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Macro and micro of external finance premium and monetary policy transmission

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Abstract

We establish basic facts about the external finance premium. Tens of millions of individual loan contracts extended to euro area firms allow studying the determinants of the external finance premium at the country, bank, firm, and contract levels of disaggregation. At the country level, the variance in the premium is closely linked to sovereign spreads, which are important in understanding financial amplification mechanisms. However, country level differences only explain half of the total variance. The rest is predominantly attributed to variances at the bank and firm levels, which are influenced by the respective balance sheet characteristics. Studying the response of the external finance premium to monetary policy, we find that balance sheet vulnerabilities of banks and firms strengthen the transmission of policy measures to financing conditions. Moreover, our findings reveal an asymmetrical effect contingent upon the sign and type of the policies. Specifically, policy rate hikes and quantitative easing measures exert a more pronounced impact on lending spreads, further magnified through their repercussions on the external finance premium.

JEL Classification: E44, E58, F45, G15, G21.
Keywords: External finance premium, financial accelerator, euro area, loan pricing.

Non-technical summary

The external finance premium (EFP), which is the extra cost firms incur when borrowing compared to using their own cash, is an important determinant of business cycle fluctuations. It can amplify fluctuations in the business cycle and worsen recessions. We examine millions of loan contracts to answer two main questions: what factors affect the EFP for euro area firms, and how does monetary policy influence it? We find that banking relationships remain very local, with 96% of bank-firm pairs in lending relationships being in the same country. It is then not surprising that country level variance captures almost 50% of the total EFP variance. The remaining 50% is mostly explained by bank and firm level variance. Country level variance correlates substantially with sovereign spreads, justifying the importance attached to these spreads in thinking of financial amplification mechanisms. Factors linked to bank and firm fragility also matter. Less liquid and less capitalized banks as well as smaller, younger, and more indebted firms tend to face higher EFPs.

Concerning the second research question, we investigate how monetary policy is transmitted to real activity through banks and whether it generates financial amplification effects. By changing the policy rate or altering the composition of the central bank balance sheet, monetary authorities can affect loan supply through credit market frictions that give rise to an external finance premium. We find that the effects of monetary policy on the external finance premium vary by the sign of the surprise and the policy instrument employed, and act differently at the bank and firm levels.

Quantitative easing (QE) reduces the external finance premium at both bank and firm levels. This effect is driven by banks and firms that are less strong, consistent with the presence of bank lending and firm balance sheet channels that are sensitive to QE. Quantitative tightening (QT), instead, while effectively tightening lending conditions, leaves the EFP unchanged. We relate this asymmetry to the different modalities in which QE and QT have been announced and implemented so far. Specifically, as QT has been implemented at a slower and more predictable pace than QE, the associated financial effects have been very different. During the initial phase of their implementation, QT announcements have therefore left the EFP unchanged. However, deviation from this gradual unwinding of the central bank balance sheet could have significant effects on the lending conditions of firms and households. As a caveat, the results on QT are contingent on the limited empirical evidence accumulated so far and need to be reassessed in future research.

Our results show that policy rate decisions also have asymmetric effects. A rate hike is relatively more effective than a rate cut, as it also produces an amplification effect via the external finance premium. This effect originates from the loan pricing behavior of weaker banks, i.e. the less capitalized, less liquid and higher NPL credit institutions.

We also find significant complementarities between interest rate and balance sheet policies. When banks have less liquidity, they tend to respond more to increases in interest rates. It follows that as the central bank balance sheet continues to shrink, high(er) interest rates are more likely to generate financial amplification effects via the external finance premium.

1 Introduction

In policymaking and academic literature, the external finance premium (EFP) – the additional cost a firm incurs when raising external funds compared to the opportunity cost of holding cash – is recognized as a crucial determinant of business cycle fluctuations. The financial amplification mechanisms associated with the emergence of the external finance premium have the potential to amplify business cycle fluctuations and worsen the severity of recessionary episodes. This financial accelerator idea (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Bernanke, Gertler and Gilchrist, 1999) stems from the observation that business cycles are large and long-lasting, whereas shocks to the macroeconomy are usually small and temporary, indicating a strong amplification and propagation mechanism. A prime example is monetary policy, where changes in policy rates tend to be small but lead to large cyclical effects. The financial accelerator is a plausible endogenous amplification and propagation mechanism that operates through the external finance premium, facilitating the translation of small shocks into significant responses.

The extent to which country, bank, and firm characteristics contribute to the EFP is an empirical question that requires studying loan level information to answer. We undertake this study, analyzing tens of millions of loans to learn whether country level variance, the main object of interest in euro area heterogeneity, indeed captures the bulk of variance at the level of loans. We then move to successively more granular levels of analysis, studying how much of the residual (non-country level) variation is at the level of banks, then firms, then individual loan contracts. Bank loans are by far the largest source of external finance for euro area firms, making their analysis particularly important for policy purposes and creating ample data for research.

The analysis in this paper addresses two main research questions related to the external finance premium at different levels of aggregation. The first question concerns what factors the external finance premium paid by euro area firms is related to. The second question focuses on how monetary policy is transmitted to this premium.

Concerning the first question, the broad-brush finding is that country level variance accounts for about half of loan level variance. The other half is explained mostly by bank and firm level variance, with bank level variation explaining about a quarter of the total and firm level about 15%, and to a minor extent by contract specific variation. It is immediately clear that while variation at the country level, often the focus of policy attention, is an important source of EFP variation, it is only half of the story. Policymakers and researchers need to pay attention to more disaggregated data to keep tabs on financial conditions. We take a step in that direction by documenting this fact and asking what the drivers of country, bank, firm and contract level variation are when analyzing the salient properties of the EFP.

We find that the external finance premium moves countercyclically. Country-level variance correlates substantially with average sovereign spreads, justifying the importance attached to these in thinking of financial amplification mechanisms. Importantly, the relevant measure is the average euro area spread rather than countries' individual spreads, suggesting that general risk attitudes are the dominant source of country level variation. We find covariates that statistically significantly correlate with bank and firm level variation as well. These covariates are linked to bank and firm fragility. On the lender side, a higher EFP is associated with banks that are less capitalized, more exposed to riskier assets, and with lower liquid assets. On the borrower side, the EFP is higher for smaller, younger, more leveraged, and less profitable firms. It is worth noting that, unlike the country level variation that is almost fully explained by sovereign spreads, the bulk of the bank and firm level variation and essentially all of the contract level variation remains unexplained by a long list of covariates that we have explored. Future empirical work will need to focus on providing a more comprehensive understanding of EFP variation at these levels of disaggregation.

Concerning the second research question, we investigate how monetary policy is transmitted to real activity through banks and whether it generates financial amplification effects via the external finance premium. By changing the policy rate or altering the composition of the central bank balance sheet, monetary authorities can affect loan supply through credit market frictions that give rise to an external finance premium (e.g. Adrian and Liang, 2018). Disaggregated data allow studying the behavior of bank loan spreads in response to monetary policy surprises. We find that the effects of monetary policy on the external finance premium vary by the sign of the surprise and policy instruments employed, and acts differently at the bank and firm levels. Our results support the literature on asymmetric effects of monetary policy: a rate hike is relatively more effective than a rate cut as it also produces an amplification effect via the external finance premium.

In line with the bank lending channel, this effect arises from the loan pricing behavior of weaker banks—those that are less capitalized, less liquid, and have higher non-performing loan (NPL) ratios. Quantitative easing reduces the external finance premium at both bank and firm levels, again driven by weaker banks, but also by weaker firms, consistent with a firm balance sheet channel. Quantitative tightening, instead, while being fully passed-through to tighten lending conditions, leaves the EFP unchanged. We relate this asymmetry to the difference in the modalities in which QE and QT are announced and implemented (Altavilla, Rostagno and Schumacher, 2023), with the caveat that the QT sample is quite limited.

Our contribution on the first research question builds on a vast literature on the financial accelerator. At the core of this propagation mechanism is a failure of the celebrated Modigliani-Miller theorem, which posits the irrelevance of the composition of borrowers' internal and external sources of financing to real economic outcomes. The financial accelerator idea rests on imperfect financial markets, often due to information asymmetries, which make lender and borrower balance sheets consequential.[1]

The literature related to our second research question, i.e. the effects of monetary policy on the EFP, mostly concentrates on the conventional policy measures. Indeed,

[1] One main branch of this literature focuses on borrower characteristics, with firm net worth helping alleviate principal-agent problems as in the seminal works of Bernanke and Gertler (1989) and Kiyotaki and Moore (1997). Another branch focuses on the lenders, banks and their lending behavior, as a function of their balance sheets, as in Bernanke and Blinder (1992), Kashyap, Stein and Wilcox (1993), and Van den Heuvel (2008).

while there is abundant literature on the asymmetric effects of monetary policy over the policy cycle (Keynes, 1936; Cover, 1992; De Long and Summers, 1988; Ravn and Sola, 1996; Weise, 1999; Tenreyro and Thwaites, 2016), studies on the relative policy effectiveness across instruments are scant. In recent years, the experience of many central banks with non-standard monetary policy measures has stimulated researchers to look into whether policy accommodation can be obtained by sequentially or simultaneously using different policy instruments (Bernanke, 2020; Rostagno, Altavilla, Carboni, Lemke, Motto, Saint Guilhem and Yiangou, 2021; Sims and Wu, 2020; Weale and Wieladek, 2022). These studies have, in many cases, informed the reviews of monetary policy strategies recently undertaken by central banks. Nonetheless, very few papers have tried to compare the effectiveness of unconventional policy instruments during policy easing and tightening events. Wei (2022) and Crawley, Gagnon, Hebden and Trevino (2022) are two examples of this small set.

In applied work, the literature on external finance premium often uses bond premia as a measure of EFP as bond interest rates are readily available but bank lending rates are not observed (Gilchrist, Yankov and Zakrajsek, 2009; Gilchrist and Zakrajšek, 2012; Gilchrist and Mojon, 2018). By construction, this only relates to the select firms that are able to issue bonds. This limitation is particularly significant for the euro area where the majority of firm financing is intermediated via banks. We speak to this issue.

A well understood difficulty of studying the bank lending channel is distinguishing supply driven changes in loan amounts and rates from demand driven ones (Bernanke, Gertler and Gilchrist, 1996). This problem is compounded by country heterogeneity in the euro area, where the country spreads are often used as summary statistics of differences in financial conditions, without much empirical evidence on whether country level variation captures the bulk of loan level variation. We address this issue directly, using microdata, which allows us to distinguish between spreads that can be explained at the bank level from those that can be explained at the firm level, as well as the country level.

Microdata, although usually not as rich in either spatial or time series dimensions as ours, has been used to study determinants of loan rates before. A standard practice in the literature is to employ a rich variety of fixed effects when working with microdata. These range from country-time fixed effects to control for demand conditions in the older literature to the current state-of-the-art identification methods using either multiple lending relationships (Khwaja and Mian, 2008; Amiti and Weinstein, 2018) or industry-location-size (Degryse, De Jonghe, Jakovljević, Mulier and Schepens, 2019) variation to separate demand and supply dynamics.

Saturating the model with fixed effects (country-time, bank-time, and firm-time) of course mechanically increases the fit of regressions, but at the same time absorbs variation that contains useful information that would enhance our understanding of the drivers of the external finance premium. Those fixed effects are usually not reported, let alone analyzed, which leaves much of the variation in the EFP behind a veil. This is why our approach relies on using the granularity of the data to study macro and micro determinants of the external finance premium by sequentially extracting fixed effects that aggregate information at country, bank, firm, and contract levels. We are then able to ask how much variation is present at each step, how much of that variation we are able to relate to observable fundamentals, and how monetary policy is transmitted to each level.

Given the analysis it presents, this paper is best read as a fact-finding effort. We document the salient properties of the population of loan level external finance premium at various degrees of aggregation, showing that some key observations are readily understandable while others require further study. Variation at the country level is clearly important but also clearly by itself insufficient to summarize the behavior of EFP that firms face when they borrow. Study of microdata is necessary, as it offers fruitful information on the importance of bank and firm characteristics. This should provide guidance for further research on this key financial indicator both from the finance and macroeconomic policy perspectives, as a complete narrative clearly escapes us at this time. Similarly, we present evidence on the asymmetric effects of the policy target and QE surprises on the EFP. We discuss plausible mechanisms that may lead to these findings, paving the way for further studies on asymmetries of monetary policy transmission.

2 Decomposing the external finance premium

Our analysis primarily relies on the Anacredit database, a loan level database comprising all loans to firms in the euro area of at least €25,000. We consider the set of all new, unsecured loans to firms in the ten largest euro area economies [2] each month at the country level, issued by a bank in the euro area. These loans being uncollateralized implies they were not directly affected by various government guarantee mechanisms during the Covid crisis. The sample spans January 2019 to December 2023. This set contains about 36 million loans, together with information on a wide variety of loan level characteristics.

We match the loan data to Bureau van Dijk's Orbis database to obtain firm level controls and collect information on banks from various sources. The bank balance sheet information is from the proprietary ECB data on Individual Balance Sheet Items (IBSI), and capital ratios are from granular supervisory data. We obtain bank bond yields from the Centralised Securities Database (CSDB) and cross-check the micro evidence with macro evidence by using information on aggregate bank loan rate developments from IMIR (Individual Monetary Financial Institutions) interest rates.

The main characteristics of the variables employed in the empirical analysis are summarised in Table 1.

[Table 1 about here.]

To quantify the panel variation in our data, Figure 1 depicts the 5-95% variation in lending rate measures at different levels of aggregation (country, bank, firm, and contract). While the aggregate lending rates remained dormant up until 2022, the chart shows large variation in the distribution of underlying rates in the microdata, with in particular

[2] The ten countries are Austria, Belgium, Germany, Spain, Finland, France, Ireland, Italy, the Netherlands and Portugal. We restrict the analysis to these countries as to have at least 500 loans at the country level in each month of our sample. The remaining euro area countries frequently have significantly fewer observations. The ten countries cover 93% of both the number and the value of new loans in the euro area over our sample period.

the upper tail moving by 250 bps between early 2020 and mid-2021. We will see that these loans associated with weaker institutions play a crucial role in monetary policy transmission. The subsequent period is characterised by monetary policy tightening, with the increased policy rates progressively passing through to bank lending rates.

[Figure 1 about here.]

We are primarily interested in the spread, $y_{l,i,b,c,t}(\tau)$ of loan l, to firm i, provided by bank b, in country c, at time t, with maturity τ.[3] This is the measure of external finance premium for firms borrowing from banks, with the spread defined relative to a maturity-matched OIS rate. We sequentially decompose the EFP into increasingly granular components, starting with country-time, followed by bank-time and firm-time effects, and obtaining contract level effects as a residual. That is, we measure:

$$y_{l,i,b,c,t} = \mu_{c,t} + \epsilon_{l,i,b,c,t}, \tag{1}$$

$$\epsilon_{l,i,b,c,t} = \mu_{b,t} + \varepsilon_{l,i,b,c,t}, \tag{2}$$

$$\varepsilon_{l,i,b,c,t} = \mu_{i,t} + \upsilon_{l,i,b,c,t}. \tag{3}$$

The fixed effects at different levels of aggregation–$\mu_{c,t}$ for country×time, $\mu_{b,t}$ for bank×time, $\mu_{i,t}$ for firm×time and $\upsilon_{l,i,b,c,t}$ for contract×time–are estimated sequentially using weighted least squares where the weight of each observation is the amount of the loan. As a result, the fixed effects are effectively value-weighted indices of bank loan spreads at the relevant level.[4]

Country-time effects capture **48.5%** of the variation, hence the proverbial glass is indeed half full. On the one hand, country level variation is clearly the predominant determinant of loan level variation, accounting for half of the variation in the external finance

[3] c is the country of the firm receiving the loan but our results are invariant to assigning the country according to the location of the bank as an amazing 96% of bank-firm pairs are in the same country. This share is 84% when the loans are value weighted. Banking relationships remain very local.

[4] Equal-weighted regressions drastically overweight the impact of small loans. For instance, the smallest 90% of loans make up just 1.3% of the total loan market. Nonetheless, our main results are unchanged when we do the analysis with OLS rather than WLS.

premium by itself and justifying the policymaker emphasis on country heterogeneity. On the other hand, there is the other half.

We find that most of the other half is captured by bank and firm level effects, **23.8%** and **16.3%,** respectively, bringing the total variation attributable to time-varying country, bank and firm effects to 88.6%. The remaining **11.4%** is the residual contract level variation attributable to the same firm originating multiple loans in the same month.

The remainder of the paper will be analyzing what these country, bank, firm, and contract level components of the EFP are and how they react to monetary policy. But before turning to these, it is important to note that the sequence of fixed effect extraction is consequential for our analysis. The sequence has to be from the more aggregate to the more granular. If we began with loan level fixed effects these would have soaked up all of the variance. But, beginning with estimating the more aggregate fixed effects attributes possible covariances to these higher levels of aggregation.

For example, if firms of a particular type are working with a particular bank, that effect will show up at the bank level fixed effect. The effect will be estimated correctly at the level of the bank, but it will not be due to the bank itself, rather to its average borrower. Similarly, if a country has a particularly strong or weak banking system we will see that as a country effect. As a result, the amount of variation attributed to higher aggregation levels may be slightly higher compared to a situation where the fixed effects would be estimated jointly. At the same time, since the right-hand side variables in our specifications exclusively use measures associated with the relevant aggregation level, their explanatory power can be interpreted as a lower bound.

We do not follow the alternative method where all fixed effects would be estimated simultaneously in one step for two reasons. The first one is mechanical: there is not a computationally feasible way of estimating millions of fixed effects in a multiple regression. The second one is more substantive: in the sequential method we employ we know exactly where any covariances show up, that is always in the higher levels of aggregation. In the simultaneous way we would not be able to interpret the fixed effects as clearly.[5] With that in mind, we can begin analyzing what observable measures these fixed effects at various levels are related to.

2.1 Country level variation

We begin our exploration at the highest level of aggregation, the country-time fixed effect, $\mu_{c,t}$. Recall that, due to the WLS estimation, the country-time fixed effect is effectively a value-weighted average of our measure of external finance premium across countries and time, where the weights are the size of each loan. As a result, with some abuse of notation,

$$\mu_{c,t} = \frac{\sum_{l \in c,t} size_{l,i,b,c,t} y_{l,i,b,c,t}(\tau)}{\sum_{l \in c,t} size_{l,i,b,c,t}}. \tag{4}$$

Importantly, the resulting country-time bank loan spread is not only averaged over the firms and banks that are active in the country, but also represents a value-weighted average across potentially heterogeneous maturity structures in the country.

At the country-time level, we study sovereign spreads, real GDP growth, inflation and unemployment rates as potential covariates related to the fixed effects. For sovereign spreads, rather than choosing a specific maturity, we average over the same maturity distribution as the relevant buckets, although the results presented below are robust to either choosing the 2- or 10-year sovereign spread. We consider both a country-matched spread, as well as a euro area (EA) aggregate spread, which is the GDP-weighted average across all countries in the euro area.[6]

[5]While various implementations allow one to estimate a model with nearly ten million country-, bank- and firm-time fixed effects jointly, to the best of our knowledge these effects would have to be absorbed and that implementation does not allow us to subsequently retrieve the values of the fixed effects. But the fixed effects themselves are of primary importance for our analysis as these will be the dependent variables in what follows. The sequential estimator proposed here has the advantage that it is computationally trivial (as the estimates are means of the variables at the relevant level of aggregation for each month), easily replicable, and conceptually straightforward. In an attempt to compare the two methods at a level where the number of fixed effects are estimable, we estimate a specification where the fixed effects at firm- and bank-level are absorbed via differencing, while country-time fixed effects are explicitly estimated, resulting in a correlation of 98% between the sequential and jointly estimated country-time fixed effects.

[6]The ten countries in our sample represent 95% of euro-area GDP as of the end of 2023.

More specifically, the value-weighted sovereign spread and total loan size (for new loans that are the objects of our analysis) are computed as

$$SovSpread_{c,t} = \frac{\sum_{l \in c,t} size_{l,i,b,c,t} SovSpread_{c,t}(\tau)}{\sum_{l \in c,t} size_{l,i,b,c,t}} \quad (5)$$

$$SovSpread\ EA_{c,t} = \frac{\sum_{l \in c,t} size_{l,i,b,c,t} SovSpread\ EA_{t}(\tau)}{\sum_{l \in c,t} size_{l,i,b,c,t}} \quad (6)$$

$$size_{c,t} = \sum_{l \in c,t} size_{l,i,b,c,t}, \quad (7)$$

where the maturity of the sovereign spreads is matched to that of the respective loan.[7] A similar procedure is used for all country level variables included in the analysis. Subsequently we regress $\mu_{c,t}$ on these various country-time level indices, again with WLS, where the weights are the $size_{c,t}$ defined above.[8] The results are reported in Table 2.

[Table 2 about here.]

The specifications in columns 1 and 2 show the relative importance of local and euro area average sovereign spreads. Country spreads explain 48% of variation while EA average explains nearly 80%. Based on specification (2), the EFP is roughly 2.6 times larger than the sovereign spreads. Column 3 shows that there is no additional explanatory power of local spreads beyond the euro area one. This is a somewhat surprising finding that suggests a common factor in risk premia being captured by the euro area average sovereign spread. It is likely that the main driver here is global risk aversion as manifested in the EA average spread. This is also consistent with variance along the t dimension being significantly larger than variance along the c dimension, i.e., variance of the average country fixed effect being much larger than variance across countries. We will return to this below.

[7] As a result, despite SovSpreadEA not having a true country dimension, because of different maturity structures of the loan portfolios in each country the measure shows some variance. These differences due to maturity structures are negligible.

[8] Although these series are possibly non-stationary, tests in the style of Westerlund (2005) confirm the non-spurious nature of our regressions due to cointegration.

In column 4, we saturate the model with additional key macroeconomic variables to understand how the country level component of EFP varies across the business cycle. The estimates here clearly show that the EFP is countercyclical: periods of lower GDP and higher unemployment rates are associated with higher EFP. These effects are statistically significant although the improvement in the R^2 is small. But note that the euro area average sovereign spread is not orthogonal to macroeconomic variables, hence we are not measuring marginal R^2s.

On that note, while we are studying the comovements between the EFP and macroeconomic variables, we are not conditioning on exogenous variance, hence causal claims would not be strongly grounded. Lastly, note that unlike GDP or inflation, sovereign spreads are not more "fundamental" than the EFP. That is, the sovereign spread is an asset price like the EFP and while learning that the average sovereign spread is highly correlated with the country level average of the external finance premium of bank loans is important for the literature and for policy purposes, this does not by itself relate the premium to macroeconomic fundamentals.

Based on microdata, but at the macro level, we find that the aggregate spreads are most relevant for large firms (Table 3), which are likely to operate in multiple countries, and for loans of short maturity, where idiosyncratic term/risk premia are less likely to drive spreads (Table 4). The tables clearly show that for small firms and for loan contracts of long maturity, the relevant spread is indeed the one belonging to the country where the firm operates. The visible monotonic changes in the weights of euro area and local sovereign spreads in these two tables are also verified statistically using a Patton and Timmermann (2010) monotonicity test.[9]

The relevance of firm size, which also proxies for (inverse) fragility, is a recurring theme. Small and large firms are not alike and a lot of financial variation, including responsiveness to monetary policy, is more pronounced for more fragile firms that are

[9] In Table 4, separating explicitly by maturity, as we do, provides a cleaner delineation but using deciles (which correspond to different maturities at different times, unlike for size where deciles are fairly time invariant) gives similar answers.

often the smaller firms. In the maturity dimension, the euro area average spread always matters but for longer-maturity loans local spreads also matter. In the size dimension, the euro area spread matters for country-time effects estimated for all deciles but the smallest, while local spreads also matter for the smaller half of the firms while having no effect on the larger half.

[Table 3 about here.]

[Table 4 about here.]

Country level data are easier to come by and are well studied. Hence, it is easier (compared to more disaggregated data) to do robustness checks and compare the results to well known stylized facts. We briefly report results here, relegating the statistical output to appendix tables.

First, we find that the result is not driven by country level idiosyncracies during Covid. Table A1 excludes 2020 as a whole, and results are the same. Second, we find that the irrelevance of the country spreads is not driven by the fact that the appropriate country match is the bank origination country. When estimating the results on a subset where bank-country is the same as firm-country, the result is even stronger (Table A2). The result is also not driven by our short T-dimension. In a macro sample (using aggregate data directly, without building it up from micro loan data) from April 2005 to December 2023 we find similar results (Table A3). This also verifies the bottom-up construction of the country level effects from individual loan data in this study.

2.2 Bank level variation

In order to understand bank-time variation (that is orthogonal to country level variation) in the EFP we focus on two sets of bank level characteristics: balance sheet data and funding costs. The euro area has well over 5,000 active banks in our sample, for most of which we have balance sheet and supervisory data. The coverage of bank funding costs is more sparse however (recall Table 1).

Table 5 reports the results of our effort to relate bank level EFP variance to bank related factors. Column 1 starts with the three standard summary statistics of bank balance sheet characteristics: size, capital, and liquidity. Column 2 augments the specification with the exposure to risky assets as well as the loan loss provisions. Columns 3 and 4 instead concentrate on the costs of the various funding sources. Column 5 reports the result of a specification where all the variables used to characterise bank balance sheets and funding costs are jointly included.

[Table 5 about here.]

Clearly, higher EFP is associated with weaker banks. Less capitalised banks, or banks more exposed to riskier assets, those with lower liquid assets, and higher funding costs tend to offer worse conditions to their clients, therefore amplifying the effects of the EFP. For instance, based on specification (2), the difference between the 95% and 5% quantiles of Tier 1 Capital implies an almost 100 bps increase in the EFP for loans issued by the less capitalized banks. Note that unlike other variables in this table, the interbank rate is common to all banks and effectively captures average time variance. The procyclicality of the interbank rate–closely tied to policy target rates–and the countercyclicality of EFP are evident here as well.

These results tell a bank lending channel story. Remember that while bank level EFP may also be indicative of the average firm borrowing from that particular bank, the covariates we employ (with the exception of the interbank rate) are bank specific and show the relationship between bank balance sheets and funding costs with the EFP charged by that bank. That relationship clearly indicates banks with weaker balance sheet positions and banks with higher funding costs charge higher loan rates. That is the essence of the bank lending channel, for which we find strong evidence in the case of the euro area banks.

The finding that larger banks charge higher loan rates is also interesting and may speak to banks' market power. This is also in line with the extensive literature on the effect of bank competition on the cost of credit (Beck, Demirgüç-Kunt and Maksimovic, 2004; Cetorelli and Strahan, 2006; Degryse and Ongena, 2007; Fungacova, Shamshur and Weill, 2017). Like many other results in this paper, we present the findings, suggest interpretations worth studying, and leave pursuing these for future work that our results will hopefully foster.

Before turning to firm level effects, it is instructive to note that while we find covariates that have statistically strong relationships with bank-time effects, the R^2s of these regressions are quite low. This signals how little of the bank level loan rate behavior is easily explainable.

2.3 Firm level variation

We now move to the determinants of the firm-time variation, $\mu_{i,t}$. Recall that this is the EFP average within a firm at a particular month after country-time and bank-time effects are taken out. We will relate $\mu_{i,t}$ to firm characteristics, some of which require detailed balance sheet information, limiting the sample.

Table 6 reports the estimation results. Column 1 explores the role of three standard indicators of firm creditworthiness: size, age, and leverage. For the definition of firm size we use the Eurostat definition based on number of employees (micro: less than 10, small: 10 to 49, medium: 50 to 249, and large: 250 and above). Column 2 adds information on probability of default and firm profitability, where EBIT/Assets measures the firm's earnings before interest and tax as a share of the firm's total assets. Columns 3 and 4 show the results for specifications with a more comprehensive set of indicators of firm balance sheets (sales and net income), as well as size.

Using the parameter estimates from specification (4), the 5 to 95 quantile range of leverage implies high leverage firms have a 90 bps higher EFP, while the distribution of probability of default implies a 20 bps differential. The difference between an old (50 years) and young (5 years) firm is associated with an increase in EFP of about 30 bps.

[Table 6 about here.]

Similar to our analysis of bank-time effects, the results here point to borrower balance sheet fragility as a source of external finance premium. This is a clear balance sheet mechanism, which creates a financial accelerator. Smaller, younger, more leveraged, and less profitable firms tend to pay a higher premium when borrowing from banks. This result is even more remarkable than that for banks as the sequence of fixed effect extraction attributes all bank-firm covariance to banks. Even then, there clearly is a role for firm level drivers of EFP.

Being able to capture the firm-time effects (about 16% of total EFP variation) and relate these to firm level indicators is useful and provides evidence supporting the financial accelerator channel. At the same time, it is instructive to note that these covariates, although statistically significant, explain only a fifth of the variation in firm-time effects. Further, some of this fit is due to the inclusion of probability of default, itself a financial price, as an independent variable. Hence, there remains much to learn about which firm characteristics give rise to the firm level EFP.

2.4 Contract level variation

The most granular level of aggregation we have in the data is at the individual contract level. Indeed, all of the analysis we do is with this information, aggregated up as needed. After controlling for country, bank, and firm level effects, the residual variation in EFP is due to the individual contracts. Note that for a firm borrowing only once in a given month (frequency of the data we use), idiosyncratic effects would be captured by the firm-time fixed effects. Hence, the contract level variation arises only for firms borrowing multiple times at different rates in the same month.

We use the obvious contract characteristics of maturity and loan size as possible co-variates that may be related to the external finance premium. Table 7 shows that while both size and maturity statistically affect EFP, they collectively explain a negligible share of the remaining variance. This "nothing to see here" result is unsatisfactory, suggesting that there are other contract level characteristics, such as loan covenants, that affect the

EFP and need further study.[10] Of course, the fact that different loan covenants will be associated with different loan rates is not surprising. But the fact that the same firm, in the same month, chooses or is forced to borrow with different covenants is interesting and worthy of closer scrutiny.

[Table 7 about here.]

3 Monetary policy transmission to the EFP

In this section we focus on how monetary policy influences the external finance premium of euro area firms.

We are interested in two main issues. First, the effect of monetary policy on firm financing conditions via the external finance premium. Second, whether such effects differ between negative and positive monetary policy surprises, as well as policy rate and balance sheet surprises. The balance sheet measures considered here are policies aiming at increasing (quantitative easing, QE) or reducing (quantitative tightening, QT) the central bank's asset portfolio. These issues are of paramount relevance for both researchers and policymakers as they relate to the effectiveness of central banks in pursuing their mandate using different policy instruments to ease and tighten.

There are several reasons to believe that these asymmetries can exist across policy instruments and policy cycles. First, the "traditional Keynesian asymmetry" (Keynes, 1936) that has been investigated in many empirical studies (Cover, 1992; De Long and Summers, 1988; Ravn and Sola, 1996; Weise, 1999; Tenreyro and Thwaites, 2016) indicates that monetary policy tightening shocks have larger real effects than easing shocks. Second, the relative effectiveness of alternative instruments can depend on the macroeconomic conditions prevailing at the time of announcement and implementation of these policies. Monetary policy measures taken in conditions of financial distress might have different

[10] These contract level determinants, likely loan covenants, would be correlated with size and maturity, creating a clear omitted variables bias. Hence, we do not go into the interpretation of the results beyond noting the lack of explanatory power. Note again that these are unsecured loans so covenants would not be about explicit collateral.

effects compared to when macroeconomic conditions are calmer (Beckmann, Fiedler, Gern, Kooths, Quast and Wolters, 2020; Rostagno et al., 2021). Third, the strength of the policy transmission channels are likely to depend on the current and expected stance of monetary policy.

Monetary policy transmission within the euro area countries, at the levels of banks and firms, is under-studied and our data allows us to shed light on this question. We estimate local projections (Jordà, 2005) of cumulative changes in the external finance premium at various levels of aggregation on high-frequency identified ECB monetary policy surprises of Altavilla, Brugnolini, Gürkaynak, Motto and Ragusa (2019). These monetary policy surprises (MPS) are rotations of factors extracted from overnight indexed swap (OIS) rate changes in a narrow window around the policy announcement, rotated to admit interpretations of market-perceived surprises in the policy rate Target, Forward Guidance, and QE. The local projection we estimate is:

$$\mu_{k,t+h} - \mu_{k,t-1} = c_{k,h} + \gamma_{k,h}\text{MPS}_t + e_{k,t+h}, \quad h = 0, ..., 5 \text{ and } k \in \{b, i\}. \tag{8}$$

The sign of the QE surprise is flipped so that larger surprises are larger easings. Country level reactions to monetary policy surprises are relegated to the appendix as these are essentially the reactions of the average sovereign spread to monetary policy surprises, which are already well studied and do not show interesting action in our sample. Forward guidance surprises in this period are also small - in line with the explicit decision of the ECB Governing Council not to provide guidance - hence do not generate identifying variation and the limited EFP reaction to these are similarly relegated to the Appendix.

It is important to interpret the response of the EFP to monetary policy remembering that even when we are analyzing the bank level aggregate, the underlying object is the interest rate on a loan extended by a bank to a firm. Changes of EFP at the bank level indicate changes of loan rates over the risk free (OIS) rate for loans extended by a bank to its average borrowing firm. This may be due to changes in the bank borrowing costs, bank regulatory constraints, bank lending appetite, or changes in the state of the average borrower of that bank. These would all appear at the bank level. On the other hand, firm level effects must be due to firm level factors as common movements are already attributed to country and bank level effects. We therefore argue that changes in the EFP at the bank-time level may be related to the "bank lending channel" of monetary policy, while changes at the firm-time level, beyond those captured at the bank level, must be interpreted as stemming from the "firm balance sheet channel" of monetary policy.

3.1 Bank and firm level monetary policy transmission

In Figure 2 we show the cumulative local projections with 95% confidence bands. Recall that we are looking at the response of the EFP. Hence, a null response indicates exact pass-through of the policy rate to the loan rate at the relevant level of aggregation, and consequently does not imply ineffectiveness of the monetary policy instrument. We find that both policy rate tightening and QE surprises are amplified at the bank level and the QE surprise is further amplified at the firm level.[11] Specifically, a one standard deviation Target surprise (equal to 8 bps) results in a 10 bps increase in the EFP, peaking around three to five months. Moving to balance sheet measures, a one standard deviation QE surprise (equal to €500 bn) results in a 20 bps decrease in the EFP, distributed roughly equally between bank and firm levels.

[Figure 2 about here.]

Figure 3 shows these effects allowing for asymmetric cumulative responses of the external finance premium to easing and tightening surprises. In a tightening environment, the impact of policy rate decisions is amplified through their effect on the EFP. This amplification is mostly visible at bank level and is not present for QT measures. In an easing environment, the EFP significantly decreases following a QE surprise. More specifically, QE measures are able to narrow the EFP at both the bank and firm levels. This amplification is not present for policy rate easing measures. QE influencing the EFP at the firm level beyond the decrease observed at the bank level suggests a stronger firm

[11]The Appendix shows that, as expected, very little happens in response to forward guidance surprises due to the dearth of such surprises in this sample.

balance sheet channel where more fragile firms are helped by a reduction in their EFP. Similar to our results, QE has been shown to have significantly shrunk risk premia for especially less creditworthy borrowers in the bond market (Todorov, 2020).

[Figure 3 about here.]

These results on the asymmetry of monetary policy pass-through to EFP can be understood in light of recent studies on the effectiveness of different policy measures. For interest rate policies, the more contained ability of rate cuts to influence the EFP can be due to the limited policy space available when approaching the effective lower bound, which represents a binding constraint only for rate cuts and not for rate hikes (e.g. Ulate, 2021). This is also connected to the marginal policy instrument becoming QE during periods of very low interest rates, such as ELB episodes.

For balance sheet measures, the relevance and strength of the transmission to the EFP might instead depend on the different communication and modalities of central bank interventions when buying or selling assets. First, the signalling channel of QE, whereby when policy rates approach zero, central banks may signal their intention to maintain an accommodative stance for an extended period of time by buying assets (Bauer and Rudebusch, 2014; Altavilla, Carboni and Motto, 2021), does not naturally apply to QT, which does not offer similar interest rate guidance. Second, the economic environment at the time of the announcement and implementation of QE and QT differs significantly. While QE is typically announced in periods of financial distress (Kuttner, 2018; Jannsen, Potjagailo and Wolters, 2019), QT is implemented during calmer periods when bank and firm balance sheets are less subject to financial constraints.

Third, the implementation modalities of QT and QE are different. As QT is generally implemented at a slower and more predictable pace than QE, the financial effects of QE and QT might be very different. The gradual reversal of the asset purchases contrasts with the manner in which central banks in many countries–including the euro area, US, and UK–have announced and implemented QE. In the case of QE, the expansion of the central bank balance sheet typically happened through the announcement of a large "envelope." This strategy gave rise to sizeable "stock effects" linked to financial market response due to changes in the expected withdrawals of supply of publicly available debt. Moreover, QE policies have been typically implemented through high monthly asset purchases, therefore generating additional "flow effects"–linked to the reaction of asset prices associated with ongoing asset purchase operations. During QT, both stock and flow effects were more muted as unlike QE, which increases liquidity, QT, which decreases it, is designed to be as unsurprising and gentle as possible (Smith and Valcarcel, 2023; D'Amico and King, 2013).

While all three of these channels are likely valid, only the last one is relevant for our results on asymmetry. The first two channels have to do with QE and QT "periods" rather than "surprises." In our event study framework, many of the QT surprises take place in the QE period, manifesting themselves as lower (in absolute value) than expected QE announcements. Hence, explanations based on policy cycle differences do not apply to our results directly. But the third point, that QE envelopes arrive with a loud bang and that there is no equivalent of this for QT is very relevant. We directly test the implication that QE envelope announcements are special and lead to asymmetries in financial market responses.

Empirically, we use a difference-in-difference approach, in which we evaluate the changes of the EFP over months with QE envelope announcements relative to changes in all other months.[12]

Figure 4 shows the relative developments of the EFP around QE envelope announcement months with base month $t-1$ at bank and firm level, along with 95% confidence bounds, based on standard errors clustered at the bank- and firm-time levels. Neither panel shows evidence against common developments before the QE envelope announcement, but both do show a significant decline in the EFP following the envelope announce-

[12]In our sample period, the ECB announced and recalibrated quantitative easing packages of various sizes under the asset purchase programmes (APP) and pandemic emergency purchase programme (PEPP) on September 2019, and March, April, June and December of 2020. All other months are non-QE envelope announcement months.

ment, reducing lending rates above and beyond the developments in the risk-free curve.

[Figure 4 about here.]

The results suggest that the amplification effects associated with QT can depend substantially on the actual implementation modalities with which the central bank shrinks its balance sheet. The strategy followed by the ECB to avoid a fast and sizable reversal of the assets accumulated with the QE programs, and in particular avoiding surprisingly large QT announcements that would be similar to QE envelope announcements in the tightening direction, have reduced amplification effects. However, deviation from this gradual and expected path of central bank balance sheet normalisation could have significant consequences on lending conditions of firms and households (Altavilla et al., 2023) and financial markets (Du, Forbes and Luzzetti, 2024). Overall, our results support the findings that while the financial and macroeconomic effects associated with QE seem to be particularly strong and make a fine substitute for interest rate policy (Sims and Wu, 2020; Weale and Wieladek, 2022), the substitutability between QT and rate hikes seems to be lower (Wei, 2022; Crawley et al., 2022).

3.2 Bank lending and firm balance sheet channels

Finally, in order to corroborate the link between the bank and firm level responses to the bank lending and firm balance sheet channels respectively, we use the cross-section to evaluate whether characteristics of banks and firms may influence the strength of the policy transmission. We consider a set of characteristics (X_t) pertaining to each of the channels, which we have already identified as being relevant for the external finance premium at various levels of aggregation. We estimate equations of the form:

$$\mu_{k,t+h} - \mu_{k,t-1} = c_k + \beta_k(\text{MPS}_t \times X_{k,t}) + \gamma_k \text{MPS}_t + \delta_k X_{k,t} + e_{k,t+3}, \quad k \in \{b, i\}. \tag{9}$$

For brevity we only report local projection estimates for 3-months ahead changes, $h = 3$. For each characteristic, we flipped the signs as necessary for interpretation, such that a positive (negative for QE) β coefficient arises when monetary policy transmission leads to larger increases in spreads.

The results are summarized in Table 8. The top panel shows that, consistent with the bank lending channel, transmission of policy rate tightening surprises and QE easing surprises are amplified for banks with higher funding costs, weaker regulatory balance sheet positions, less liquid assets, and high funding costs. At the same time the bottom panel shows that, consistent with the firm balance sheet channel, the EFP is reduced more strongly for fragile firms, as measured by size, age, leverage and profitability.

There are two very important implications of these findings. The first is that QE has not only helped narrow sovereign spreads but also the external finance premium on loans taken by more fragile firms. The second is that, as banks with less liquid assets respond more to policy rate tightening, and as QT by definition lowers the liquidity in the system, QT and rate hikes will interact. In particular, as the ECB continues to shrink its balance sheet, its interest rate increases are more likely to generate financial amplification effects via the external finance premium.

[Table 8 about here.]

4 Conclusion

The external finance premium behaves differently at various levels of aggregation. Using tens of millions of individual loan contracts matched with the characteristics of individual banks and firms involved in these transactions, we measure the external finance premium at the bank loan level and decompose it into country, bank, firm, and contract level components. Two salient features are the inadequacy of country-level spreads as summary statistics and the differential behavior of the external finance premium when more fragile banks and firms are transacting. Our ability to study the external finance premiums that firms pay when borrowing from banks using granular data has allowed us to observe actions below the level of sovereigns, at the bank and firm levels, which can partially be related to balance sheets, and at the residual level of contracts, which defies classification. A deeper understanding of these aspects will be key to building better theories and formulating better policies.

In causal analysis, we find that monetary policy affects the external finance premiums firms pay to borrow from banks. Policy rate and QE surprises both elicit responses from the EFP. This is an important amplification mechanism of monetary policy transmission. There are asymmetries in this transmission, with policy rate tightening (but not easing) and quantitative easing (but not tightening) being amplified by changes in the EFP. It is again the more fragile banks and firms that are particularly affected, signaling the effectiveness of QE in alleviating funding problems at a very micro level. The asymmetric effects are likely driven by the substantially different communication and operational modalities of these policy measures.

In the *Introduction*, we promised a "fact-finding effort." The facts we presented on the external finance premium are of first-order importance for understanding banking relationships, how loan pricing differs across countries, banks, and firms, and how these are affected by monetary policy. The next steps will be to better understand causal mechanisms, learn the determinants of factors below the country level, and use these insights in policy design.

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Table 1: Descriptive Statistics

	Mean	StDev	p(5)	p(95)	N
$\mu_{c,t}$	27.33	107.74	-135.25	197.44	600
Sov. spread	-30.75	36.27	-89.06	23.61	600
Sov. spread EA	-43.26	37.59	-98.14	14.50	600
GDP growth	0.00	0.40	-0.45	0.67	600
Inflation	5.02	3.49	0.10	10.72	600
Unemployment rate	5.82	2.59	2.95	10.13	600
$\mu_{b,t}$	-0.75	63.61	-78.43	84.31	155,709
Log(Total assets)	13.02	1.25	10.87	14.71	132,135
Log(Risk weighted assets)	11.93	1.20	9.73	13.48	129,726
Log(Loan loss reserves)	7.19	1.51	4.52	9.12	130,448
Log(Tier 1 capital)	10.14	1.11	8.17	11.55	131,731
Log(Liquid assets)	9.08	1.50	6.77	11.74	59,281
Bond yield	2.31	1.26	0.19	4.07	63,866
Deposit rate	0.34	0.58	-0.22	2.11	21,275
Interbank rate	1.38	1.76	-0.58	3.90	155,962
$\mu_{i,t}$	0.83	53.23	-46.23	82.64	9,277,623
Log(Total assets)	21.40	2.69	16.63	25.47	4,128,340
Log(Firm age)	3.49	0.86	1.83	4.66	4,130,485
Leverage	0.65	0.20	0.29	0.94	4,118,304
EBIT / Assets	0.03	0.07	-0.03	0.12	4,014,965
Sales / Assets	0.76	4.69	0.00	2.67	4,128,340
Net income / Sales	0.16	0.39	-0.15	1.03	3,957,098
Probability of Default	0.28	0.98	0.01	1.70	5,159,493
$v_{l,i,b,c,t}$	0.00	51.78	-59.85	67.54	35,919,600
Log(Loan Size)	21.47	3.60	15.00	25.71	35,919,600
Original Maturity	1.92	2.46	0.08	7.84	35,919,600
Target shock	0.27	1.00	-0.80	2.17	40
QE shock	0.07	1.00	-1.17	2.21	40
FG shock	-0.05	1.00	-1.59	1.90	40

Note: The mean and standard deviation of all but the monetary policy shocks are loan-size weighted. p(5) and p(95) represent the 5 and 95% quantiles of the distribution.

Table 2: External finance premium at country-time level

	(1)	(2)	(3)	(4)
Sov. spread	2.051***		0.166	0.215
	(0.477)		(0.187)	(0.200)
Sov. spread EA		2.558***	2.439***	2.068***
		(0.176)	(0.209)	(0.280)
GDP growth				-12.051***
				(3.167)
Inflation				0.303
				(3.467)
Unemployment rate				4.063**
				(2.303)
Constant	90.40***	138.0***	137.9***	162.1**
	(17.98)	(8.615)	(8.670)	(18.54)
Observations	600	600	600	600
Adjusted R2	0.476	0.796	0.797	0.812

Note: WLS estimates of country-time fixed effects of external finance premium on various macroeconomic variables. Each observation is weighted by the aggregate loan size at the country-time level. Standard errors clustered at country and time level. * p<0.1, ** p<0.05, *** p<0.01.

Table 3: Country-time level: Role of Size

	Size Decile									
	Largest	9	8	7	6	5	4	3	2	Smallest
Sov. spread	-0.139	0.00359	-0.0328	0.0235	-0.0172	0.316*	0.451**	1.179**	0.517**	1.219***
	(0.122)	(0.124)	(0.0882)	(0.101)	(0.121)	(0.160)	(0.195)	(0.486)	(0.197)	(0.329)
Sov. spread EA	2.428***	2.026***	1.977***	1.558***	1.918***	2.133***	1.754***	1.670***	1.447***	0.551
	(0.156)	(0.303)	(0.153)	(0.0643)	(0.282)	(0.192)	(0.124)	(0.411)	(0.256)	(0.635)
Constant	128.2***	149.7***	162.5***	167.9***	183.6***	180.3***	179.9***	180.2***	206.7***	209.6***
	(8.485)	(5.245)	(2.752)	(5.967)	(4.241)	(3.384)	(6.958)	(9.717)	(13.52)	(21.81)
Observations	600	600	600	600	600	600	600	600	600	600
Adjusted R2	0.706	0.609	0.550	0.430	0.325	0.614	0.586	0.372	0.357	0.267

Note: Loan level observations are attributed to firm size (Orbis) deciles by country and time. We subsequently compute value-weighted country-time-size loan and sovereign spreads as in Equations (4)-(7). The table provides WLS estimates of country-time bank loan spreads on sovereign spreads. Each observation is weighted by the aggregated loan size at the country-time level. Standard errors clustered at country and time level. * p<0.1, ** p<0.05, *** p<0.01.

Table 4: Country-time level: Role of Maturity

	Maturity in years									
	1	2	3	4	5	6	7	8	9	≥10
Sov. spread	-0.447	-0.407	-0.250	-0.145	0.0949	0.209*	0.247**	0.352***	0.390***	0.0170
	(0.284)	(0.233)	(0.138)	(0.131)	(0.114)	(0.128)	(0.130)	(0.122)	(0.0528)	(0.187)
Sov. spread EA	2.721***	2.508***	2.477***	2.058***	1.969***	1.430***	1.600***	1.673***	1.738***	1.852***
	(0.384)	(0.303)	(0.175)	(0.208)	(0.196)	(0.152)	(0.273)	(0.294)	(0.295)	(0.434)
Constant	142.0***	169.6***	174.9***	157.6***	138.8***	147.7***	167.2***	104.0***	95.96***	34.98***
	(15.09)	(10.23)	(9.242)	(7.455)	(10.86)	(11.18)	(6.926)	(9.504)	(4.012)	(5.422)
Observations	600	600	600	600	600	600	600	600	600	600
Adjusted R2	0.782	0.603	0.586	0.430	0.438	0.262	0.220	0.346	0.215	0.327

Note: We compute value-weighted country-time-maturity loan and sovereign spreads as in Equations (4)-(7). The table provides WLS estimates of country-time bank loan spreads on sovereign spreads. Each observation is weighted by the aggregated loan size at the country-time level. Standard errors clustered at country and time level. * p<0.1, ** p<0.05, *** p<0.01.

Table 5: Bank-time level

	Bank balance sheet		Bank funding costs		Joint	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Total assets)	17.69***	18.86**			27.30***	32.17***
	(5.885)	(7.101)			(8.478)	(9.698)
Log(Tier 1 capital)	-15.60***	-28.41***			-28.03***	-25.41**
	(5.793)	(7.439)			(8.185)	(13.43)
Log(Liquid assets)	-23.66***	-26.08***			-35.98***	-37.63***
	(3.801)	(3.980)			(4.767)	(7.191)
Log(Risk weighted assets)		13.36*			16.06**	15.487
		(6.898)			(6.990)	(11.23)
Log(Loan loss reserves)		-1.684			-1.211	0.874
		(1.396)			(1.605)	(1.773)
Deposit rate				14.76***		11.69***
				(3.072)		(3.386)
Bond yield			0.779	0.367	1.988*	2.829**
			(1.021)	(1.454)	(1.056)	(1.339)
Interbank rate			-1.849***	-4.869***	-2.806***	-6.392***
			(0.654)	(1.182)	(0.762)	(1.348)
Constant	-66.14***	-98.07***	-0.601	-1.177	-127.1***	-98.78**
	(18.45)	(22.21)	(1.621)	(2.270)	(28.85)	(37.66)
Observations	131,169	127,858	63,841	19,093	60,442	18,756
Adjusted R2	0.0117	0.0154	0.00176	0.0209	0.0243	0.0468

Note: WLS estimates of bank-time bank loan spreads on bank fundamentals and financing costs. Each observation is weighted by the aggregated loan size at the bank-time level. Standard errors clustered by both bank and time. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table 6: Firm-time level

	(1)	(2)	(3)	(4)
Log(Total assets)	-27.21***	-21.89***	-23.58***	
	(1.361)	(1.092)	(1.169)	
Medium firms (Rel. to large)				3.520*
				(1.990)
Small firms (Rel. to large)				39.59***
				(2.716)
Micro firms (Rel. to large)				105.2***
				(4.798)
Log(Firm age)	-8.227***	-10.18***	-9.543***	-13.56***
	(1.073)	(1.627)	(1.586)	(1.578)
Leverage	86.19***	103.4***	118.9***	137.3***
	(4.659)	(6.036)	(7.452)	(7.863)
EBIT / Assets		-150.5***	-83.28***	-20.22
		(12.12)	(18.74)	(18.26)
Sales / Assets			-13.46***	-10.67***
			(3.618)	(2.951)
Net income / Sales			-22.48***	-67.11***
			(4.936)	(5.239)
Probability of Default		12.29***	11.90***	12.09***
		(0.592)	(0.584)	(0.573)
Constant	488.7***	377.3***	407.8***	-5.485
	(24.88)	(20.48)	(22.05)	(8.371)
Observations	4,113,538	2,025,447	1,996,700	1,928,427
Adjusted R2	0.113	0.166	0.177	0.165

Note: WLS estimates of firm-time bank loan spreads on firm fundamentals. Each observation is weighted by the aggregate loan size at the firm-time level. Standard errors clustered by firm and time. * p<0.1, ** p<0.05, *** p<0.01.

Table 7: Contract level

	(1)	(2)	(3)
Log(Loan size)	-0.579***	-0.434***	-0.346***
	(0.0537)	(0.0666)	(0.0666)
Maturity	0.211*	1.073*	
	(0.121)	(0.591)	
Maturity^2		-0.0905	
		(0.0546)	
Constant	0.874	0.157	0.485
	(1.278)	(2.076)	(1.531)
Maturity FE	NO	NO	YES
Observations	35,919,600	35,919,600	35,919,600
Adjusted R2	0.000125	0.000135	0.000302

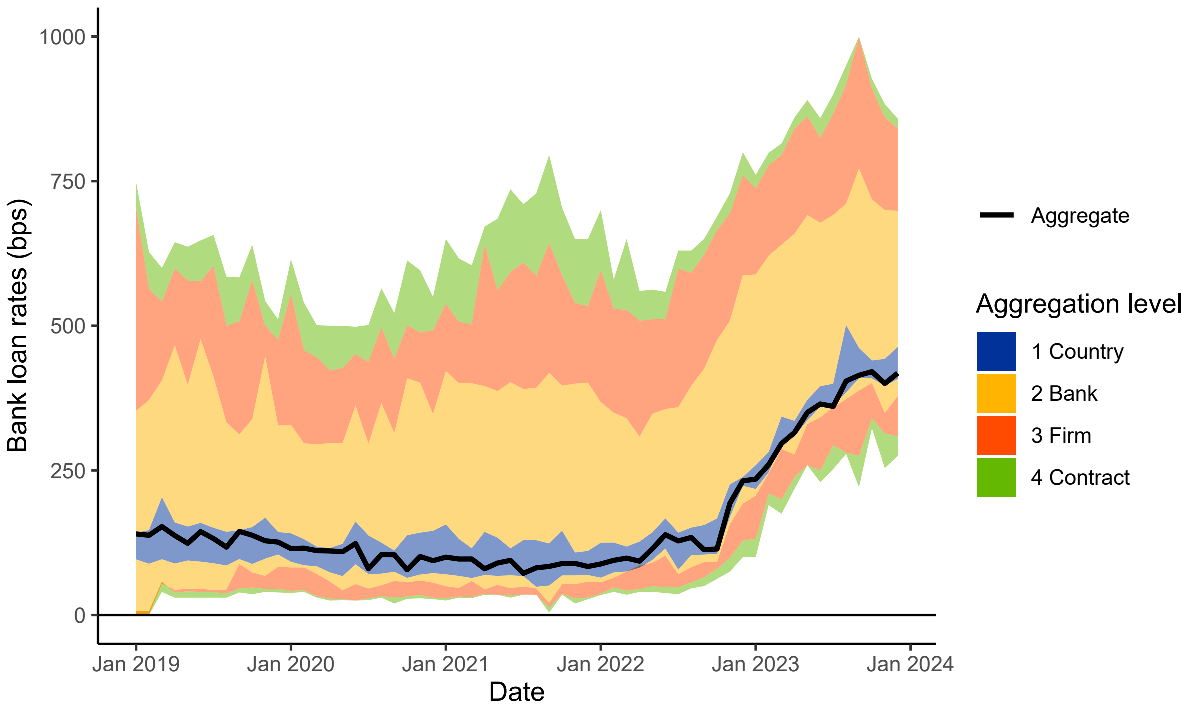
Note: WLS estimates of residual bank loan spreads on contract details. Each observation is weighted by the loan size. Standard errors clustered by firm and time. * p<0.1, ** p<0.05, *** p<0.01.

Table 8: Monetary Policy and Bank/Firm Fragility

	Bank			
	-Log(Tier 1 Capital)	Log(Risk-weighted assets)	-Log(Liquid assets)	Deposit Rate
Target	2.319***	1.951**	10.35**	7.424***
	(0.771)	(0.742)	(4.158)	(2.268)
QE	-2.922**	-2.456**	-4.113***	-5.459*
	(1.261)	(1.123)	(1.357)	(2.800)
Target Tightening	14.11***	3.570***	15.04**	11.00***
	(3.191)	(1.273)	(7.685)	(4.073)
Target Easing	0.359	-0.152	-5.082	0.977
	-1.198	(1.276)	(7.322)	(6.008)
QE Tightening	-0.698	-0.472	1.753	13.02
	(1.217)	(1.135)	(3.761)	(13.57)
QE Easing	-3.406**	-3.070**	-9.935	-15.48*
	(1.450)	(1.429)	(6.221)	(7.93)
	Firm			
	-Log(Total Assets)	-Log(Age)	Leverage	-EBIT/Assets
Target	0.621***	1.293	1.381	18.35
	(0.202)	(1.328)	(9.644)	(23.36)
QE	-0.864**	-0.580	-24.07**	-54.10**
	(0.373)	(1.442)	(10.25)	(20.66)
Target Tightening	0.247	2.618	-11.11	-11.30
	(0.325)	(1.892)	(16.51)	(53.82)
Target Easing	0.780**	-0.960	4.628	-99.61
	(0.322)	(0.823)	(12.20)	(68.89)
QE Tightening	-0.347	1.404	10.23	-22.72
	(0.377)	(1.287)	(12.26)	(46.75)
QE Easing	-1.731***	-3.654**	-30.37***	-43.88**
	(0.604)	(1.780)	(9.648)	(19.68)

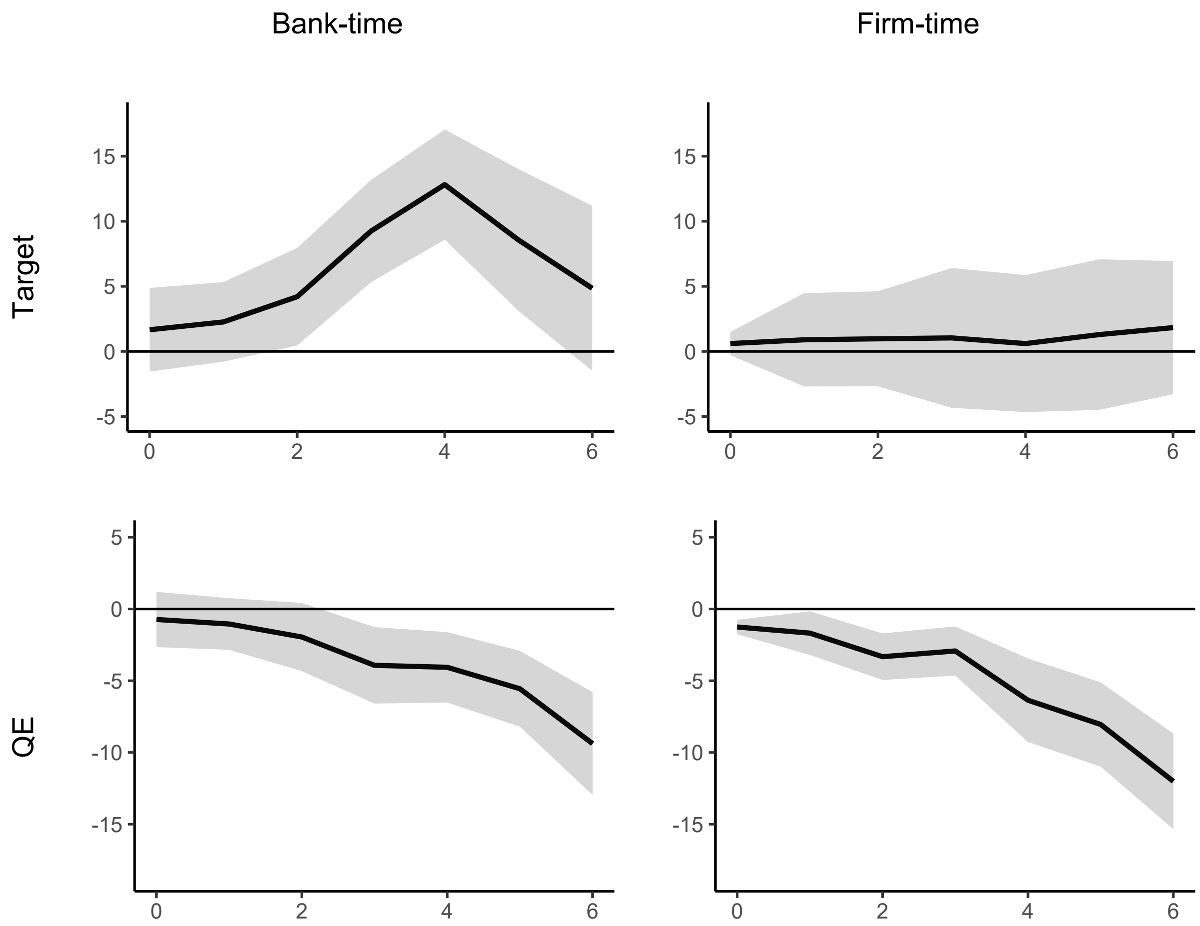
Note: The table summarizes estimated local projection coefficients on the interaction between fragility and (signed) monetary policy surprises for various measures of fragility. Standard errors are clustered by bank and time, and firm and time. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Figure 1: Bank loan rates



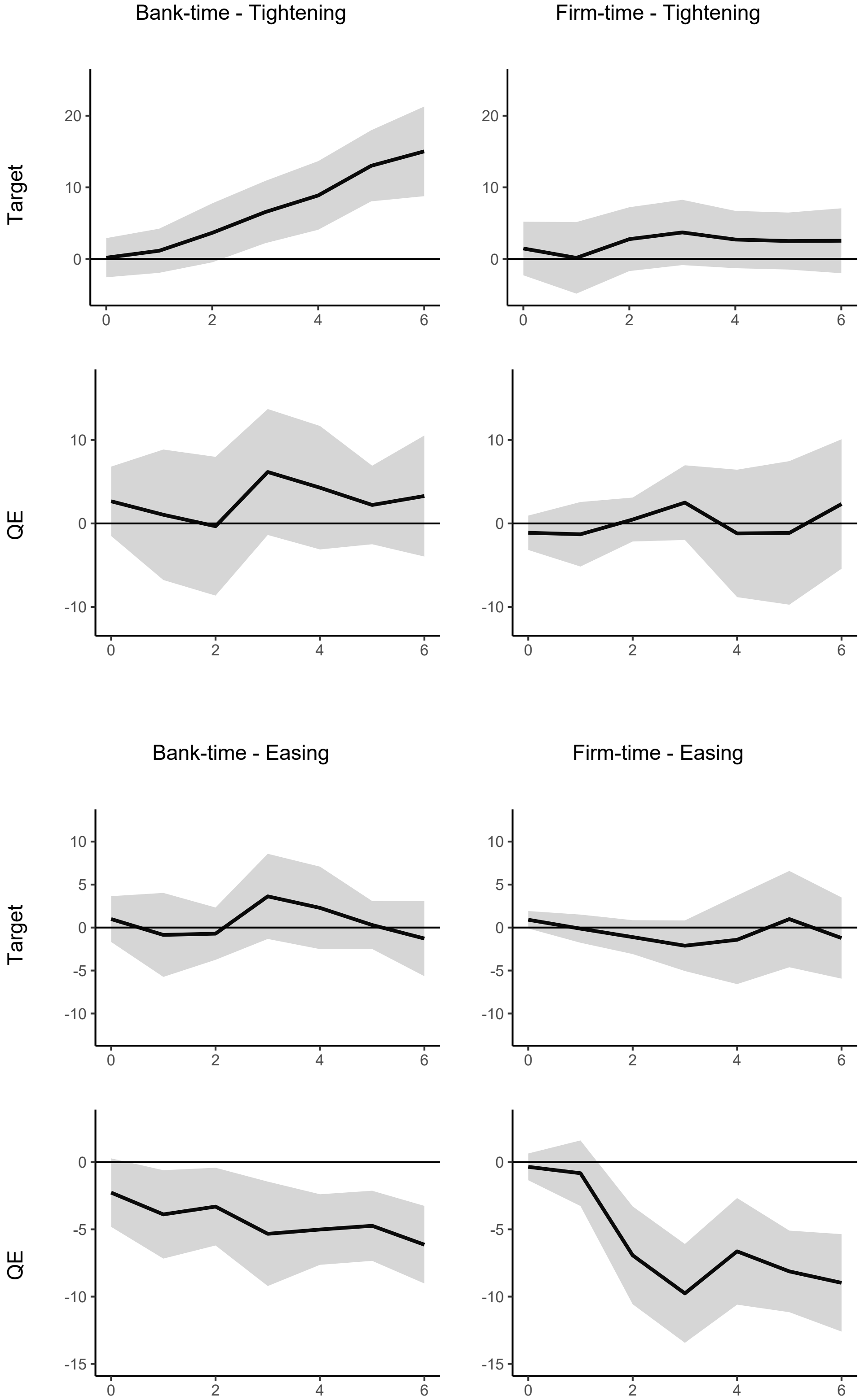
Note: The chart depicts the value-weighted average bank-loan rate. Each shaded region provides the 5-95% distribution of bank loan rates at the relevant level of aggregation.

Figure 2: Local projections of monetary policy surprises on decomposed external finance premium



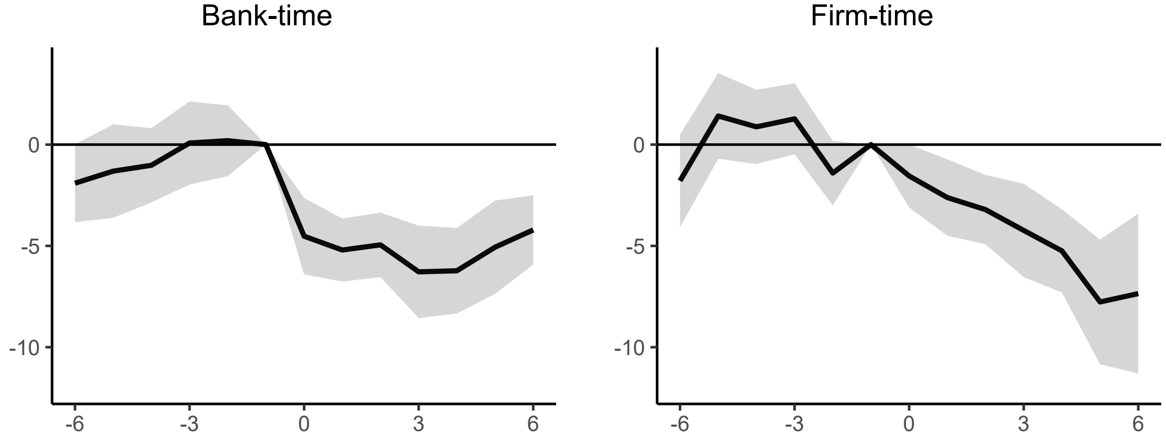
Note: The chart plots local projections with 95% confidence bands of the impact of high-frequency identified monetary policy surprises on the external finance premium. Standard errors clustered by bank and time, and by firm and time.

Figure 3: Asymmetric responses of EFP to monetary policy



Note: The chart plots local projections with 95% confidence bands of the impact of high-frequency identified monetary policy surprises on the external finance premium. Standard errors clustered by bank and time, and by firm and time.

Figure 4: External finance premium around QE envelope announcements



Note: The chart plots difference-in-difference estimates along with 95% confidence bounds. The first difference is the difference between the EFP at time $t+h$ and $t-1$, for $h = -6, -5, ..., 5, 6$. The second difference relates to the difference between EFP developments around the five QE envelope announcement months, and all other months. Standard errors clustered by bank and time, and by firm and time.

A Online Appendix

[Table 9 about here.]

[Table 10 about here.]

[Table 11 about here.]

[Table 12 about here.]

[Figure 5 about here.]

[Figure 6 about here.]

Table A1: Country-time level: Excluding Covid period

	(1)	(2)	(3)
Sov. spread	2.054**		0.232
	(0.401)		(0.284)
Sov. spread EA		2.667***	2.497***
		(0.188)	(0.333)
Constant	85.34***	145.1***	144.7***
	(23.51)	(11.03)	(12.24)
Observations	480	480	480
Adjusted R2	0.465	0.780	0.782

Note: WLS estimates of country-time bank loan spreads on sovereign spreads, excluding observations in 2020. Each observation is weighted by the aggregated loan size at the country-time level. Standard errors clustered at country level. * p<0.1, ** p<0.05, *** p<0.01.

Table A2: Country-time level: Restricted sample where bank country is firm country

	(1)	(2)	(3)
Sov. Spread	2.201**		0.315
	(0.455)		(0.328)
Sov. Spread EA		2.680***	2.457***
		(0.225)	(0.386)
Constant	91.19*	141.7***	141.7***
	(26.90)	(12.65)	(14.07)
Observations	600	600	600
Adjusted R2	0.488	0.786	0.790

Note: WLS estimates of country-time bank loan spreads on sovereign spreads. Each observation is weighted by the aggregated loan size at the country-time level. The sample is restricted to loans where both the firm and bank are headquartered in the country. Standard errors clustered at country level. * p<0.1, ** p<0.05, *** p<0.01.

Table A3: Country-time level: Role of sovereign spreads–Macro estimates

	(1)	(2)	(3)
Sov. Spread	0.714***		0.104
	(0.0466)		(0.0687)
Sov. Spread EA		1.762***	1.276***
		(0.201)	(0.143)
Constant	104.8***	161.9***	160.4***
	(8.399)	(5.374)	(5.102)
Observations	2,250	2,250	2,250
Adjusted R2	0.304	0.421	0.423

Note: WLS estimates of country-time bank loan spreads on sovereign spreads. The macro series are constructed using similar value-weighting across maturities based on iMIR data. Each observation is weighted by the aggregated loan size at the country-time level. Standard errors clustered at country level. * p<0.1, ** p<0.05, *** p<0.01.

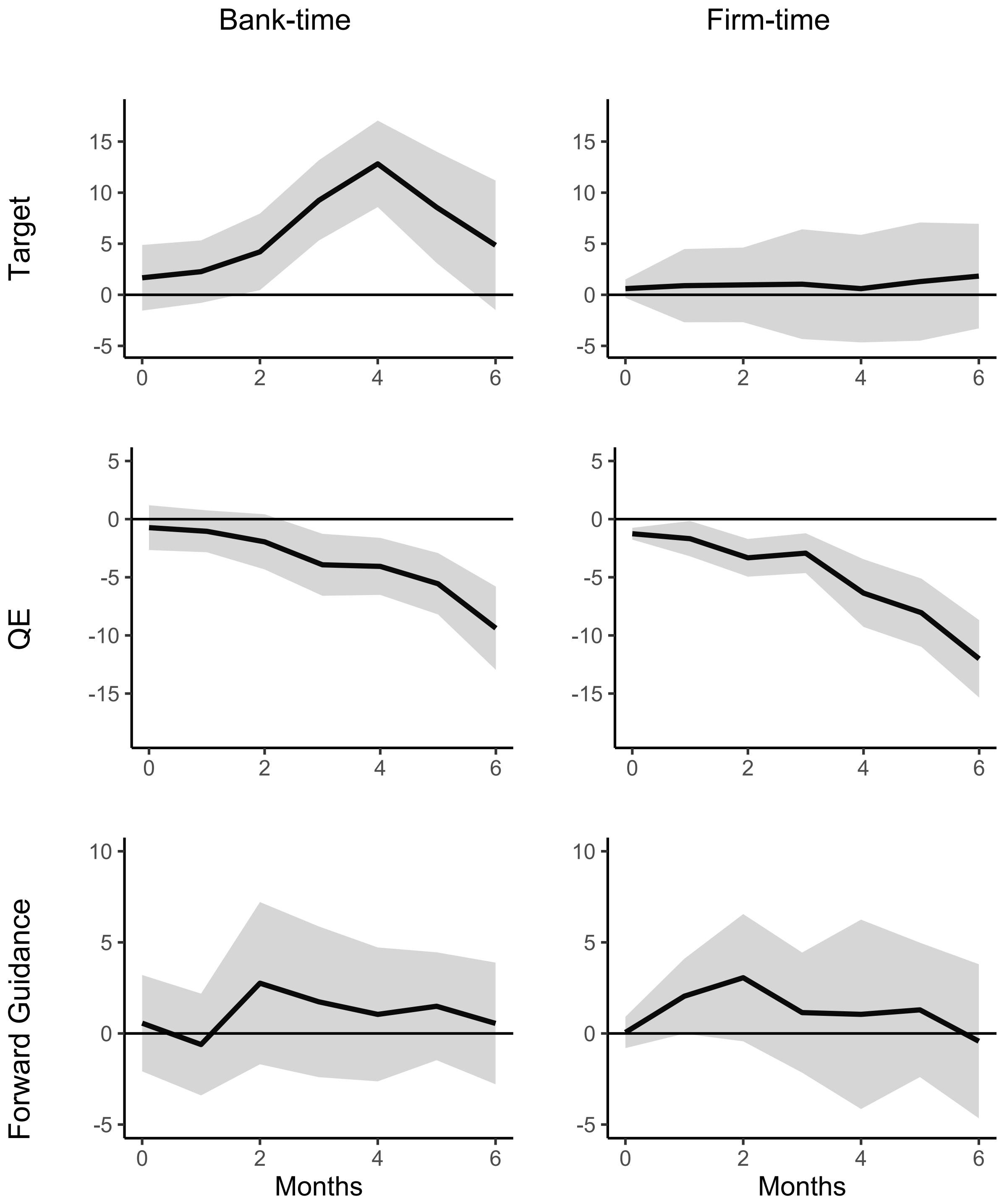
Table A4: Monetary Policy and Bank/Firm Fragility

	Bank			
	-Log(Tier 1 Capital)	Log(Risk-weighted assets)	-Log(Liquid assets)	Deposit Rate
Target	2.319***	1.951**	10.35**	7.424***
	(0.771)	(0.742)	(4.158)	(2.268)
QE	-2.922**	-2.456**	-4.113***	-5.459*
	(1.261)	(1.123)	(1.357)	(2.800)
FG	1.491	0.386	3.743**	9.008
	(0.902)	(0.820)	(2.825)	(5.965)
Target Tightening	14.114***	3.570***	15.04**	11.00***
	(3.191)	(1.273)	(7.685)	(4.073)
Target Easing	0.359	-0.152	-5.082	0.977
	-1.198	(1.276)	(7.322)	(6.008)
QE Tightening	-0.698	-0.472	1.753	13.02
	(1.217)	(1.135)	(3.761)	(13.57)
QE Easing	-3.406**	-3.070**	-9.935	-15.48*
	(1.450)	(1.429)	(6.221)	(7.93)
FG Tightening	1.337	-1.061	-6.441	-14.75
	(1.275)	(1.235)	(4.043)	(13.24)
FG Easing	-0.720	-0.935	-1.356	23.02
	(1.611)	(1.438)	(3.148)	(16.04)

	Firm			
	-Log(Total Assets)	-Log(Age)	Leverage	-EBIT/Assets
Target	0.621***	1.293	1.381	18.35
	(0.202)	(1.328)	(9.644)	(23.36)
QE	-0.864**	-0.580	-24.07**	-54.10**
	(0.373)	(1.442)	(10.25)	(20.66)
Forward Guidance	0.768	0.136	10.52	29.90
	(0.485)	(1.695)	(11.85)	(26.75)
Target Tightening	0.247	2.618	-11.11	-11.30
	(0.325)	(1.892)	(16.51)	(53.82)
Target Easing	0.780**	-0.960	4.628	-99.61
	(0.322)	(0.823)	(12.20)	(68.89)
QE Tightening	-0.347	1.404	10.23	-22.72
	(0.377)	(1.287)	(12.26)	(46.75)
QE Easing	-1.731***	-3.654**	-30.37***	-43.88**
	(0.604)	(1.780)	(9.648)	(19.68)
FG Tightening	0.0971	-0.0277	28.58**	28.59
	(0.535)	(1.722)	(11.40)	(32.14)
FG Easing	0.575	-0.833	-8.297	-1.593
	(0.650)	(2.229)	(6.387)	(26.87)

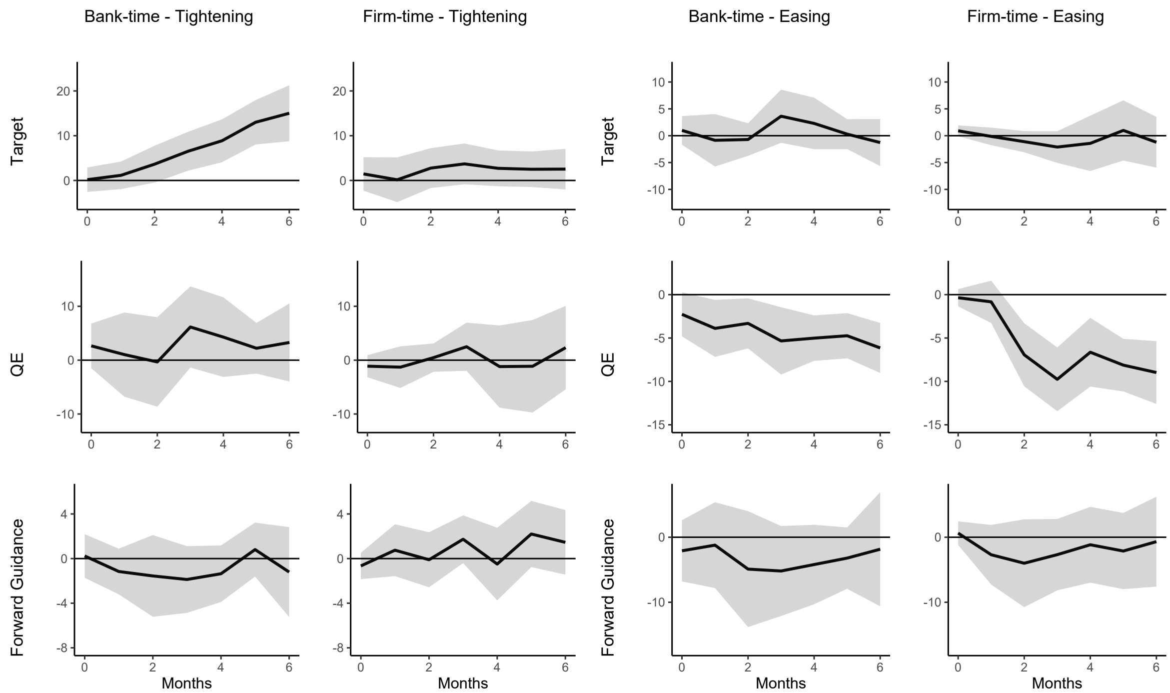
Note: The table summarizes estimated local projection coefficients on the interaction between fragility and (signed) monetary policy surprises for various measures of fragility. Standard errors are clustered by bank and time, and firm and time.* p<0.1, ** p<0.05, *** p<0.01.

Figure 5: Local projections of monetary policy surprises on decomposed external finance premium



Note: The chart plots local projections with 95% confidence bands of the impact of high-frequency identified monetary policy surprises on the external finance premium. Standard errors clustered by bank and time, and by firm and time.

Figure 6: Asymmetric responses of EFP to monetary policy



Note: The chart plots local projections with 95% confidence bands of the impact of high-frequency identified monetary policy surprises on the external finance premium. Standard errors clustered by bank and time, and by firm and time.

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