the euro area stock market index (EURO STOXX 50 Index) evaluated in the same short window around the ECB Governing Council's meetings. *Restricted pure MP shock* is equal to MP shock if the change in the EURO STOXX 50 Index has the opposite sign to the shocks, while all other shocks are discarded. *Restricted CB information shock* is equal to MP shock if the the change in the EURO STOXX 50 Index has the same sign to the shocks, while all other shocks are discarded. For the construction of *JK pure MP shock* and *JK CB information shock* we follow Jarociński and Karadi (2020) and disentangle pure monetary policy shocks from central bank information shocks comparing high-frequency data OIS rates and EURO STOXX 50 Index using a structural VAR identified via sign restrictions. Controls include all variables listed in Table A2. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). The models are estimated using OLS. Standard errors (in parenthesis) are clustered at the firm level. Coefficients are multiplied by 100. * indicates significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level.

Table A7: Monetary policy and firms' bank loan expectations - robustness checks

	Dependent variable: firms' bank loan expectations									
	4-day window		16-day window		Different standard error clustering					
	Trichot.	Binary	Trichot.	Binary	Trichot.	Binary	Trichot.	Binary	Trichot.	Binary
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MP shock	-0.872***	-0.863**	-0.669***	-0.471**	-0.784**	-0.702**	-0.784**	-0.702*	-0.784***	-0.702**
	(0.337)	(0.361)	(0.194)	(0.207)	(0.176)	(0.217)	(0.329)	(0.351)	(0.247)	(0.283)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country-Wave FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Sector-Wave FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	15,620	6,089	54,119	21,527	29,819	11,711	29,819	11,711	29,819	11,711
Adjusted R^2	0.198	0.358	0.194	0.345	0.198	0.357	0.198	0.357	0.199	0.358

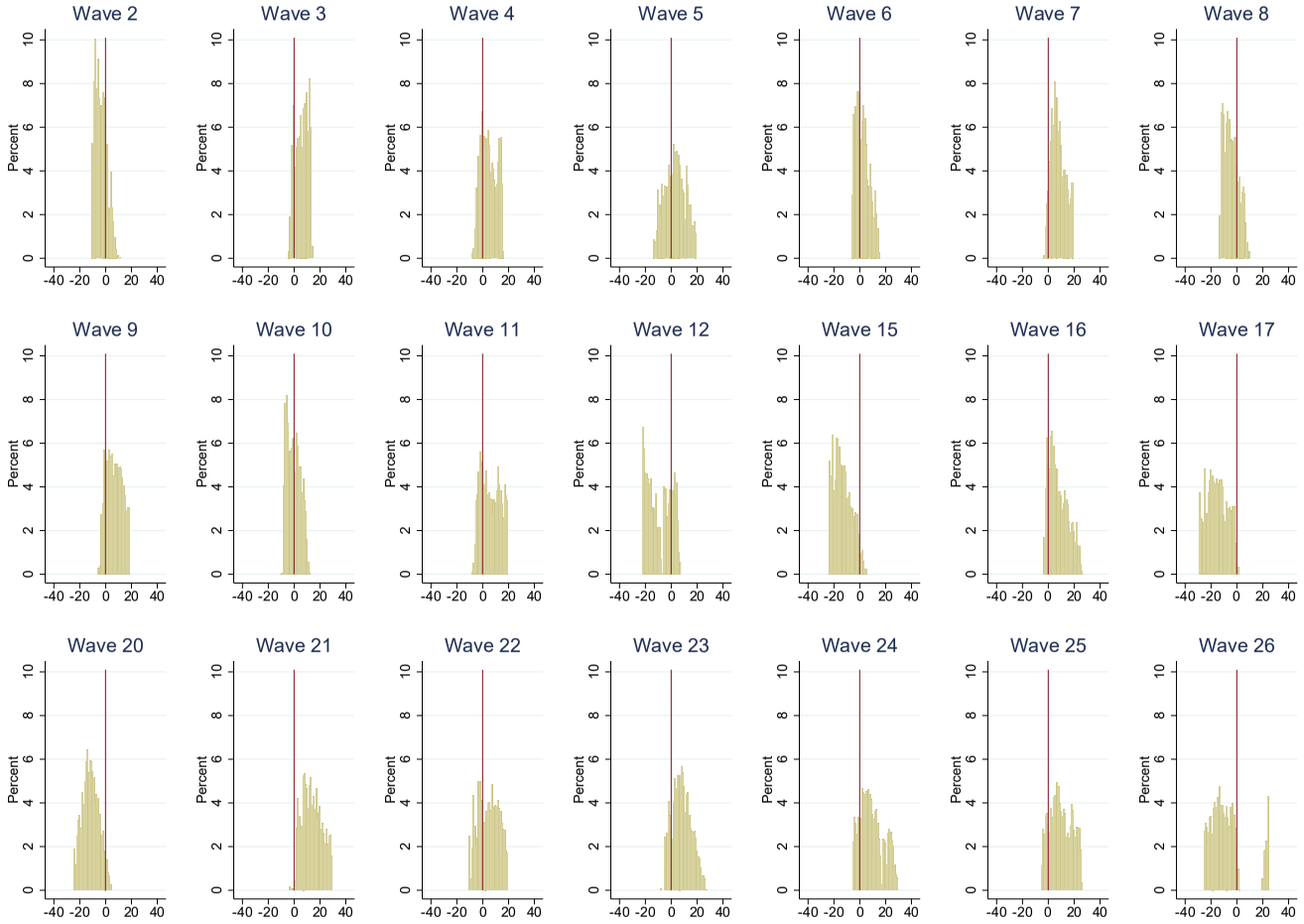
Notes: the table presents estimates of a 1 bp contractionary shock on firms' bank loan expectations. The sample includes the answers of firms that are interviewed in the 2 working days (columns 1 and 2), in the 8 working days (columns 3 and 4), and in the 4 working days (columns 5 and 10) before and after ECB's monetary policy shocks. Answers of firms interviewed on the days of the shocks are discarded. In columns 1,3,5,7, and 9 the dependent variable is trichotomous and takes values 1, 0 or -1 if firms expect an improvement, no changes or a deterioration in bank loan availability over the next 6 months. In columns 2,4,6,8, and 10 the dependent variable is a dummy that takes values 1 or 0 if the firm believes that the availability of bank loans will improve or deteriorate over the next 6 months. The monetary policy shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. Controls include all variables listed in Table A2. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). The models are estimated using OLS. Standard errors (in parenthesis) are clustered at the firm level (columns 1-4), at the country level (columns 5-6), at the sector level (columns 7-8), and at the country-sector level (columns 9-10). Coefficients are multiplied by 100. * indicates significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level.

Figure A1: Monetary policy shocks



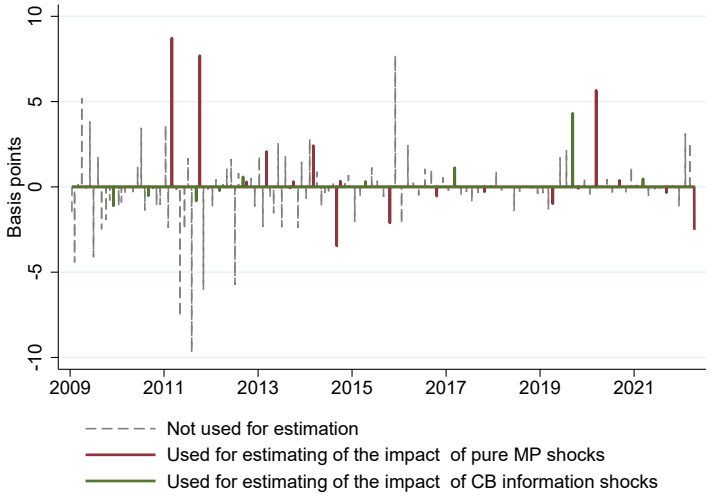
Notes: the shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022. The shocks are scaled to have unit impact on the 3-month OIS. Positive values correspond to contractionary shocks.

Figure A2: Distribution around the ECB's announcement day of the daily responses to the SAFE questionnaire by wave



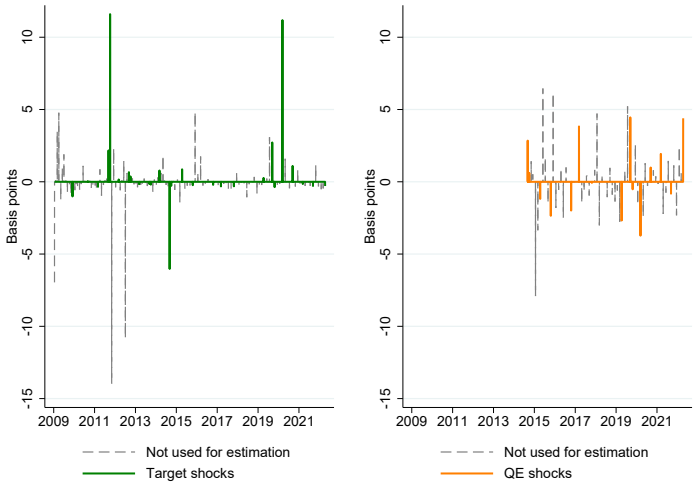
Notes: Distribution of daily responses of firms around ECB's monetary policy announcements by survey rounds. Sample period from 2009 to 2022 (from wave 1 to 26, excluding 14, 18 and 19). Source: ECB and European Commission SAFE.

Figure A3: Pure monetary policy and central bank information shocks



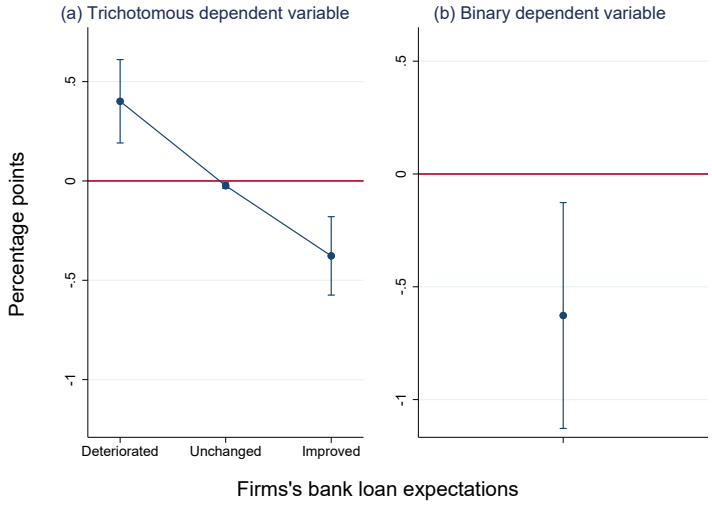
Notes: the shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022 and then partitioned into pure monetary policy and CB information shocks by comparing their sign with the sign of the surprise in the stock market index (EURO STOXX 50 Index) evaluated in the same short window around the corresponding ECB Governing Council's meeting. If the two signs diverge, the shock is classified as a pure monetary policy shock. If the two signs converge, the shock is classified as central bank information shock (for more details, see Section 3.3). The shocks are scaled to have unit impact on the 3-month OIS.

Figure A4: Target and QE shocks



Notes: the Target and QE shocks are provided by Altavilla et al. (2019). Positive values correspond to contractionary shocks.

Figure A5: Marginal impact of a 1 bp contractionary monetary policy shock on firms' bank loan expectations



Notes: the figure shows the marginal effect of a 1 basis point contractionary monetary policy shocks on firms' bank loan expectations. The estimation sample includes only the answers of firms that are interviewed in the 4 working days before and after ECB's monetary policy shocks; answers of firms interviewed on the days of the shocks are discarded. In panel (a) the dependent variable is trichotomous and takes values 1, 0 and -1 if firms expect an improvement, no changes or a deterioration in bank loan availability over the next 6 months and results are obtained from a Ordered Probit estimation. In panel (b) the dependent variable is a dummy that takes value 1/0 if the firm believes that the availability of bank loans will improve/deteriorate over the next 6 months and results are obtained from a Probit estimation. All regressions include all variables listed in Table A2, as well as country-wave and sector-wave fixed effects. The estimation period is from 2009 to 2022 (survey rounds 2 to 26, excluding 14, 18 and 19). Blue bands indicate 90% confidence bounds. Monetary policy shocks are constructed as the first principal component of the intra-daily change in seven OIS rates (1-,3-, 6-month and 1-, 2-, 5-, 10-year maturity) around scheduled ECB Governing Council's meetings from 3 January 2002 to 14 April 2022.

Acknowledgements

We thank Oscar Arce, Katarzyna Bankowska, Ursel Baumann, Joost Bats, Giacomo Carboni, Björn Fischer, Alessandro Graziola, Franziska Hünnekes, Christophe Kamps, Philip Lane, Wolfgang Lemke, the participants of an ECB workshop and the IFABS 2022 Conference and an anonymous referee for useful suggestions and comments on a previous version of the paper.
This paper contains the views of the authors and not necessarily those of the European Central Bank or the Eurosystem.

Annalisa Ferrando
European Central Bank, Frankfurt am Main, Germany; email: annalisa.ferrando@ecb.europa.eu

Caterina Forti Grazzini
European Central Bank, Frankfurt am Main, Germany; email: caterina.forti_grazzini@ecb.europa.eu

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

PDF ISBN 978-92-899-6123-3 ISSN 1725-2806 doi:10.2866/685511 QB-AR-23-075-EN-N