EUROPEAN CENTRAL BANK
EUROSYSTEM

Working Paper Series

Fédéric Holm-Hadulla, Claire Thürwächter

Heterogeneity in corporate debt structures and the transmission of monetary policy

Revised June 2021

No 2402 / May 2020

Abstract. We study how differences in the aggregate structure of corporate debt affect the transmission of monetary policy in a panel of euro area countries. We find that standard policy tightening shocks raise the cost of loans relative to corporate bonds. In economies with a high share of bond finance, the resultant rise in the overall cost of credit is less pronounced as a smaller portion of corporate debt is remunerated at the loan rate and firms further expand their reliance on bonds. In economies with a low share of bond finance, the rise in the cost of credit is reinforced by a shift in the composition of debt towards bank loans. As a consequence, a higher bond share goes along with a weaker transmission of short-term policy rate shocks to real activity. By contrast, the real effects of monetary policy shocks to longer-term yields strengthen with the share of bond finance in the economy.

Keywords: Firm Financing Structure, Bank Lending, Corporate Bonds, High-Frequency Identification, Local Projections

JEL: E44, E52, G21, G23

Non-technical summary

This paper studies how the relative role of corporate bonds and bank loans in the debt structure of firms affects the transmission of monetary policy shocks to the economy. To this end, we estimate local projections on a panel of euro area countries and allow the impact of monetary policy to differ with the relative share of bond finance in the respective economy. For the identification of monetary policy shocks, we resort to high-frequency surprises in key financial market prices around ECB policy events.

Our findings show that corporate debt financing structures are highly relevant for monetary policy transmission. Standard monetary policy tightening shocks raise the cost of bank loans relative to corporate bonds. The resultant rise in the overall cost of credit is less pronounced in economies with a higher reliance on bond finance as the relative rise in the cost of loans applies to a lower share of corporate debt. Moreover, firms in these economies further shift their debt structure towards bond finance in response to the shock. This suggests that firms resort to bonds as a ‘spare tire’ to compensate for the less favourable conditions in loan markets. By contrast, in economies with a low prevalence of bond finance, firms face a more limited scope to replace loans with bonds and the rise in the cost of credit is reinforced by a shift in the composition of debt towards bank loans. This latter shift, in turn, may be explained by the flexibility advantages of intermediated credit which become more valuable as monetary conditions tighten. As a consequence of these differential effects on credit conditions, the transmission of standard monetary policy shocks to real activity is attenuated in economies with a higher bond share. At the same time, our estimates also indicate that the real effects of shocks to longer-term yields, which tend to be more responsive to unconventional monetary policy measures, strengthen with the bond share in the economy.

These findings imply that the secular rise in the relative role of bond finance may weaken the effectiveness of short-term policy-rate changes in steering economic outcomes. As such, they would point to a greater need for monetary policy to rely on other instruments that more directly intervene on longer yield curve segments, even when short-term rates are not constrained by their lower bound. Moreover, the findings imply that cross-country heterogeneity in financing structures leads to an uneven incidence of these different types of policy measures across the euro area constituent economies. Cross-country convergence in financial structures would hence support a more uniform transmission of monetary policy and it may benefit from a broadening of firm access to direct market finance, as envisaged in the context of the EU Capital Markets Union.

1. Introduction

The theory and practice of corporate finance draw a sharp distinction between bank loans and corporate bonds as sources of firm credit. Bank loans typically offer greater flexibility, for instance to renegotiate or restructure existing credit contracts in case a borrower falls on hard times (Crouzet (2021)). Corporate bonds instead tend to be less costly and less exposed to cyclical shifts in credit supply (Becker and Ivashina (2014)). These differences in the underlying economics of different debt-financing instruments in turn may impact their behaviour in response to monetary policy shocks. But the direction of the impact is ambiguous and recent empirical evidence on the interaction between the structure of corporate debt and the transmission of monetary policy is scarce. At the same time, the issue has acquired renewed relevance as many advanced economies have experienced a marked shift in the debt structure of firms, leading to an increasingly relevant role of corporate bonds relative to bank loans over the past decade (see, *e.g.*, Adrian et al. (2013) and De Fiore and Uhlig (2015)).

Against this background, the current paper studies whether the financing structure of firms matters for the transmission of monetary policy to the economy. To this end, we subdivide the question into three related aspects and set up an empirical model that allows us to analyse them simultaneously. The first aspect is whether the two debt financing instruments differ in their response to monetary policy shocks. The second aspect is whether any such differences become more or less accentuated depending on the financing structure prevailing prior to the shock. And the third aspect is whether these differences in the responsiveness and their dependence on the initial financing structure alter the ultimate impact of monetary policy on key macroeconomic aggregates. Our empirical approach consists of a local projections setup for a panel of euro area countries, using high-frequency surprises in interest rates to identify monetary policy shocks. Further, the model allows the impact of these shocks on firm credit and economic activity to differ with the relative share of bond finance in the respective economy.

Besides their obvious policy relevance, our research questions play into a rich literature on the interaction between corporate finance and monetary policy transmission. A prominent strand of this literature has argued that bank balance sheet frictions may render loan supply more responsive to monetary policy shocks than other sources of debt finance (Bernanke and Blinder (1992); Kashyap et al. (1993)). As a consequence, bond issuance may mitigate or even counteract the impact of monetary-policy induced shifts in loan supply on the overall credit conditions of firms. However, the subsequent literature has also highlighted mechanisms that point in the opposite direction. In particular, the inherent advantages of bank lending – in terms of the screening and monitoring of borrowers (Diamond (1984); Repullo and Suarez (2000)), as well as the flexibility to renegotiate the terms of a credit contract in case of need (Berlin and Mester (1992)) – may become more valuable when monetary conditions tighten and, consequently, collateral values decline and business prospects deteriorate (Bolton and Freixas (2006)).[1] Hence, monetary policy tightening shocks may shift the preferred debt financing structure of firms towards bank loans and, via this channel, trigger a stronger contraction in corporate bonds than in loan volumes.[2]

Further, the strength of these channels may depend on the existing financing structure of the respective economy. For instance, changes in the structure of corporate debt entail fixed costs – *e.g.* for an entirely bank-dependent firm, the process of building a presence in global capital markets is resource- and time-consuming. This mechanism, in turn, would weaken the capacity of bond markets to act as a substitute financing option when loans contract and it would become more relevant the higher is the reliance on bank relative to bond finance in an economy.[3] Taken together, the theoretical predictions on whether loans or bonds are more responsive to monetary policy shocks and how this relative responsiveness would change with the existing financing structure are therefore not clear-cut. And, since these two

[1] For further, closely related, analysis on the specific role of banks in screening and monitoring borrowers, see also Holmstrom and Tirole (1997); Diamond (1991); Rajan (1992); and on the differences in bank- versus direct market-based finance, see Dewatripont and Maskin (1995) and Boot et al. (1993). While useful to highlight key conceptual differences, the distinction between the different types of credit is approximate: in practice, bank lending relationships often involve several contracting parties, *e.g.* via syndicated loans; loans may also be sold, either directly or in securitized form; bond markets also perform monitoring functions *etc.*

[2] This mechanism may be reinforced by composition effects: to "qualify" for bond market access, firms have to meet certain credit quality standards and monetary policy may shift the dividing line between qualifying and non-qualifying firms in a procyclical manner (for a related argument, see De Fiore and Uhlig (2011, 2015) and Crouzet (2017)).

[3] There are further mechanisms that may inhibit changes in firm financing structures. For instance, existing banking relationships may lead to some lock-in as borrowers and lenders try to capitalize on the informational monopoly established over time (Sharpe (1990); Rajan (1992); Kashyap and Stein (1994); Berger and Udell (1995, 2002)).

aspects are integral elements of the transmission process, this theoretical ambiguity carries over to the third aspect, consisting in the overall implications of corporate financing structures for the effects of monetary policy on the economy.

The current paper thus provides an empirical analysis of how the structure of corporate debt financing affects the transmission of monetary policy. As the specific context of the analysis, we consider a panel of euro area countries which, for three reasons, provides a particularly suitable setting to study this question. First, the shift in the relative importance of bond- versus bank-based finance has been very pronounced in the euro area (ECB (2016)). In particular, the ratio of corporate bonds to loans of euro area firms has more than doubled since its trough in 2008. Second, the euro area exhibits a high degree of heterogeneity in the relative role of these different financing instruments across countries (Rodriguez-Palenzuela et al. (2013)). For instance, since the start of the euro, the average bond to loan ratio has ranged from 3% for firms in Spain to 50% in France. This variation in both, the time-series and cross-sectional dimension, offers ample scope for empirical analysis. Third, given these countries belong to one currency union, it allows us to clearly identify a common monetary policy stance, without requiring assumptions about the comparability of measures taken by different central banks.

Our econometric model starts from the standard set of variables typically considered in the monetary economics literature, including indicators for real activity, the price level, and policy-controlled short-term interest rates. It then adds a set of variables measuring corporate financing costs and volumes, broken down by bank loans and debt securities, as well as a set of controls that may influence the relative role of these financing instruments across countries and over time. In terms of estimation, we follow Jordà (2005)'s local projections method, which offers a flexible approach to model how the interaction of monetary policy with the financing structure of firms alters its effects on key macroeconomic aggregates. For the identification of monetary policy shocks, we resort to high-frequency surprises in key financial market prices around ECB policy events.

Our findings show that corporate debt financing structures are highly relevant for monetary policy transmission. Standard monetary policy tightening shocks raise the cost of bank loans relative to corporate bonds. The resultant rise in the overall cost of credit is less pronounced in economies with a higher reliance on bond finance as the relative rise in the cost of loans applies to a lower share of corporate debt. Moreover, firms in these economies further shift their debt structure towards bond finance in response to the shock. This suggests that firms resort to bonds as a 'spare tire' to compensate for the less favourable conditions in loan markets. By contrast, in economies with a low prevalence of bond finance, firms face a more limited scope to replace loans with bonds and the rise in the cost of credit is reinforced by a shift in the composition of debt towards bank loans. This latter shift, in turn, may be explained by the flexibility advantages of intermediated credit which become more valuable as monetary conditions tighten. As a consequence of these differential effects on credit conditions, the transmission of standard monetary policy shocks to real activity is attenuated in economies with a higher bond share. At the same time, our estimates also indicate that the real effects of shocks to longer-term yields, which tend to be more responsive to unconventional monetary policy measures, strengthen with the bond share in the economy.

These findings add to a rapidly growing empirical literature that has sprung from the shift in firm financing structures observed since the Global Financial Crisis and touches upon some of the aspects we address in the current paper. Regarding the question of how the response to monetary policy differs across bank versus bond-finance, Becker and Ivashina (2014) also find evidence for the substitution function of bond finance in firm level data, thus confirming earlier findings by Kashyap et al. (1993) and Kashyap et al. (1996), as well as the pattern we observe for economies with a high bond share. Further, several recent studies, including Lhuissier and Szczerbowicz (2018), Grosse-Rueschkamp et al. (2019) and Arce et al. (2020), distinguish between conventional and unconventional monetary policy (or zoom in on specific unconventional measures such as the ECB's corporate sector purchase program) and find differences in the response patterns across financing instruments. Finally, Crouzet (2021) presents a structural model that incorporates the countervailing mechanisms by which monetary policy shocks may affect firm financing structures and tests these mechanisms in a panel of US firms.

Regarding the question whether differences of monetary policy transmission depend on the financing structure prevailing prior to the shock, the literature is much scarcer. In a methodologically similar setup to ours, Grjebine et al. (2018) study how corporate debt structures affect macroeconomic outcomes; but their focus is on the pace of recovery after recessions, rather than the transmission of monetary policy. Darmouni et al. (2020) instead show that, in the euro area, the responsiveness of firm share prices to monetary policy shocks intensifies the higher is their reliance on bond finance, whereas this relationship is absent in the US. To the best of our knowledge, our paper is the first to simultaneously explore how the response to monetary policy differs across corporate debt instruments, how these responses are shaped by the debt financing structure prevailing prior to the shock, and how these differences ultimately affect the macroeconomic implications of a given monetary policy shock.

The remainder of the paper proceeds as follows. Section 2 introduces the model and identification strategy. Section 3 describes the data and key stylized facts. Section 4 presents our main results, followed by a set of robustness checks in Section 5. Section 6 concludes.

2. Econometric methodology

2.1. Model

We estimate the dynamic response of key macroeconomic aggregates and firm financing variables to a monetary policy shock via local projections (Jordà (2005)). The baseline model to estimate the impulse response functions (IRFs) is:

$$\begin{aligned} Y_{i,t+h} = \alpha_{i,h} &+ \Big(\beta_{0,h} + \beta_h (\mathrm{B/D})_{i,t-1}\Big)\, \mathrm{shock}_t^{IR} \\ &+ \gamma_h \sum_{p=1}^{2} X_{i,t-p} + \theta_h \sum_{p=1}^{2} \bar{X}_{t-p} + \epsilon_{i,t+h} \end{aligned} \tag{1}$$

where subscripts i, t, and h denote the country, month, and IRF horizon, respectively, and subscript p denotes the number of lags included in the sets of control variables $X_{i,t-p}$ and $\bar{X}_{t-p}$.

The dependent variables $Y_{i,t+h}$ comprise real GDP and the GDP deflator, as well as the outstanding amount of bank loans to non-financial corporations and of corporate debt securities. In addition, the dependent variables include the relative quantities and relative costs of bank loans and bond finance to capture the structure of corporate debt financing and the attractiveness of the different instruments. The former enters the model as the ratio of bonds over total debt financing (defined as the sum of corporate loan and bond volumes) and is henceforth referred to as the 'bond share'; the latter enters as the difference between composite measures of the cost of bank and bond finance, respectively, and is henceforth referred to as the 'intermediation wedge' (for additional detail see Section 3). The dependent variables also include a policy-controlled short-term interest rate, which is the same across countries and which helps in assessing the plausibility of our identification strategy.[4] All variables enter in log-levels, except the bond share, the intermediation wedge, and the policy rate, which are expressed in percent.

The key explanatory variables of interest are the monetary policy shock ($shock_t^{IR}$) and its interaction with the lagged bond share $(B/D)_{i,t-1}$. As Section 2.2 explains in detail, the shock series are extracted from high-frequency changes in key money market interest rates around ECB monetary policy events. To facilitate interpretation of the regression coefficients, we demean the bond share. Thus, the coefficient $\beta_{0,h}$ captures the response in each of the dependent variables in period $t+h$ to an exogenous monetary policy tightening in period t at the average bond share over the sample. The coefficient β_h shows whether and how this impact varies along the bond share distribution. Taken together, these coefficients summarize the combined impact of the monetary policy shock at horizon h conditional on the prevailing bond share as:

$$\frac{\partial \mathrm{Y}_{i,t+h}}{\partial \mathrm{shock}_t^{IR}} = \beta_{0,h} + \beta_h (\mathrm{B/D})_{i,t-1}. \tag{2}$$

Further, the model includes a set of control variables to capture common and country-specific influences on the economy over time, denoted by $\bar{X}_{t-p}$ and $X_{i,t-p}$, respectively. The common influences consist of euro area real GDP and the GDP deflator, as well as the EUR-USD exchange rate and global commodity prices to capture the external environment. Moreover, $\bar{X}_{t-p}$ includes the bond market sub-index of the 'composite indicator of systemic stress' (CISS) by Kremer et al. (2012) and $X_{i,t-p}$ contains measures of bank balance sheet strength and banking sector concentration at the country level. These variables are motivated by the specific timing of the observed shifts in firm financing structures in the euro area: the trend towards a greater relative role of bond finance started from dislocations in the

[4] The underlying logic is that changes in policy-controlled short-term interest rates constitute the first step in the transmission of standard monetary policy shocks. So a significant and relevant response in these variables to the shock-variable are a minimum criterion for the latter to be a plausible proxy for exogenous changes in the monetary policy stance; see, *e.g.*, Gertler and Karadi (2015).

banking system and the protracted period of financial stress that followed the Global Financial Crisis (Adrian et al. (2013); De Fiore and Uhlig (2015); Crouzet (2017)). Over the same period, also the monetary policy stance underwent marked changes, as central banks sought to contain the fallout from the crisis. Accordingly, the specific conditions prevailing over the post-crisis period may be correlated with both, monetary policy and the relevant outcome variables in $Y_{i,t+h}$.[5] By including the bond market sub-index of the CISS and the banking sector controls in the specifications, we account for such confounding factors and thereby further sharpen the identification.

Besides these additional controls, $\bar{X}_{t-p}$ includes lags of the euro area wide policy interest rate and the shock. The inclusion of the lagged shock is important to purge the high-frequency surprises from potential serial correlation, which further underpins the identifying assumption that the shock represents unanticipated changes in monetary policy (Ramey (2016)). Similarly, the set of country-specific controls $X_{i,t-p}$ comprise lags of the dependent variables included in $Y_{i,t+h}$ and the lagged interactions of the shock with the bond share.[6] Last, we saturate the model with a set of country-fixed effects $\alpha_{i,h}$. Our estimations use Driscoll and Kraay (1998) standard errors that allow for both serial correlation and spatial dependence across countries. Our baseline regressions include $p = 2$ lags of the variables comprised in $X_{i,t-p}$ and $\bar{X}_{t-p}$.[7]

2.2. Identification strategy and estimation

2.2.1. High-frequency identification

Our identification strategy follows an increasingly active strand of the monetary economics literature using high-frequency changes in financial market variables around central bank decisions as a measure of exogenous changes in the monetary policy stance (see Ramey (2016) for a review of this literature). The basic rationale of this high-frequency identification strategy (HFI) is that, provided the time window around these events is sufficiently narrow, it is plausible to attribute the observed changes in interest rates to monetary

[5] The role of banks' market power in shaping the strength of monetary policy transmission has for example been emphasized by Drechsler et al. (2017) and Rocheteau et al. (2018).

[6] Since bond and loan volumes, as the constitutive terms of the bond share, are included as separate lagged controls, $(B/D)_{i,t-p}$ is omitted to avoid redundancies.

[7] We also tested specifications including a deterministic time trend and experimented with different lag numbers, but found this to be inconsequential for our estimates.

policy – and to exclude that they reflect any other confounding factors that may be simultaneously correlated with the policy stance and the macroeconomic or financial outcome variables.

Following this logic, HFI has been applied in a host of papers studying the impact of monetary policy on the US economy and financial markets (Kuttner (2001); Cochrane and Piazzesi (2002); Gürkaynak et al. (2005); Piazzesi and Swanson (2008); Barakchian and Crowe (2013); Gertler and Karadi (2015); Nakamura and Steinsson (2018)). More recently, a nascent literature has adopted this approach to similar applications in the euro area context (Lhuissier and Szczerbowicz (2018); Altavilla et al. (2019); Auer et al. (2019); Jarocinski and Karadi (2020); Andrade and Ferroni (2021)).

The data underlying our HFI approach comes from the Euro Area Monetary Policy Event-Study Database (EA-MPD), constructed by Altavilla et al. (2019) and published on the ECB website.[8] The EA-MPD computes intraday changes in a broad set of financial market variables around the time the ECB's Governing Council communicates its monetary policy decisions. These communication events follow a preset schedule and format in that: the Governing Council meets in regular intervals and the meeting dates are publicly known well in advance;[9] at 1.45 pm on the day of the meeting, a press release is published on the ECB website announcing the Governing Council's monetary policy decision (which may also consist in an announcement that the policy configuration remains unchanged); and at 2.30 pm a press conference takes place, at which the President reads out a written statement explaining the rationale of the decision, followed by a question- and answer-session with journalists. The EA-MPD calculates three sets of surprises, one for the publication of the press release, one over the period of the press conference, and one for both events together. Taken together, the EA-MPD constitutes a very comprehensive and publicly available database for high-frequency identification of monetary policy shocks in the euro area.

[8] https://www.ecb.europa.eu/pub/pdf/annex/Dataset_EA-MPD.xlsx

[9] According to the regular schedule, the Governing Council has a monetary policy meeting every six weeks. This regular meeting schedule has changed twice since the introduction of the euro in 1999. Initially, the meetings took place twice per month, whereas after November 2001 and until December 2014 the regular monetary policy meetings followed a four-week rhythm. Further, on a few occasions the Governing Council deviated from the regular meeting schedule to respond to acute crisis events. For further detail, see Altavilla et al. (2019).

2.2.2. Definition of monetary policy shocks

In our baseline estimations, we use changes in short-term interest rates over the entire event window, *i.e.* from before the press release to after the press conference, as the basis for calculating the monetary policy shocks. In doing so, we take into account an important insight from the recent literature: when central banks communicate on policy, market participants do not only receive a signal on whether and how the central bank is going to adjust its policy instruments, but also on how the central bank assesses economic prospects. If market participants in turn assume that the central bank commands over superior information on the state and prospects of the economy, this may lead them to revise their own economic assessment. Thus, depending on which type of signal dominates, investors may draw very different inferences on the current and future stance of monetary policy resulting in different financial market responses around the event.

For instance, an unexpected interest rate increase may be accompanied by a decline in stock prices if market participants perceive the central bank decision as a true monetary policy tightening, which engenders an expected contraction of economic activity; in this case, the negative cross-asset correlation between interest rates and stock prices would qualify the high-frequency surprise as a genuine monetary policy shock. Alternatively, a positive interest rate surprise may be accompanied by rising stock prices if the rate increase is interpreted as a sign of the central bank's information, suggesting that economic prospects are more buoyant than previously thought; in this case, the surprise would constitute what the literature has come to refer to as an information shock.

As visible from Figure 1, this distinction is of major practical relevance in the euro area context (and, as shown by Jarocinski and Karadi (2020), also in the US context). For instance, over the sample considered in our empirical analysis, almost 40% of high-frequency surprises fall under the information shock category (see upper right and lower left quadrant). Since our aim is to estimate the effects of genuine monetary policy shocks, our analysis only considers the shocks in the other two quadrants.

The specific variable used in our baseline to extract the monetary policy shocks is the 1-month OIS rate. The EA-MPD contains surprises for a broad range of risk-free interest rates spanning maturities from 1-week to 30-years for the OIS. In the absence of strong conceptual reasons to favour one over the other point on this spectrum, we are left with several degrees of freedom in choosing between these rates.

We thus discipline our choice by imposing two criteria. The first is to ensure a relatively close mapping from the shock variable to the policy variable we include in our dynamic model. Since, in line with much of the related literature, we choose the policy variable to be the 3-month OIS rate, a natural choice would be to also use a shock located at the same or a similar point on the term structure. The second criterion is that, within a reasonably narrow segment around the 3-month maturity, we choose a shock that has the highest statistical fit for the 3-month OIS rate after controlling for all other variables in equation (1). This is important to ensure that, also from a statistical perspective, there is a close mapping from the shock variable to the policy variable.

Figure 1: Stock price and rate surprises.

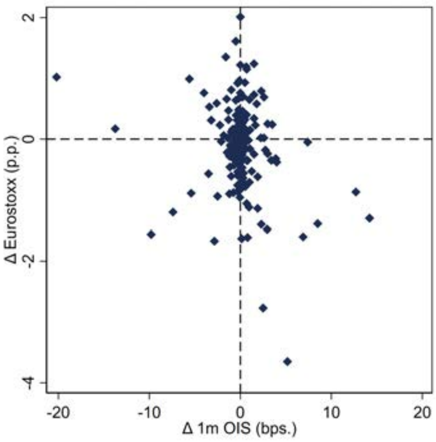
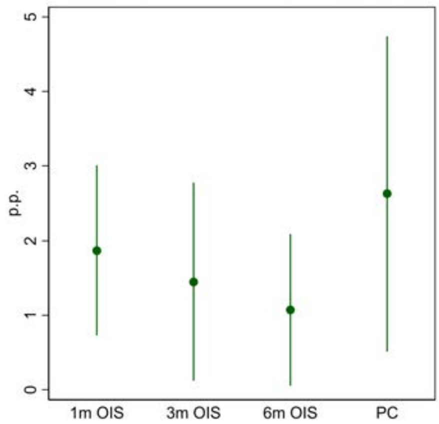


Figure 2: Response of 3-month OIS rate on impact.



Note: The response in Figure 2 is scaled to a 100 basis point (bps) tightening shock in the respective high-frequency surprise at the average bond share. PC refers to the first principal component of the 1-week to 2-year OIS rates. The range shows the 95% confidence interval.

Regressing the residuals of the 3-month OIS rate on different shocks from the EA-MPD, the 1-month OIS surprise emerges as the most suitable among a range of candidates (see Figure 2). Its coefficient is estimated with a markedly higher precision than that of the 3-month OIS rate shock and the principal component (PC) of different rates; and for the 6-month OIS rate shock, the response is only statistically significant at a very narrow margin. In summary, our baseline definition of $shock_t^{IR}$ thus consists of the monetary policy shock component of the surprises in the 1-month OIS rate. In Section 5.3, we test the robustness of our key findings to this choice.[10]

3. Data and stylized facts

We estimate the model on monthly data over the sample period from January 2002 to May 2019.[11] At the cross-sectional level, we include a panel of 10 euro area countries, which together account for 96% of euro area GDP.[12] A detailed overview of all data series, transformations, and sources is available in Table A.1 in Appendix A. As the monetary policy variable, we use the monthly averages of daily observations of the 3-month OIS rate. GDP and the deflator are interpolated from quarterly to monthly frequency, so as to match the frequency of the firm financing variables. Loans and bond finance to non-financial corporations are measured in notional stocks, which correct for changes in the financing volumes that arise from valuation changes. Moreover, the loan data is adjusted for sales and securitization, and cash pooling, and we restrict the counterparty sector to residential non-financial corporations. The intermediation wedge is defined as the difference between a loan and a bond spread. The former is calculated as the spread between the composite bank lending rate for loans to corporations on new business and the 1-year OIS rate (this choice of risk-free rate ensures a close match with the maturity and average rate fixation profile of the bulk of loans in

---

[10] A time-series plot of the high-frequency surprises that we consider in the analysis can be found in Figure A.1 in Appendix A.

[11] We follow the recommendation of Altavilla et al. (2019) and exclude the years from 1999 to the end of 2001 from the sample due to noise and sparse quotes in the intraday OIS data during the first years of the euro. Estimating the model on monthly data allows us to exploit the availability of loan and bond volumes at that frequency.

[12] The countries are Austria, Belgium, Germany, Spain, Finland, France, Ireland, Italy, the Netherlands, and Portugal.

our sample).[13] The bond spreads are based on De Santis (2018) and are constructed by aggregating up the spreads on individual bonds purged of bond- and issuer-specific characteristics.[14]

For the control variables, the GDP and deflator series at the euro area level are interpolated from quarterly to monthly frequency in the same procedure as the corresponding country level data. The variables capturing the external environment are the EUR-USD exchange rate, averaging daily observations over each month, and an encompassing commodity price index, which is provided by the IMF. For the bond market sub-index of the CISS we also average the weekly values per month. The strength of bank balance sheets is measured as regulatory capital over risk-weighted assets and banking sector concentration is measured by the Herfindahl index for banks' total assets. For both series, we linearly interpolate the annual data to monthly frequency. The macroeconomic variables, financing volumes, and the commodity price index are seasonally adjusted.

In constructing the monetary policy shock, we directly convert the daily high-frequency surprises to monthly frequency.[15] In Section 5.3, we however test for the robustness of our findings under an alternative frequency conversion that weights the shocks according to the dating of the monetary policy decision within the month.

Table 1 presents summary statistics of the variables that enter our model. The data exhibit rich variation, also reflecting the pronounced size differences across euro area countries, visible for instance in GDP and loan volumes. Important for our analysis is that the relative size of bond- to bank-based finance also covers a wide range. In particular, the minimum bond share of only 1.27% indicates that for some countries loans represent the dominant source of debt to firms while, at the other end of the distribution, almost

[13] Over our sample, around 60% of euro area loans to non-financial corporations have a maturity of up to one year or an interest rate reset within one year if the initial maturity is above one year. Our results are unaffected when instead computing the spread against the 2-year OIS rate.

[14] Among these characteristics, De Santis (2018) also includes the expected default frequency (EDF) of the issuer, which allows for the construction of an excess bond premium. By contrast, the cost of bond finance measure used in our analysis does not include EDF in the list of controls since differences in credit risk exposures may be one of the features that distinguish bond- from bank-based finance.

[15] If there are two events in one month we sum up the observations. If there is no event our shock measure carries a zero-value.

40% of firms' debt finance is directly sourced from bond markets in some countries.

Table 1: Summary statistics.

	Mean	Std.dev.	Min	Max
Monetary policy shocks				
1-month OIS	0.12	2.55	-20.20	14.20
5-year Bund	0.03	3.44	-19.75	15.30
Dependent variables				
3-month OIS	1.24	1.51	-0.37	4.33
5-year Bund	1.82	1.68	-0.55	4.82
GDP	81,120	74,963	12,826	271,457
GDP deflator	93.69	7.02	77.79	106.62
Loans	375,489	325,965	27,193	1,086,184
Corporate bonds	89,816	121,366	1,706	646,019
Bond share	19.66	10.12	1.27	38.29
Intermediation wedge	2.00	1.65	-14.53	10.66
Control variables				
GDP (EA)	850,278	45,081	767,705	946,875
GDP deflator (EA)	93.94	6.48	81.33	104.70
EUR-USD	1.25	0.14	0.87	1.58
Commodity price index	123.80	37.73	48.74	198.08
CISS bond market	0.05	0.03	0.01	0.14
Bank capitalization	14.72	3.54	9.40	26.94
Bank concentration	0.11	0.09	0.02	0.39
Observations	1,955			

Note: The shocks are in bps; GDP, loans, and coporate bonds are in million EUR; the 3-month OIS and 5-year Bund rate, bond share, intermediation wedge, and bank capitalization are in percent. GDP is expressed in real terms with base year 2015; the GDP deflator and commodity prices are indexed to 2015. The intermediation wedge is computed as loan spread minus bond spread.

Meanwhile, the relevance of bond finance has clearly increased over time, both in individual countries and in the euro area as a whole. In the cross-country distribution presented in Figure 3, three observations stand out. First, the wide range of the bond share across countries appears to be a persistent characteristic of the euro area. Second, bond finance has become increasingly important, especially since the global financial crisis (GFC) after which the euro area average, as well as the median of the cross-country distribution, have risen markedly (in fact, the secular rise in the bond share since the GFC has been a pervasive phenomenon across countries, in some cases preceded by a decline in the bond share during the pre-crisis boom in bank lending; see Figure A.2 in Appendix A). Third, the time-series patterns of the bond share are primarily driven by the steady increase in bond volumes over the sample period (Figure 4). In particular, since the onset of the financial crisis bond finance has shown a marked ascent and has more than doubled, whereas the outstanding volume of loans plateaued. Moreover, also the cross-country dispersion is particularly pronounced for bonds and, in contrast to loans, has risen since the GFC (Figure 5).

Figure 3: Cross-country distribution of bond share.

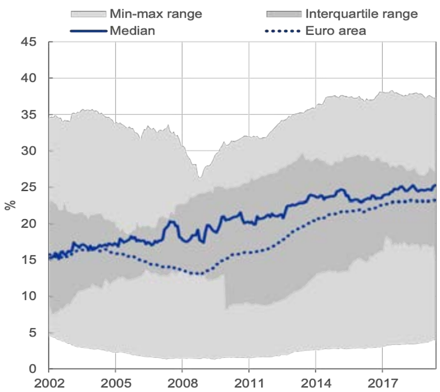
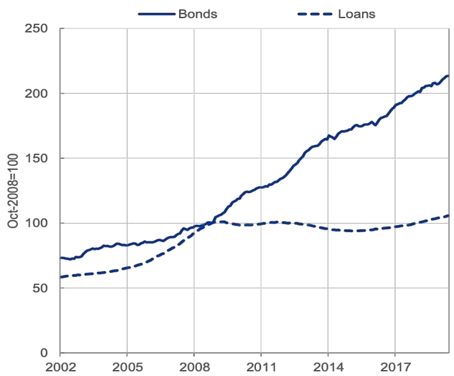
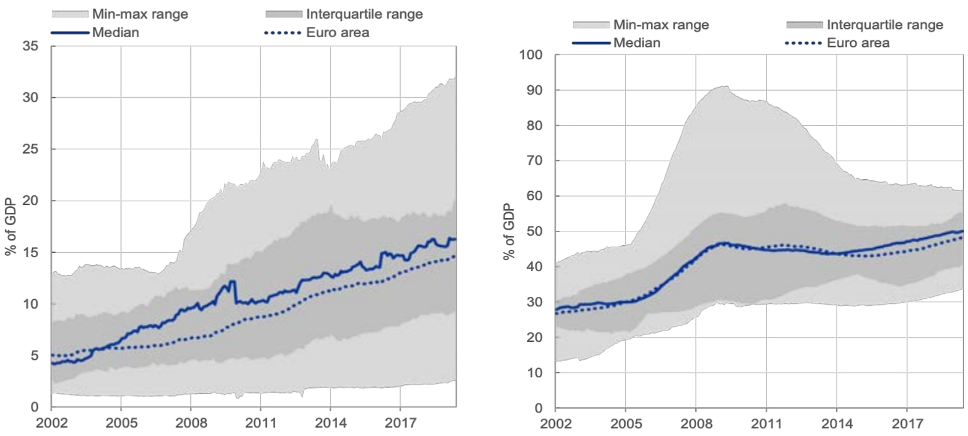


Figure 4: Euro area corporate bond and loan volumes.



Note: The drop in the interquartile range at the end of 2009 in Figure 3 is due to a shift in the distribution when data for Irish bond finance becomes available. The series in Figure 4 are indexed to October 2008, which corresponds to the trough in the euro area bond share depicted in Figure 3.

Figure 5: Cross-country distribution of bonds and loans as share of GDP.



(a) Bonds-to-GDP (b) Loans-to-GDP

Note: The ratio of bonds and loans to GDP is computed relative to the average of annual GDP (in nominal terms) for each country over the sample period.

4. Results

In the following, we describe our baseline findings, starting with the estimated impact of monetary policy shocks at the average bond share (Section 4.1), before turning to the response patterns across economies in different parts of the bond share distribution (Section 4.2). We then explore the mechanisms underlying the heterogeneity in transmission (Section 4.3). Finally, we examine whether the transmission of monetary policy shocks depends on whether they intervene at the short end or at longer segments of the yield curve (Section 4.4).

4.1. Average transmission patterns

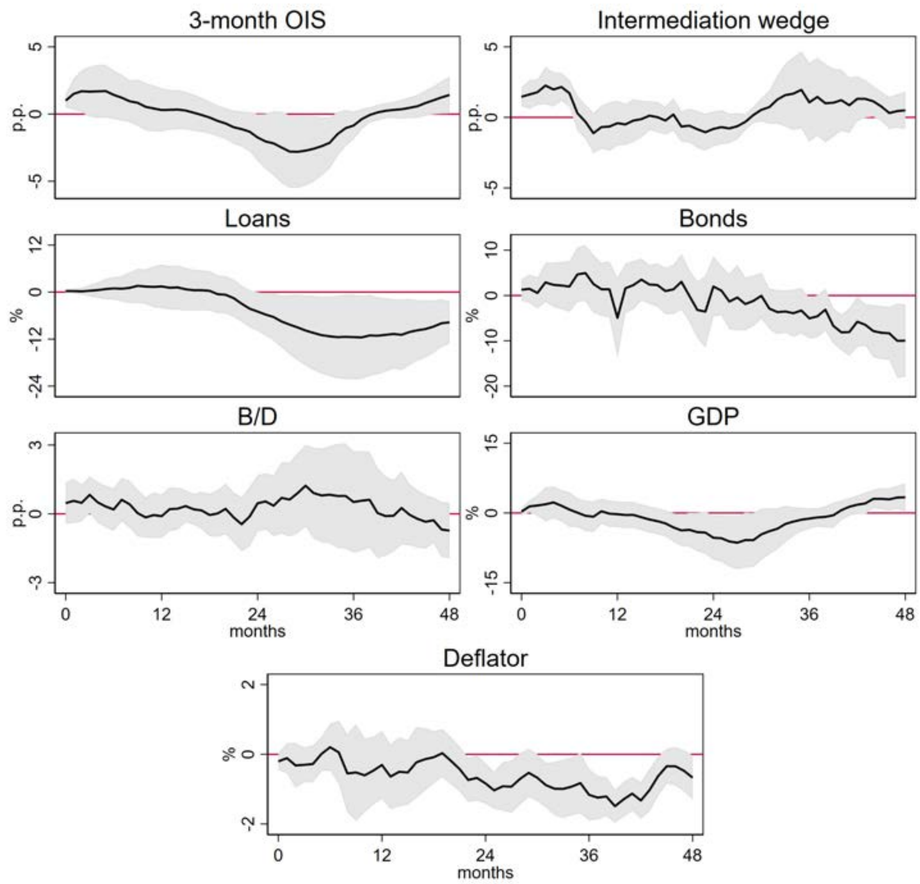
The impulse response functions (IRFs) at the average bond share display the typical transmission patterns of monetary policy shocks (Figure 6). The short-term policy rate responds contemporaneously to the tightening shock and builds up gradually to reach a peak of 1.7 percentage points after five months; it then reverts and shows some temporary undershooting, which is also a common feature in many macro models. Loan spreads respond more forcefully than bond spreads, thus giving rise to an increase in the intermediation wedge between these debt financing instruments at the early stages of transmission, which then fades out seven months after the shock.[16] Loans and bonds both contract in response to the policy tightening, with the coefficient on loans turning significant around two years after the shock and the transmission to bonds exhibiting a somewhat longer lag. At the same time, the response path of the bond share remains insignificant at almost all horizons, implying that the two financing instruments fall in roughly equal proportions.

The drop in credit is also accompanied by falls in real GDP and prices. GDP declines gradually, with the point estimate turning significant nineteen months after the shock and reaching a trough of -6.4% twenty-seven months later, before converging back to its initial level.[17] The price level, measured by the GDP deflator, responds with a lag relative to activity, which is also in line with typical transmission regularities. The trough response of the deflator is -1.5% and is reached after 39 months. Overall, our estimates are broadly in line with the related literature, also from a quantitative perspective. For instance, scaling the GDP response to a shock leading to a 100 basis point (bps) peak increase in the OIS rate, we obtain a trough effect of -3.8%, which falls within the upper part of the range of estimates for real activity in the US context, as reviewed by Ramey (2016). The corresponding trough in the deflator, of -0.9%, points to a fairly muted transmission to prices, compared to the transmission to real activity.

[16] For some variables and horizons, the average responses as well as the responses conditional on the bond share are not statistical significant (see also Section 4.2). In part, this reflects the different timing of the transmission to these variables.

[17] The insignificant point estimates in the initial horizons conform with the standard notion that monetary policy transmits to the economy with a lag; the eventual fading out of the monetary policy effect on activity, in turn, is consistent with monetary neutrality; see Lucas Jr. (1995) for a review. Likewise, the slight overshoot of GDP at the end of the IRF horizon, as visible from Figures 6 and B.2 and Table B.6, constitutes a puzzle that however also arises in parts of the related literature (see Ramey (2016) for a discussion). Besides replicating familiar patterns from the related literature, these findings are also robust to a wide range of specification tests (see Section 5) and the statistical power of the estimates increases further for economies in the lower part of the bond share distribution (see Section 4.2).

Figure 6: Impulse responses at average bond share (baseline).



Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

The relative price and quantity adjustments in the financing variables yield relevant insights into the channels driving the response patterns of different debt instruments. The increasing intermediation wedge is consistent with the literature on the bank lending channel of monetary policy transmission. This literature predicts the cost of loans to rise relative to the cost of bonds in response to a monetary policy tightening due to a stronger supply response in the former than in the latter debt instrument (Kashyap and Stein (1994)). However, the results point to another channel that goes beyond the supply response emphasised in the bank lending view: if supply were the only channel driving the transmission of the shock, not only the cost of loans would rise more than the cost of bond finance, but also the volume of loans would contract by more than the volume of bonds; to instead rationalize the joint occurrence of differential cost- and similar quantity-adjustments, also the demand for loans has to shift in the opposite direction than the supply of loans. This demand substitution channel in turn is consistent with the greater value that borrowers attach to the flexibility of loans in tighter monetary conditions, when economic prospects and valuations soften (Bolton and Freixas (2006)).

4.2. Heterogeneity in transmission

As we show next, the patterns of monetary policy transmission strongly depend on the corporate debt financing structure prevailing prior to the shock. As visible for selected horizons in Table 2, the coefficient on the interaction term (β_h in equation (1)) points to a statistically significant influence of the corporate bond share on how monetary policy affects key outcome variables (Tables B.1 to B.6 and Figure B.1 in Appendix B report these estimates for the full set of variables and longer horizons).

In particular, higher initial bond shares are associated with a significant increase in this variable after the shock. For instance, a one percentage point higher initial bond share goes along with a 0.416 percentage point stronger bond share response after three months. This impact builds up further at later horizons and remains highly significant. Moreover, as the initial bond share rises, the contractionary impact of the shock on GDP is dampened, as apparent from significant positive coefficients on the interaction term from horizon six on. At that horizon for instance, a one percentage point increase in the bond share goes along with a 0.344 percentage point weaker GDP contraction, and also this coefficient becomes larger and more significant towards the outer parts of the IRF horizon.[18]

[18]For changes in loan volumes as well as the GDP deflator the interaction term is not statistically significant. The impact multiplier of the shock on the policy rate is slightly muted, declining by 0.003 percentage points for a one percentage point increase in the bond share; but the corresponding coefficient is statistically insignificant, thus pointing to a similar initial transmission of the shock for economies with different bond shares. Similarly, the IRFs of the interaction term for the intermediation wedge vary only slightly across the bond share spectrum (see Figure B.1).

Table 2: Baseline estimates for coefficients on monetary policy shock and interaction with bond share.

$Y_{i,t}$		$h=0$	$h=3$	$h=6$	$h=9$	$h=12$	$h=18$	$h=24$
Intermediation	$\beta_{0,h}$	2.729***	4.215***	3.198***	-2.093	-0.770	-0.415	-1.526
wedge		(0.745)	(1.488)	(1.072)	(1.615)	(1.802)	(1.125)	(1.395)
	β_h	-0.131***	-0.078	-0.126**	0.051	0.025	0.008	0.030
		(0.045)	(0.063)	(0.052)	(0.035)	(0.026)	(0.048)	(0.035)
Loans	$\beta_{0,h}$	0.515	0.648	1.766	2.989	2.694	0.600	-9.288*
		(0.561)	(1.689)	(3.222)	(4.949)	(6.329)	(5.700)	(5.613)
	β_h	-0.003	-0.247	-0.366	-0.433	-0.464	-0.507	-0.647
		(0.049)	(0.200)	(0.367)	(0.524)	(0.697)	(0.894)	(1.113)
Bonds	$\beta_{0,h}$	2.389	5.411	3.701	4.747	-9.198	1.850	3.717
		(2.682)	(4.905)	(6.316)	(7.220)	(10.053)	(5.774)	(7.532)
	β_h	0.434	1.499***	0.847	0.879	2.989	0.624	-0.411
		(0.368)	(0.515)	(0.832)	(0.805)	(1.956)	(0.506)	(0.884)
B/D	$\beta_{0,h}$	0.875	1.548*	0.355	0.057	-0.191	-0.094	0.860
		(1.024)	(0.909)	(1.056)	(1.158)	(1.069)	(1.053)	(1.394)
	β_h	0.239	0.416**	0.424**	0.467***	0.557***	0.402**	0.326**
		(0.252)	(0.207)	(0.178)	(0.177)	(0.175)	(0.157)	(0.154)
GDP	$\beta_{0,h}$	0.545	3.481	1.363	-1.504	-0.502	-4.175	-9.979*
		(0.906)	(4.197)	(4.222)	(3.723)	(3.143)	(3.195)	(5.419)
	β_h	-0.110	0.130	0.344*	0.392*	0.257	0.434***	0.557***
		(0.087)	(0.089)	(0.193)	(0.228)	(0.173)	(0.156)	(0.203)
	N	1,965	1,935	1,905	1,875	1,845	1,785	1,725

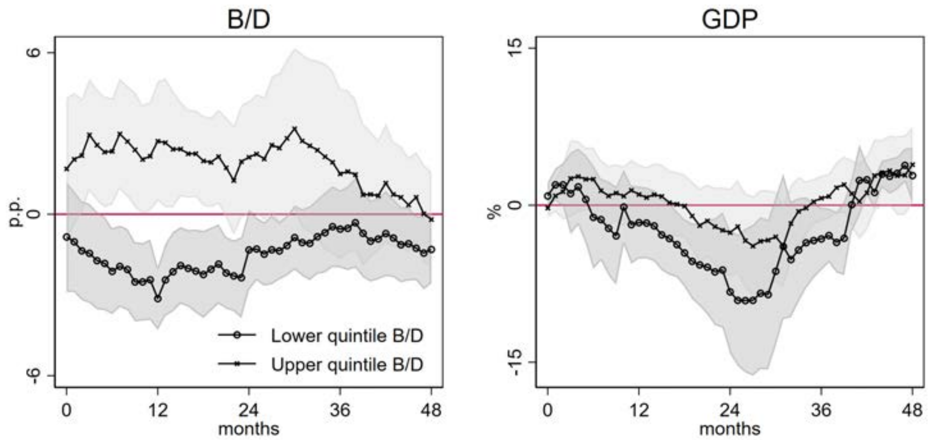
Note: The Driscoll and Kraay (1998) standard errors are given in parenthesis. ***/**/* indicate the 1%/5%/10% significance level. Following the notation in equation (1), $\beta_{0,h}$ corresponds to the coefficient on the monetary policy shock and β_h to the coefficient on the interaction of the monetary policy shock with the bond share. The column $Y_{i,t}$ lists the dependent variables, while h refers to the horizon of the IRF. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

To further gauge the economic relevance of these findings, Figures 7 and 8 present the impact of a given monetary policy shock conditional on the bond share in the respective economy.[19] We discuss these results from two complementary angles. The first is to plot the conditional responses over the

[19]Formally, this conditional impact is calculated based on equation 2 and the respective confidence intervals are based on the joint standard errors of $\beta_{0,h}$ and β_0 at each bond share realisation (see *e.g.* equation 8 in Brambor et al. (2006)).

full IRF horizon for specific quantiles of the bond share distribution (Figure 7); the second is to plot these conditional responses over the full bond share distribution for a specific projection horizon (Figure 8).[20] As dependent variables, we focus on the bond share and real GDP since these are the variables exhibiting relevant and significant coefficients on the interaction term. All values are normalized to a 100 bps impact response of the policy rate.[21]

Figure 7: Impulse responses at upper and lower quintile of bond share distribution (baseline).



Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at the respective bond share. The grey area is the 90% confidence interval. B/D denotes the bond share.

For both variables, the transmission of monetary policy shocks exhibits relevant heterogeneity across the bond share spectrum. At low initial bond shares, the monetary policy tightening shock induces a further contraction in bonds relative to overall credit volumes, which turns significant after five

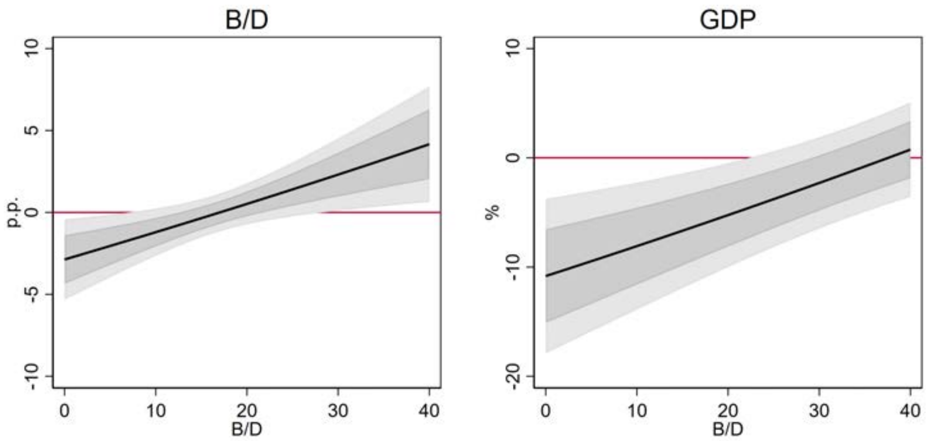
[20]For the former exercise, we choose the upper and lower quintiles so as to capture the outer parts of distribution, while avoiding extremes. For the latter exercise, we choose $h = 24$ as the horizon, since most of the transmission has materialized by that time; the range of bond shares over which we evaluate the conditional responses in Figure 8 goes from 0% to 40%; the minimum (maximum) bond share over the sample is 1.3% (38.3%), but for presentational reasons we slightly extend the range.

[21]The impact response in the policy rate may vary at the respective bond share which leads to the slight non-linear shape in the graphs (see *e.g.* Figure 8).

months and reaches a trough of 3.1 percentage points in the lower quintile (Figure 7, left panel). The opposite response emerges for economies in the upper part of the distribution in which the bond share expands in response to the shock (with a roughly similar timing and strength as in the lower quintile). The transition from negative to positive conditional effects arises in the vicinity of the average bond share, standing at around 20% (Figure 8, left panel).

Likewise, the GDP response exhibits strong heterogeneity across the bond share distribution. Economies in the lower quintile experience a pronounced and significant contraction in response to the shock. By contrast, the IRF for the upper quintile is shallower and the point estimates are insignificant throughout the horizon (Figure 7, right panel); the finding of insignificant monetary policy effects on output concentrates at the upper end of the bond share spectrum however (Figure 8, right panel).[22]

Figure 8: Impulse responses across bond shares (baseline).



Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at each point of the bond share. The response horizon is $h = 24$. The light (dark) grey area is the 90% (68%) confidence interval. B/D denotes the bond share.

[22]While this finding is striking, it is based on coefficients that are uniform across observations, whereas heterogeneity in the estimated impact solely results from applying these uniform coefficients to different values of the bond share as the conditioning variable. Thus, it is not possible to infer from Figure 8 that monetary policy shocks do not affect output in specific economies at the upper end of the spectrum of bond shares as the uniform coefficients may not capture all aspects of heterogeneity across economies.

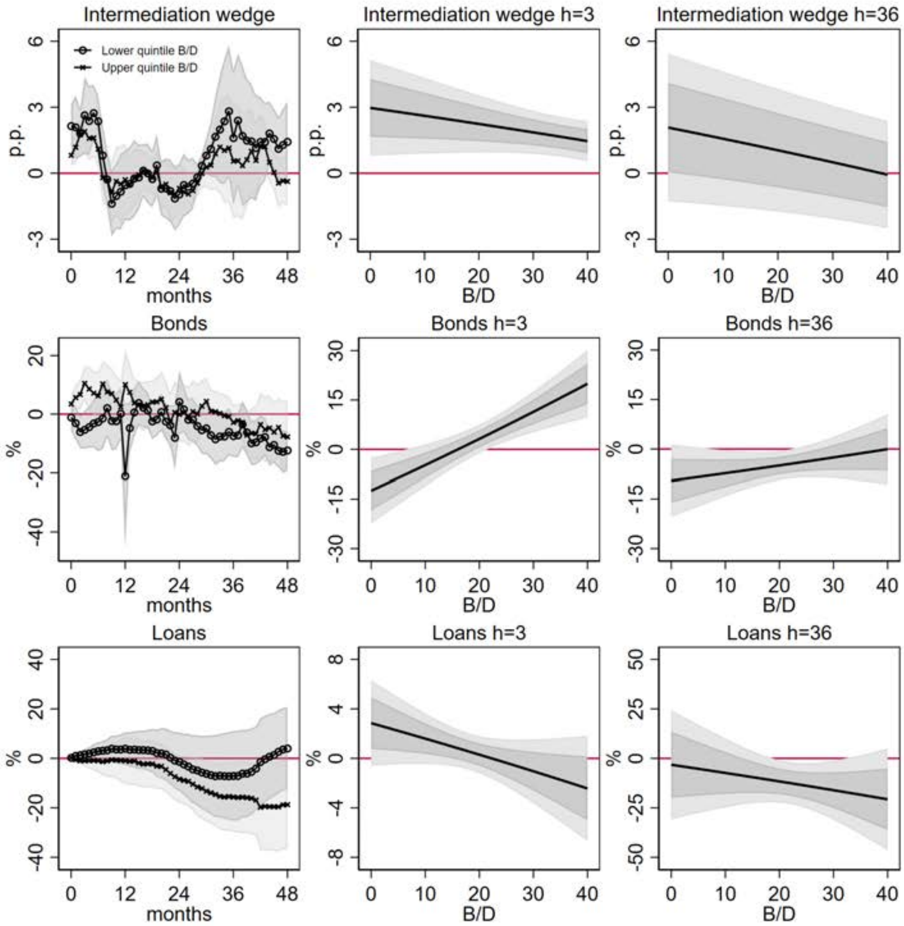
4.3. Mechanisms

To understand the mechanisms underlying these findings, we consider two additional pieces of evidence. First, we study how the costs of the different debt financing instruments respond to monetary policy shocks. Second, we estimate separate impulse response functions for corporate bond and loan volumes to disentangle the dynamics of the bond share. Together, these relative price and quantity adjustments to monetary policy shocks allow us to gauge the importance of supply shifts versus substitution effects conditional on the corporate debt financing structure of the economy.

Economies over the entire bond share distribution experience a pronounced and swift increase in the cost of loans relative to bonds in the early stages of transmission (see IRFs for intermediation wedge in Figure 9). While the rise in the intermediation wedge is slightly faster and steeper in economies with low bond shares, the gradient along the bond share distribution is fairly flat. However, the rising intermediation wedge still has different implications across economies. This is because, by definition, a larger part of corporate credit is remunerated at the loan than at the bond rate in economies with a low bond share.[23] As a consequence, even an equal increase in the intermediation wedge induces a stronger effective tightening in firm financing conditions in such economies.

[23]The middle column of Figure 9 focuses on the third month after the shock to reflect that the transmission of monetary policy to financial variables tends to precede its transmission to the economy; other months in the early parts of the IRFs yield similar patterns. As visible from the coefficients on the interaction term for the intermediation wedge in Table 2, significant differences across the bond share spectrum indeed concentrate in the early IRF horizons. When subdividing the intermediation wedge into the loan- and bond-spread, similar patterns arise for the interaction term, while both cost measures exhibit a sluggish response to the shock, as visible from the negative coefficients at the early horizons for the average bond share (Table B.5).

Figure 9: Impulse responses at selected bond shares and horizons (baseline).



Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at each point of the bond share. *Left column:* The grey area is the 90% confidence interval. *Middle and right column:* The light (dark) grey area is the 90% (68%) confidence interval. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Together with the quantity adjustments of the two financing instruments, the adjustment in the intermediation wedge sheds light on the relevance of different transmission channels across the bond share distribution. In the upper (lower) parts of the distribution, bond (loan) volumes expand, especially at the initial horizons and the shock fades out after three years (Figure 9, second and third row). This pattern is consistent with the comparative advantages of different financing instruments. As emphasised in the related literature, bond finance is less susceptible to monetary-policy induced credit supply shifts, whereas bank lending offers greater flexibility and this feature may become more valuable in tighter financial conditions (Section 1). In economies with a sizeable share of bond finance, firms make use of this financing instrument as a 'spare tire' to counteract the credit contraction due to the inward shift in loan supply. In economies with a low share of bond financing, firms instead face a more limited scope to replace bank loans with bond finance; and, consequently, the demand substitution towards bank loans, as a more flexible form of credit, dominates. This adds to the upward pressure on the intermediation wedge deriving from the relative loan supply contraction; and, consistent with the standard view of monetary policy transmission, the steeper increase in firm financing costs in turn translates into a stronger economic contraction at low than at high bond shares.

4.4. Shocks at longer maturities

Over the past decade, the ECB has systematically expanded its monetary policy toolkit to address impairments in monetary policy transmission and inject additional accommodation. As a key constituent of this expanded toolkit, the ECB has increasingly relied on asset purchases. The related literature has documented that the financial market impact of asset purchases concentrates in different segments of the yield curve than conventional policy rate shocks (Gürkaynak et al. (2005) and Swanson (2021)). The latter primarily affect the shorter end of the yield curve, whereas their impact weakens when moving out on the maturity spectrum (Lane (2019)). Asset purchases instead intervene mainly on longer maturities, where the duration extraction per unit of purchases is higher and local supply effects are likely to be more relevant (Greenwood and Vayanos (2010) and Vayanos and Vila (2021)).

The current section thus explores whether the interaction between transmission and financing structures differs with the type of monetary policy shock hitting the economy. This distinction allows us to link our findings to a growing literature suggesting that conventional and unconventional monetary policies differ in their effects on loan versus bond finance (see, *e.g.*, Lhuissier and Szczerbowicz (2018)).[24]

[24]As a further exercise, we tested for asymmetries in the transmission of monetary policy easing versus tightening shocks (results available in Appendix B, Figure B.4). The

To reflect these considerations, we extend the baseline specification with a variable capturing the high-frequency surprises in the 5-year Bund rate and its interaction with the bond share among the list of regressors.[25] This choice of maturity follows Lhuissier and Szczerbowicz (2018) and combines two desirable features: first, it approximates the typical average duration of corporate bonds and hence has particular relevance for the incentive to issue this instrument. Second, the 5-year maturity is sufficiently far out on the maturity spectrum to capture most of the impact of Quantitative Easing (QE) type policy shocks.[26] Consistent with the baseline, we also include the corresponding 5-year rate as an additional policy indicator in the model and confirm that it exhibits a significant response to the 5-year shock in the initial horizons.

The results document a distinctly different transmission of the long-rate shock than of the short-rate shock considered in the baseline (Figure 10). Instead of expanding, the bond share in the upper quintile contracts in the initial months after the shock and only recovers towards the end of the horizon. Consistent with the weaker buffering function of bond finance in response to the shock, also the contraction in GDP becomes slightly more pronounced and, in contrast to its response to the short-rate shock, is statistically different from zero at later horizons. The lower quintile does not exhibit any significant response in the bond share and the point estimates for GDP largely cluster around zero.

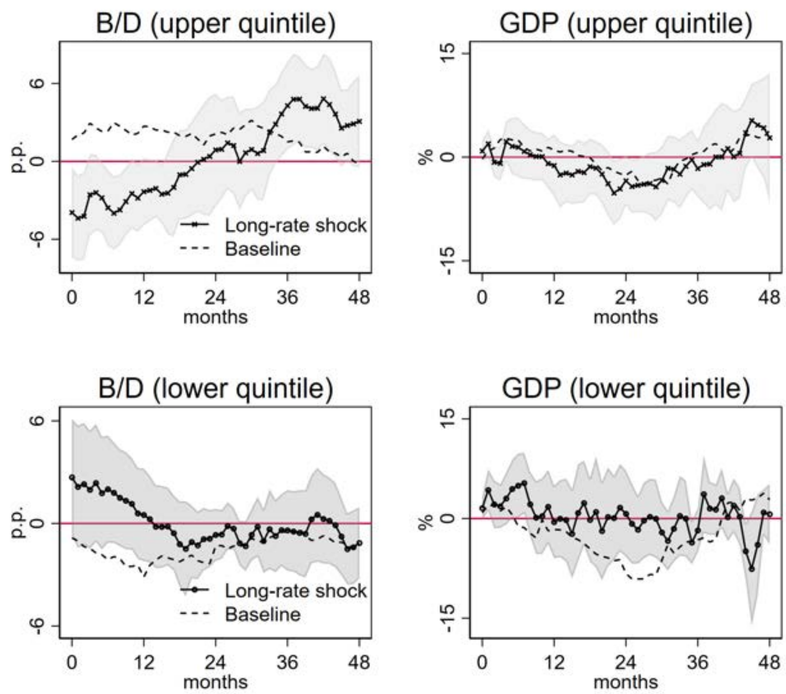
---

resultant point estimates provided some tentative evidence that tightening shocks lead to stronger adjustments in financing volumes and economic activity than easing shocks. But the statistical power of these estimates is low and hence does not permit firm conclusions.

[25]The data are also sourced from the EA-MPD and again discard information shocks as explained in Section 2.2. While, in analogy with the baseline, we could resort to the 5-year OIS rate to derive the monetary policy shock, the respective data are available only from 2011, which is too late to ensure a reasonable model fit.

[26]This is visible, for instance, from Figure 3 in Altavilla et al. (2019), where the relevance of the QE-shock rises only marginally beyond the 5-year rate. We also experimented with a 10-year rate shock, as is done in a later version of the Lhuissier and Szczerbowicz paper. However, this choice did not yield a significant coefficient of the shock for the corresponding policy rate, thus raising concerns about model identification. Moreover, it does not offer the aforementioned close mapping between the shock and the typical maturity of corporate bonds.

Figure 10: Impulse responses at upper and lower quintile of bond share distribution (long-rate shock).



Note: The IRFs are normalized to a 100 bps impact response in the 5-year Bund rate at the respective bond share. The grey area is the 90% confidence interval. The dashed line shows the point estimate from the baseline. B/D denotes the bond share. The IRFs are estimated from a model where the baseline specification has been augmented by the monetary policy surprises in the 5-year Bund rate and interaction with the bond share as well as the 5-year Bund rate in levels.

The patterns in the upper part of the bond share distribution conforms to the intuition that long-rate shocks more directly intervene on the yield curve segments in which the bulk of corporate bond issuance takes place. Therefore, they induce stronger shifts in the respective credit supply conditions than short-rate shocks. The absence of a clear-cut and significant response in the lower parts of the distribution, in turn, is consistent with the notion that the limited relevance of bond finance in the respective economies neutralizes the transmission via bond financing conditions.[27]

[27] It is also worth noting that the estimates for the short-rate shock in this extended

Overall, the results point to an interesting tension between monetary policy shocks transmitting via different yield curve segments. On the one hand, the IRFs in Figure 10 imply that monetary easing shocks arising at longer yield curve segments shift the financing structure towards bonds in economies with a high initial bond share.[28] This result is in line with Lhuissier and Szczerbowicz (2018), who find long-rate easing shocks to raise bond finance while keeping loan volumes unaffected in the US, an economy that would stand at the upper end of the bond share distribution in our sample. Moreover, the result is in line with recent papers on the specific effects of the ECB's CSPP, as the unconventional policy program involving corporate bond purchases, which document its role in supporting bond issuance (Grosse-Rueschkamp et al. (2019); Arce et al. (2020); Betz and De Santis (forthcoming)). On the other hand, our findings for short-rate shocks suggest that increases in the relative reliance on bond finance weaken the transmission of conventional monetary policy, thus pointing to offsetting effects across these different types of shocks. Accordingly, the trend towards a greater role of bond finance in the structure of corporate debt may accelerate in the context of unconventional monetary policy easing measures and raise their effectiveness relative to conventional short-term policy rate changes.[29]

5. Robustness

To test the robustness of our estimates, we modify the baseline specification in three directions. First, we account for changes in the monetary policy environment over the sample period. Second, we control for additional cross-country heterogeneity that may affect monetary policy transmission and may be correlated with the financing structure. Third, we vary the way in which the monetary policy shocks are constructed. As we describe in greater detail

specification are almost identical to the baseline (see Figure B.3). Accordingly, our baseline findings do not appear to be affected by the omitted variable bias that would arise if the short- and long-rate shocks were correlated, but the latter were not included as a separate regressor.

[28] To recall, the IRFs in Figure 10 are calibrated to a tightening shock, but the underlying model is symmetric.

[29] We are grateful to an anonymous referee for suggesting this interpretation and the additional analysis conducted in the current section. It is worth noting that the analysis here also considers long-rate shocks that arose prior to the introduction of unconventional monetary policy, so that the inference is indirect.

below, these modifications leave our main findings intact.

5.1. Changes in the monetary policy environment

As a complement to the distinction between short- and long-rate shocks in Section 4.4, the current section presents two, more agnostic, exercises to account for the pronounced shifts in the monetary policy environment over the sample period. The first is to re-estimate the baseline specification over different subsamples. The second is to test an alternative specification that replaces the 3-month OIS rate with a 'shadow interest rate' to measure the monetary policy stance.

5.1.1. Subsample analysis

To anchor the subsample analysis, we first identify three key inflection points in the monetary policy environment over the sample period and then re-estimate the model excluding observations after that point. This approach allows us to define sufficiently sizeable subsamples to preserve the statistical power of our estimations, while detecting breaks in the estimated relationships based on the comparison between subsample results and the baseline.

As the relevant dates for the sample splits, we select November 2011, August 2014, and February 2016.[30] While in November 2011 the key ECB interest rates were still in positive territory, the ECB in December adopted a set of longer-term refinancing operations, with maturity of up to three years. This was a major departure of previous policy conduct and therefore offers a plausible definition for the start of the period in which the ECB relied on unconventional monetary policies (UMP). The sample split in August 2014 is motivated by two considerations. First, from September 2014 on, market expectations for the ECB to announce a large-scale asset purchase program intensified (De Santis (2020)). The subsequent ECB announcement of its expanded asset purchases program (APP), in turn, constituted a major shift in policy conduct in that asset purchases, which had previously been motivated by transmission impairments. Therefore, the APP became a key tool to steer the stance. The second consideration is that this period was characterised by increasing concerns that the key ECB policy rates were

[30] In terms of implementation, this means that for the first subsample, we discard any observations after November 2011 *etc.*

approaching their effective lower bound (ELB).[31] Hence, this period, at least from a real-time perspective, serves as a plausible definition for the start of the ELB period and thus captures a further relevant shift in the euro area monetary policy environment.[32] The sample split in February 2016 is motivated by the inclusion of corporate bonds in the APP (under the corporate sector purchase program, CSPP), which recent literature finds to have altered the interaction between monetary policy and corporate debt financing structures (Grosse-Rueschkamp et al. (2019); Arce et al. (2020); Betz and De Santis (forthcoming)).

The results point to almost perfect stability in the point estimates for the bond share and GDP across subsamples (see Figure 11(a) and Appendix C for the IRFs from the entire model). For GDP, the gradient from low to high bond shares steepens slightly as the time dimension of the respective subsample lengthens; but the differences are neither statistically significant, nor economically relevant. Taken together, this stability across subsamples is an encouraging signal that our baseline findings are not driven by any particular episodes over our sample period, related for instance to the proximity of policy rates to their lower bound or the presence of specific unconventional monetary policy measures.

5.1.2. Shadow rates

As is standard in the related literature, we use a short-term interest rate as our indicator of the monetary policy stance. While appropriate for the initial years of our sample, this indicator might be an overly narrow representation of the stance over the latter part of the sample, when short-term interest rates approached the ELB and the ECB resorted to unconventional monetary policy measures. To complement the subsample analysis, we therefore test the model in an alternative specification that accommodates this change in policy conduct by including a broader measure of the monetary policy stance in the regressions.

To implement this approach, we combine the 3-month OIS interest rate

[31] In fact, the ECB itself motivated the adoption of the APP by key interest rates being at their lower bound in the respective legal acts; see Decision EU 2015/774, Recital 4.

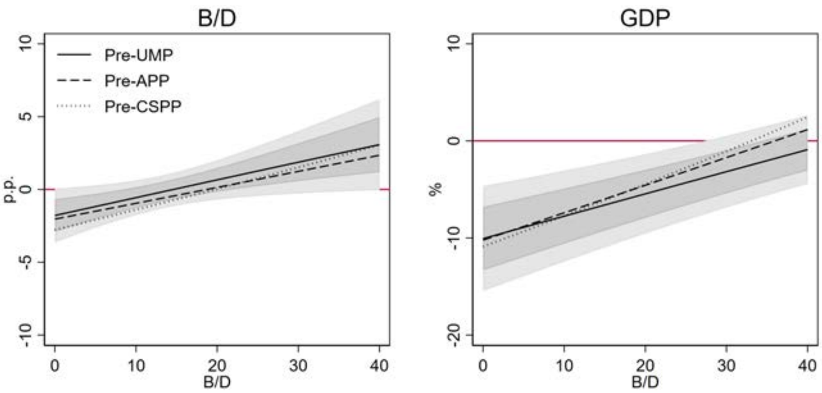
[32] We also experimented with a sample split in December 2014. This split follows an analogous motivation as the split in August 2014, but caters for the possibility that it was the eventual announcement of the APP (rather than its anticipation) that made the difference. This modification did not have any notable impact on the results, however.

with a 'shadow rate' which approximates the short-term interest rate that, based on broader yield curve constellations, would be expected to prevail in the absence of a lower bound. Following Hartmann and Smets (2018), we deploy a summary statistic of five shadow rate estimates, which is less sensitive to the specific model from which each individual shadow rate is derived. Specifically, we extract the first principal component of the euro area shadow rates by Kortela (2016), Krippner (2015), Lemke and Vladu (2017) (using an adaptive and a monotonic lower bound specification), and Wu and Xia (2020).[33] Up until December 2011, which we again define as the starting point of the period in which the ECB engaged in unconventional monetary policy, we use the 3-month OIS rate and afterwards we add the cumulative change from the principal component of the shadow rates to it. This combined measure replaces the policy rate in our baseline model.

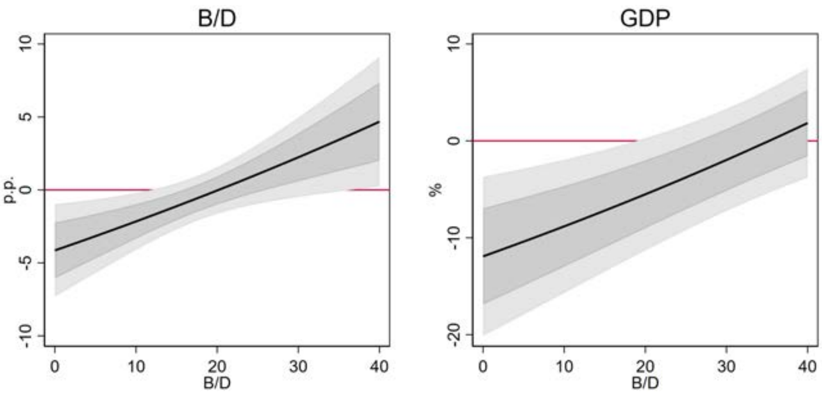
Again, the robustness checks confirm our main findings (see Figure 11(b); the IRFs for the entire model are available in Appendix C). Also when including an alternative policy indicator, the results point to a significant reduction of bonds relative to loans in response to the shock when the bond share is low and an expansion when the bond share is high. The contraction in GDP again becomes smaller for higher levels of the initial bond share and loses significance at the upper end of the spectrum.

[33]Since the measure by Wu and Xia (2020) starts only in September 2004 we extend it with the EONIA rate prior to that.

Figure 11: Impulse responses across bond shares (robustness: monetary policy environment).



(a) Subsamples



(b) Shadow rates

Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at each point of the bond share. The response horizon is $h = 24$. The light (dark) grey area is the 90% (68%) confidence interval. B/D denotes the bond share. In panel (a) the sample for the estimation of "Pre-UMP" / "Pre-APP" / "Pre-CSPP" ends in October 2011 / August 2014 / February 2016. In panel (b) the policy indicator of the baseline model has been exchanged with a shadow rate measure.

5.2. Further sources of cross-country heterogeneity

Our results may be prone to omitted variable bias if countries with high or low bond shares also differ in other aspects that are relevant to monetary policy transmission. In particular, two aspects deserve attention in this regard, the first relating to differences in firm-size structures and the second to the maturity structure of credit.

5.2.1. Firm-size structures

In some euro area countries, such as Germany and France, the universe of firms ranges from small and medium-sized enterprises (SMEs) to very large corporates. In others, especially in Southern Europe, the firm-size structure is instead dominated by SMEs. As typically only large corporates have access to bond markets, these differences are mirrored in the aggregate bond share of each country. At the same time, large and small firms also tend to differ in their response to monetary policy shocks (Gertler and Gilchrist (1994), Oliner and Rudebusch (1996) and Crouzet and Mehrotra (2020)). So the differential transmission of monetary policy shown in Figure 8 may not just reflect differences in the financing structures, but also in firm-size structures.

To account for this, we thus allow the transmission of shocks to differ not only with the bond share but also with the firm-size structure. To this end, we select a set of firm-size proxies and, for each of them, create a dummy variable that equals one if a country's median exhibits a value that is higher than or equal to the sample median and zero otherwise. We then interact the respective dummy with the monetary policy shock and add this interaction along with the dummy variable to the regression equation (1). As firm-size proxies, we use the share of non-financial firms with more than 250 employees in the universe of non-financial firms and, as an alternative, the share of value added of these firms in total value added in the business economy of the respective country.[34]

Our main findings are robust to these model extensions (Figure 12(a) and Figure C.3 in Appendix C for the full set of IRFs). In particular, in both specifications the response of the bond share to a monetary policy shock increases and the contractionary effect of the shock on GDP is attenuated, the higher the bond share prevailing prior to the shock. The estimates are somewhat less precise than in the baseline as, for instance, the expansion in

[34]The data are retrieved from the OECD's Structural Business Statistics data base and are available at annual frequency from 2005 except for Finland, where the first observation is 2006. The latest available data for the share of value added is 2018 for Finland, France, Germany, and Italy, 2017 for Spain and Ireland, and 2016 for Austria, Belgium, Netherlands, and Portugal. For the number of large firms the latest available data is 2018 except for Ireland and Spain where it is 2017.

the bond share at the upper end of the spectrum loses significance. But the baseline patterns overall remain intact, thus suggesting that differences in the firms-size structure across countries do not drive our results.

5.2.2. Maturity of credit

The maturity structure of credit may also affect the transmission of monetary policy (Gertler and Gilchrist (1993) and Christiano et al. (1996)). For instance, a higher share of short-term liabilities may allow firms to more flexibly adjust their external borrowing and hence accelerate the response to a shock compared to a situation in which a large part of the outstanding stock of credit is tied up in long-term contracts. This may be relevant in two ways. First, bonds are typically issued at a longer maturity than bank loans, so the bond share may be correlated with the maturity structure of credit. If the maturity of credit in turn correlates with the dependent variables, this would introduce omitted variable bias. Second, short-term credit is primarily obtained via bank loans, so the maturity composition of loans may drive that of overall credit.[35] At the same time, the maturity profile of credit and loans varies widely across countries. In some countries, including Germany and France, a fairly large share of credit to firms has a medium- to longer-term maturity, whereas in others, such as Italy or Portugal, short-term debt makes up a greater share of lending to firms (the maturity share of loans varies in a similar fashion).

To control for potential differences in transmission arising from this source, we allow the impact of the monetary policy shock to differ not only with the bond share but also with the maturity structure of credit. For this purpose, we subdivide total credit, again defined as the sum of loans and bonds, into its short-term and long-term components, with 'short-term' referring to an initial maturity of up to one year. We then use this breakdown to construct a maturity share variable defined as the share of long-term credit in overall credit. We interact this maturity share variable with the monetary policy shock and add this interaction, together with the maturity share itself, to the baseline regression (equation (1)).[36] Moreover, given the relevance of loans

[35] As much as 87% of short-term debt in our sample are bank loans, but countries exhibit a strong variation in the composition of short-term credit between loans and bonds. In Finland, for instance, the share of bank loans in short-term debt is less than 60% whereas in Austria or Italy short-term debt is almost exclusively made up of bank loans.

[36] Up to now, the analysis has defined the loan variable as lending by banks to non-

in short-term debt, we also run a separate set of local projections based on the maturity structure of bank lending, rather than total credit.

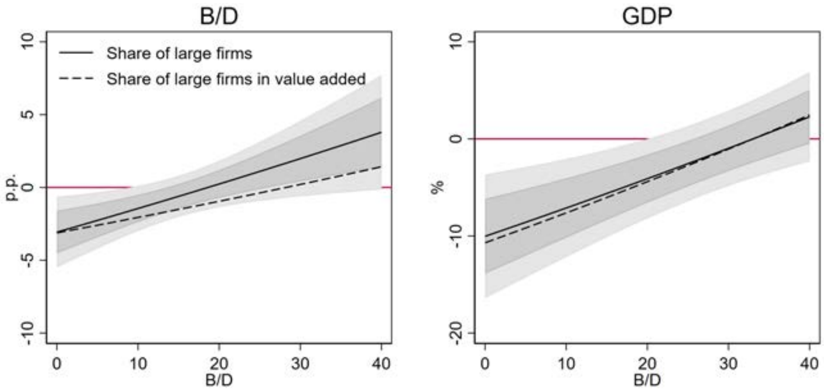
Also these model extensions leave our baseline findings on the relevance of the bond share for monetary policy transmission unaffected (Figure 12(b) and Figure C.4). The response in the bond share again exhibits a contraction at the lower end and an expansion at the upper end of the bond share distribution (the estimates of the bond share are slightly less precise than in the baseline in the lower part); also confirming the familiar patterns from the baseline, the decline in GDP becomes smaller for higher levels of the initial bond share. Very similar results derive from the specification using only the maturity breakdown for bank lending. Hence, the maturity structure of credit does not appear to be a confounding factor in our baseline estimates.

As an interesting aside, this model extension also allows us to study the differential transmission of monetary policy depending on the maturity structure prevailing at the time of the shock: analogous to our baseline results, we trace out the differential response in the maturity share and GDP at the upper and the lower quintile of the maturity share of debt (see Figure 13). Similar to the case of bond versus loan finance, the response of long- versus short-maturity debt depends on the relative composition prior to the shock and is of opposite sign at the different ends of the spectrum: economies with a strong initial reliance on short-term (long-term) debt of the corporate sector reinforce the reliance on shorter (longer) maturities in response to the shock. The differences in the IRFs are, however, slightly less accentuated than for the bond share. For GDP, the point estimates line up closely, albeit with differences in statistical significance in that the GDP contraction around the trough is significant only at the upper and not the lower quintile.

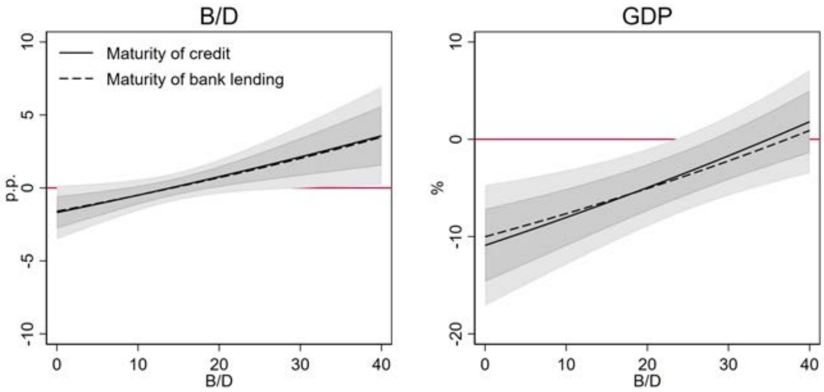
---

financial corporations (NFC) in the same country. This definition of the NFC counterparty sector allows for a precise measurement of cross-country differences in credit conditions. However, the breakdown of loans by maturity is not publicly available for this definition of the counterparty sector and instead refers to lending to NFCs in the entire euro area. Using ECB-internal data, we also ran our model with the maturity share variable computed on loans to domestic NFCs as the counterparty sector and found very similar results. As a further contrast to the baseline loan variable, the loans by maturity are not adjusted for cash pooling, sales, and securitization. Also here, we checked whether this difference is likely to matter for our results by estimating our baseline model using aggregate loans data that is not adjusted for these items and found our main results to be unaffected.

Figure 12: Impulse responses across bond shares (robustness: cross-country heterogeneity).



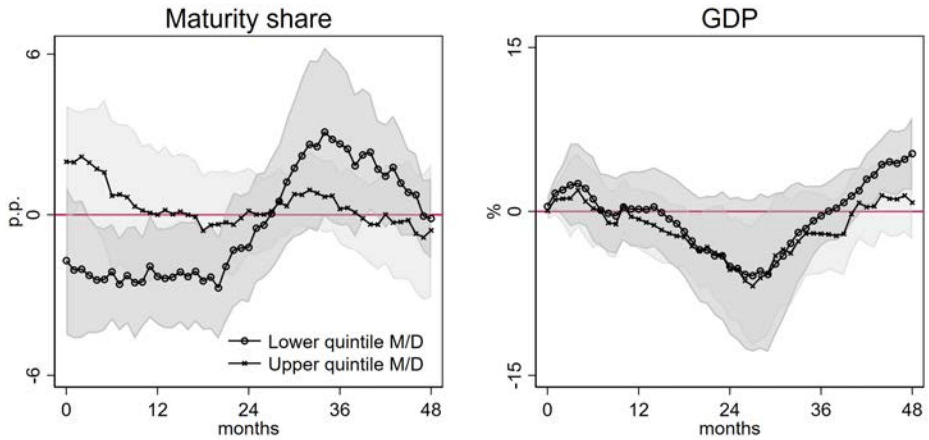
(a) Firm-size structures



(b) Maturity structure

Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at each point of the bond share. The response horizon is $h = 24$. The light (dark) grey area is the 90% (68%) confidence interval. B/D denotes the bond share. For the estimates of "Share of large firms" ("Share of large firms in value added") in panel (a) the baseline model has been augmented by a dummy variable that is equal to one if the time-series median of a country's share of large firms in the total number of firms (share of value added by large firms in total value added of the business economy) is above the sample median and the interaction of this dummy with the monetary policy shock. For the estimates of "Maturity of credit" ("Maturity of bank lending") in panel (b) the baseline model has been augmented by the share of short-term debt in total debt (the share of short-term loans in total loans) and the interaction of this share with the monetary policy shock.

Figure 13: Impulse responses at upper and lower quintile of maturity share distribution.



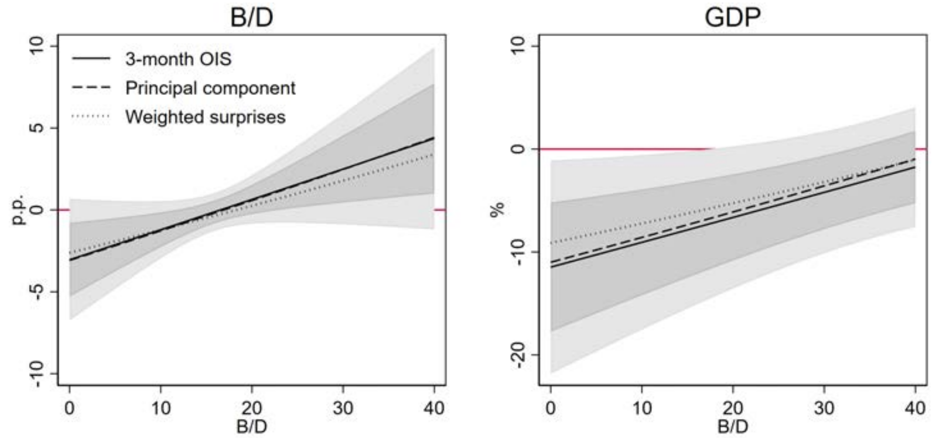
Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at the respective maturity share. The grey area is the 90% confidence interval. M/D denotes the maturity share. The IRFs are estimated from a model where the baseline specification has been augmented by the share of short-term debt in total debt and the interaction of this share with the monetary policy shock.

5.3. Alternative monetary policy shocks

As a final robustness check, we modify the construction of monetary policy shocks based on high-frequency surprises. Section 2.2 describes how we discipline our choice of the 1-month OIS rate surprises as the measure of monetary policy shocks in our baseline estimations. To make sure that this choice does not impact our findings, we also test alternative measures. First, we vary the maturity of the shock, by instead: *(i)* using surprises in the 3-month OIS rate, which directly corresponds to the policy indicator in the model; and *(ii)* in line with Nakamura and Steinsson (2018), constructing a composite measure based on the first principal component of the surprises in the 1-week, 1-month, 3-month, 6-month, 1-year, and 2-year OIS rates. Second, we change the way we aggregate daily surprises to monthly frequency: in the baseline, the shock in each month consists of the unweighted sum of surprises taking place over this period; but a monetary policy event that takes place at the beginning of the month has more time to propagate to other variables than a decision that is dated at the end of a month; to ensure that our baseline aggregation approach does not disregard relevant information, we thus construct weighted shocks, as proposed by Gertler and Karadi (2015), that reflect the timing of the monetary policy event. In particular, for each month, we construct the weighted average of the surprise in the 1-month OIS rate from the current and the previous month with the weights reflecting the number of days that have elapsed within each month up until the policy event relative to the total number of days in the month.[37]

The alternative approaches to construct monetary policy shocks yield very similar point estimates as the baseline, while exhibiting slightly lower precision (see Figure 14). Taken together, we can therefore also rule out that our particular approach to construct policy shocks determines our findings.

Figure 14: Impulse responses across bond shares (robustness: alternative monetary policy shocks).



Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at each point of the bond share. The response horizon is $h = 24$. The light (dark) grey area is the 90% (68%) confidence interval. B/D denotes the bond share. For the estimates of "3-month OIS" / "Principal component" / "Weighted surprises" the monetary policy shock is identified through changes in the 3-month OIS rate / the first principal component of the 1-week to 2-year OIS rate / the time-weighted 1-month OIS rate.

[37] As a concrete example: policy events took place on 12 September 2019 and on 24 October 2019. The value for the weighted policy shock for October 2019 is computed as 24/31 times the plain shock recorded in September plus 7/31 times the plain shock recorded in October. Further, by including lagged values of the weighted shock in the estimations, we purge them from the serial correlation that this weighting scheme introduces; see also Ramey (2016) for a discussion of this issue.

6. Conclusion

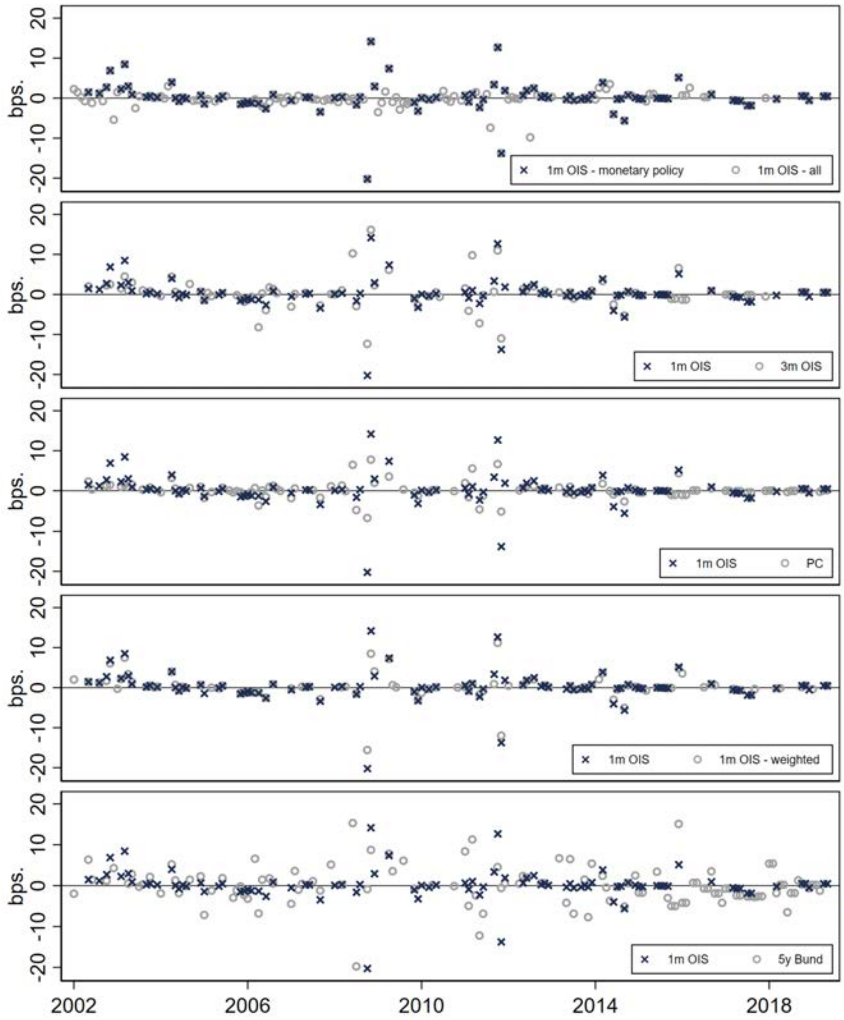
This paper studies how the relative role of corporate bonds and bank loans in the debt structure of firms affects the transmission of monetary policy shocks to the economy. To this end, we estimate local projections and allow the impact of these shocks on firm credit and economic activity to differ with the relative share of bond finance in the respective economy. The results point to corporate debt financing structures as an important factor shaping monetary policy transmission. In particular, we find that a higher share of bond finance in the economy attenuates the transmission of short-term interest rate shocks to credit conditions and real activity. At the same time, the transmission of longer-term interest rate shocks tends to strengthen the higher is the bond share in the economy.

These findings imply that the secular rise in the relative role of bond finance may weaken the effectiveness of conventional monetary policy, working via short-term policy-rate changes, in steering economic outcomes. As such, they would point to a greater need for monetary policy to rely on unconventional measures that more directly intervene on longer yield curve segments, even when short-term rates are not constrained by their lower bound. Moreover, the findings imply that cross-country heterogeneity in financing structures leads to an uneven incidence of these different types of policy measures across the euro area constituent economies. This constellation may allow for a more precise tailoring of policy to the specific conditions of these economies, whenever they differ due to asymmetric economic shocks and structures. But it may also complicate efforts to ensure a broadly uniform monetary policy stance throughout the euro area once economic convergence across countries is sufficiently advanced to render such asymmetries unimportant, whereas financing structures remain uneven.

Accordingly, cross-country convergence in economic and in financial structures appear as complementary goals that may benefit from a broadening of firm access to direct market finance, as envisaged in the context of the EU Capital Markets Union. And this conclusion may be reinforced by the resultant diversification gains that strengthen the resilience of corporate finance to potential constraints emerging in bank-intermediated credit.

Appendix A. Additional data details

Figure A.1: Time series of shocks.



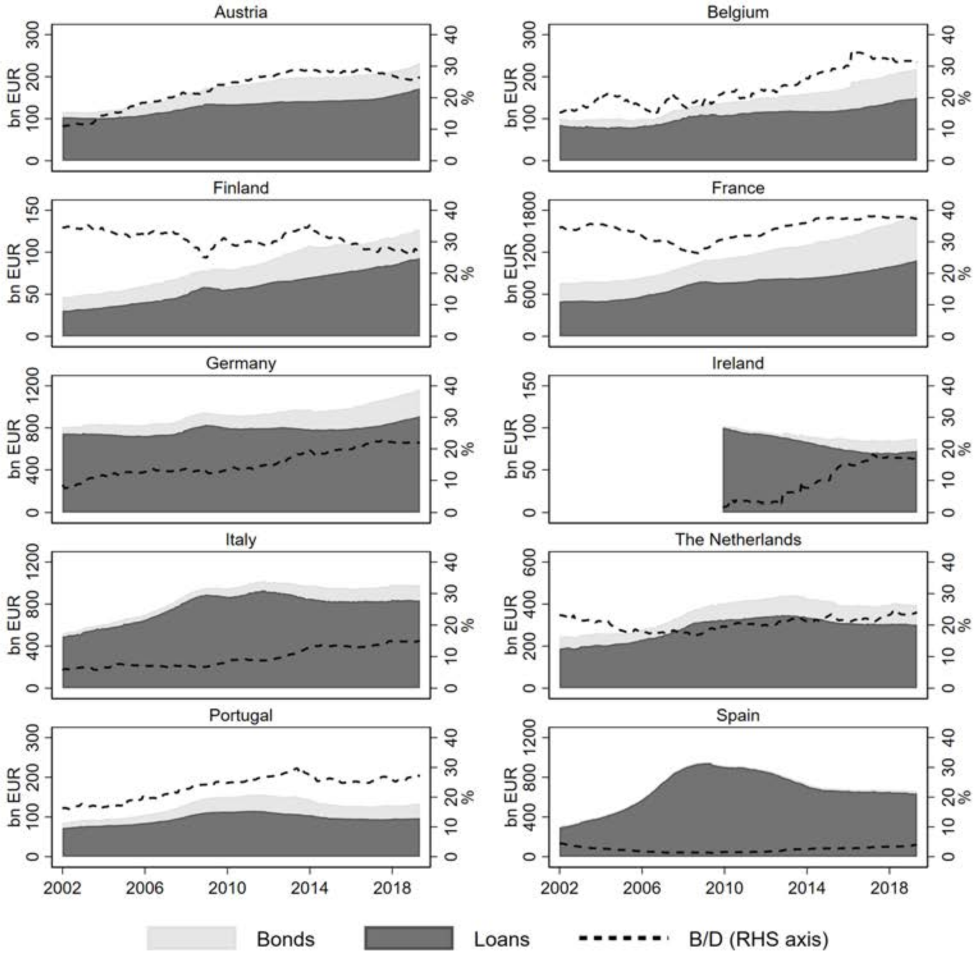
Note: All shocks except '1m OIS - all' have been identified through the cross-asset correlation of the surprises in the respective interest rate and the stock price. The series with the x-marker represents the shock from our baseline model. For presentation purposes, zero values are not shown.

Table A.1: Detailed data overview.

Variable	Description and transformation	Source
Monetary policy shocks		
Short-term rate shock	High-frequency surprises of 1-month OIS rate; identified through negative cross asset correlation of surprise of rate and Eurostoxx index; daily surprises summed over the month	EA-MPD by Altavilla et al. (2019)
Long-term rate shock	Analogous to short-term rate shock using the surprises of the 5-year Bund rate	EA-MPD
Dependent variables		
Policy rate (short-term)	3-month OIS rate; average of daily observations over the month	Reuters
Risk-free rate (long-term)	5-year German Bund rate; average of daily observations over the month	Reuters
Real GDP	Interpolated real GDP; interpolation based on monthly industrial production (ex. construction) using Chow and Lin (1971) method; seasonally adjusted; series enters in log-levels	SDW (GDP: *MNA.Q.Y.?.W2.S1.S1.B.B1GQ._Z._Z._Z.EUR.LR.N*), Eurostat (IP: *STS_INPR_M*)
GDP deflator	Interpolated GDP deflator; interpolation based on monthly HICP index using Chow and Lin (1971) method; seasonally adjusted; series enters in log-levels	SDW (HICP: *ICP.M.?.N.000000.4.INX*), Eurostat (deflator: *TEINA110*)
Loans to non-financial corporations (NFCs)	Notional stocks of lending to domestic NFCs; computed from change in outstanding amount (stock) due to financial transactions (flow); from 2003 onward, adjusted for securitization, cash pooling, and sales; seasonally adjusted; series enters in log-levels	SDW (stock: *BSI.M.?.N.A.A20T.A.1.U6.2240.Z01.E*; flow: *BSI.M.?.N.A.A20T.A.4.U6.2240.Z01.E*)
Bonds issued by NFCs	Notional stocks of debt securities issued by NFCs; computed from change in outstanding amount (stock) due to financial transactions (flow); seasonally adjusted; series enters in log-levels	SDW (stock: *SEC.M.?.1100.F33000.N.1.Z01.E.Z*; flow: *SEC.M.?.1100.F33000.N.4.Z01.E.Z*)
Bond share	Share of bonds in total debt (sum of bonds and loans to NFCs)	
Intermediation wedge	Difference of loan spread and bond spread	
Loan spread	Bank lending rate for loans to corporations on new business (available at monthly frequency) minus 1-year OIS rate (average of daily observations over the month)	SDW (*MIR.M.?.B.A2A.A.R.A.2240.EUR.N*)
Bond spread	Aggregate of spreads on individual bonds issued by NFCs (bond yield minus OIS rate of similar duration) purged of bond- and issuer-specific characteristics	De Santis (2018)
Control variables		
Real GDP (EA)	*(see GDP)*	*(see GDP)*
GDP deflator (EA)	*(see GDP deflator)*	*(see GDP deflator)*
EUR-USD exchange rate	Average of daily observations over the month	SDW (*EXR.M.USD.EUR.SP00.E*)
Commodity price index	All Commodity Price Index; base year 2015; seasonally adjusted; series enters in log-levels	IMF
CISS bond market sub-index	Composite Indicator of Systemic Stress (CISS) contribution from bond market subindex; average of weekly observations over the month	SDW (*CISS.D.U2.Z0Z.4F.EC.SS_BM.CON*)
Bank capitalization	Banks regulatory capital as share of risk-weighted assets; until 2017 the Worldbank Global Financial Development data is used; afterwards the series is extrapolated using the rate of change of the ECB's Supervisory Banking Statistics; annual data linearly interpolated to monthly frequency	Worldbank (*GFDD.SI.05*), SDW (*SUP.Q.?.W0._Z.I4008._T._Z._Z._Z._Z.PCT.C*)
Bank concentration	Herfindahl index of concentration among credit institutions measured via total assets; annual data linearly interpolated to monthly frequency	SDW (*SSI.A.?.122C.H10.X.U6.Z0Z.Z*)

Note: SDW refers to the ECB Statistical Data Warehouse. The data identifier is stated whenever available. A "?" in the identifier is to be replaced with the two-letter country code.

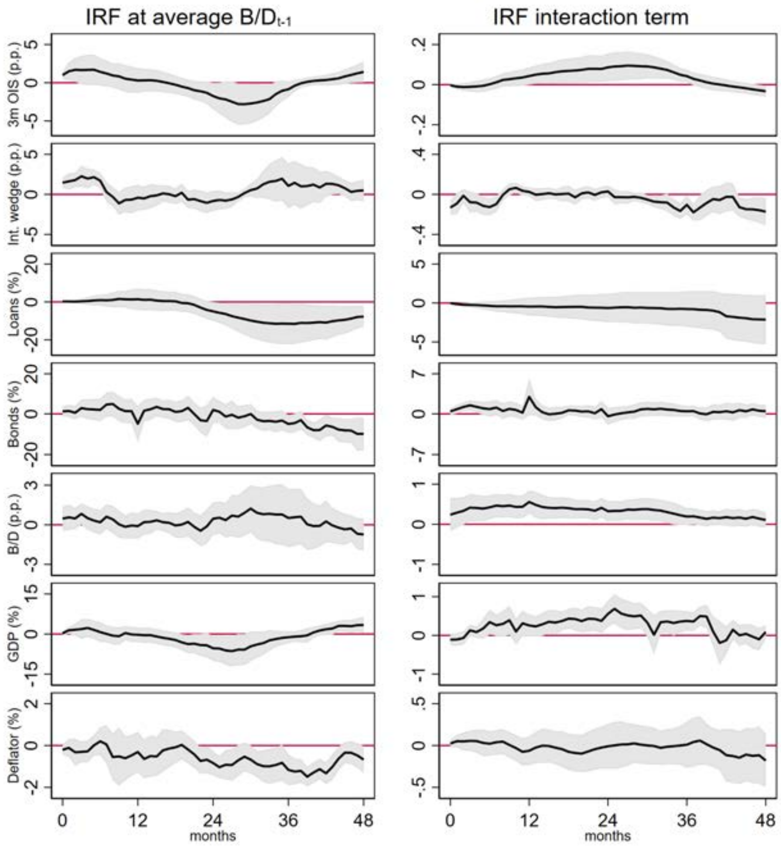
Figure A.2: Outstanding stock of credit and bond share across countries.



Note: B/D denotes the bond share. Bonds and loans are the notional stocks. The bond share is computed relative to the sum of loans and bonds. Data for the notional stock of bonds for Ireland is available from December 2009 onward.

Appendix B. Additional figures and tables (baseline)

Figure B.1: Baseline impulse responses.



Note: The IRFs in the left column are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Table B.1: Regression coefficients (baseline – 1).

	3-month OIS				Intermediation wedge			
	$h = 0$	$h = 9$	$h = 12$	$h = 24$	$h = 0$	$h = 9$	$h = 12$	$h = 24$
shock^{IR}	1.868***	1.565	0.557	-3.254*	2.729***	-2.093	-0.770	-1.526
	(0.577)	(1.963)	(1.825)	(1.959)	(0.745)	(1.615)	(1.802)	(1.395)
shock^{IR}*L.B/D	-0.003	0.027	0.043	0.086**	-0.131***	0.051	0.025	0.030
	(0.004)	(0.022)	(0.026)	(0.042)	(0.045)	(0.035)	(0.026)	(0.035)
L.shock^{IR}	0.576	0.789	0.301	-3.032	0.546	0.055	-0.416	-1.201
	(0.482)	(2.056)	(1.966)	(2.440)	(0.777)	(1.259)	(1.739)	(1.064)
L2.shock^{IR}	0.113	-0.369	0.027	-1.952	-0.105	0.471	1.004	-0.243
	(0.196)	(1.406)	(1.524)	(2.030)	(0.768)	(0.860)	(1.182)	(0.969)
L.shock^{IR}*L2.B/D	-0.007*	0.047*	0.067*	0.094**	-0.010	0.107***	0.024	-0.030
	(0.004)	(0.028)	(0.035)	(0.039)	(0.041)	(0.039)	(0.039)	(0.044)
L2.shock^{IR}*L3.B/D	-0.001	0.043*	0.057*	0.072**	0.081**	0.053	0.005	-0.023
	(0.003)	(0.024)	(0.031)	(0.032)	(0.035)	(0.034)	(0.033)	(0.044)
L.3-month OIS	1.688***	0.606	0.499	-0.760	0.557***	-1.520***	-0.506	-0.315
	(0.078)	(0.989)	(0.915)	(0.547)	(0.207)	(0.551)	(0.488)	(0.686)
L2.3-month OIS	-0.707***	-0.128	-0.229	0.141	-0.573***	1.318**	0.278	-0.032
	(0.081)	(0.928)	(0.824)	(0.563)	(0.205)	(0.514)	(0.552)	(0.592)
L.Intermediation wedge	0.013*	0.013	-0.011	-0.102	0.888***	0.219***	0.122*	-0.036
	(0.007)	(0.052)	(0.061)	(0.068)	(0.053)	(0.070)	(0.072)	(0.049)
L2.Intermediation wedge	-0.013*	-0.109*	-0.160*	-0.095*	-0.053	-0.058	-0.059	0.079
	(0.007)	(0.059)	(0.087)	(0.048)	(0.081)	(0.082)	(0.078)	(0.093)
L.Loans	0.003	0.083***	0.080***	0.052*	-0.000	-0.059	-0.086**	-0.053
	(0.003)	(0.028)	(0.028)	(0.030)	(0.013)	(0.037)	(0.042)	(0.051)
L2.Loans	-0.003	-0.082***	-0.081***	-0.068**	0.001	0.059	0.082*	0.050
	(0.003)	(0.027)	(0.028)	(0.030)	(0.013)	(0.038)	(0.042)	(0.054)
L.Bonds	-0.000	-0.001	-0.001	-0.009*	0.000	0.003	0.002	-0.000
	(0.000)	(0.002)	(0.002)	(0.005)	(0.002)	(0.003)	(0.003)	(0.003)
L2.Bonds	0.000	-0.002	-0.004	0.002	-0.000	-0.002	-0.002	0.001
	(0.000)	(0.002)	(0.002)	(0.003)	(0.002)	(0.005)	(0.004)	(0.003)
L.GDP	0.002	0.017*	0.015	0.001	0.006	-0.008	-0.017	-0.041*
	(0.002)	(0.009)	(0.010)	(0.006)	(0.007)	(0.009)	(0.011)	(0.021)
L2.GDP	-0.001	0.001	0.007	0.014*	-0.007	0.003	0.002	0.007
	(0.002)	(0.007)	(0.007)	(0.008)	(0.008)	(0.011)	(0.011)	(0.012)
L.Deflator	-0.000	-0.041	-0.051	0.057*	-0.028	-0.027	-0.143**	0.002
	(0.004)	(0.034)	(0.038)	(0.033)	(0.032)	(0.047)	(0.061)	(0.071)
L2.Deflator	-0.001	0.020	0.036	-0.002	0.037	0.049	0.203***	0.107
	(0.004)	(0.036)	(0.039)	(0.042)	(0.035)	(0.042)	(0.058)	(0.068)
L.GDP (EA)	-0.002	0.257**	0.189**	0.046	-0.013	-0.085	-0.261**	-0.155**
	(0.016)	(0.111)	(0.073)	(0.099)	(0.039)	(0.085)	(0.118)	(0.061)
L2.GDP (EA)	0.009	-0.168	-0.067	0.238***	-0.004	-0.011	0.165	0.112
	(0.016)	(0.107)	(0.070)	(0.083)	(0.039)	(0.077)	(0.100)	(0.103)
L.Deflator (EA)	-0.054	0.307	0.222	-0.475	-0.183*	0.101	0.256	0.049
	(0.045)	(0.246)	(0.287)	(0.369)	(0.101)	(0.347)	(0.328)	(0.405)
L2.Deflator (EA)	0.049	-0.380	-0.343	0.044	0.196**	-0.059	-0.271	-0.230
	(0.046)	(0.234)	(0.277)	(0.294)	(0.098)	(0.300)	(0.318)	(0.384)
L.EUR-USD	-0.070	0.500	-1.224	-0.173	0.436	-0.431	-2.471	-0.629
	(0.228)	(1.600)	(1.772)	(1.855)	(0.573)	(1.441)	(1.866)	(1.335)
L2.EUR-USD	0.111	-1.126	0.781	1.854	-0.393	-2.221*	-0.389	-2.025
	(0.210)	(1.868)	(1.943)	(2.028)	(0.529)	(1.247)	(1.754)	(1.441)
L.Commodity price index	0.003	0.015	0.002	-0.017	0.007	-0.010	-0.020	0.011
	(0.002)	(0.013)	(0.011)	(0.013)	(0.005)	(0.010)	(0.017)	(0.019)
L2.Commodity price index	-0.003	-0.011	0.002	0.017	-0.008*	0.015	0.029*	0.006
	(0.002)	(0.014)	(0.012)	(0.014)	(0.004)	(0.010)	(0.017)	(0.018)
L.CISS bond market	-1.200*	-7.520**	-10.381***	-10.363***	-0.320	-6.474**	-6.057	10.277
	(0.657)	(3.381)	(3.765)	(3.115)	(1.360)	(2.738)	(3.947)	(6.991)
L2.CISS bond market	0.355	-9.175**	-10.784**	-2.953	-2.199	-3.264	1.177	1.803
	(0.541)	(4.456)	(4.299)	(3.833)	(1.798)	(2.935)	(2.476)	(2.014)
L.Bank capitalization	0.004	-0.302*	-0.305	-0.325	0.115**	-0.359	-0.496*	0.094
	(0.009)	(0.178)	(0.207)	(0.227)	(0.057)	(0.224)	(0.264)	(0.255)
L2.Bank capitalization	-0.009	0.195	0.184	0.276	-0.118**	0.329	0.516**	0.024
	(0.009)	(0.165)	(0.196)	(0.218)	(0.057)	(0.233)	(0.254)	(0.274)
L.Bank concentration	-2.772***	-76.437**	-97.184**	-100.382**	-5.396	-76.928*	-51.189	98.848*
	(1.031)	(30.579)	(38.263)	(47.612)	(4.961)	(42.350)	(36.451)	(54.639)
L2.Bank concentration	2.738***	75.987**	96.767**	101.833**	5.213	77.064*	52.606	-95.125*
	(1.021)	(30.452)	(38.180)	(47.911)	(4.857)	(42.492)	(36.580)	(53.197)
R^2	1.00	0.86	0.84	0.78	0.88	0.51	0.47	0.38
N-obs	1,965	1,875	1,845	1,725	1,965	1,875	1,845	1,725

Note: The Driscoll and Kraay (1998) standard errors are given in parenthesis. ***/**/* indicate the 1%/5%/10% significance level. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Table B.2: Regression coefficients (baseline – 2).

	Loans				Bonds			
	$h=0$	$h=9$	$h=12$	$h=24$	$h=0$	$h=9$	$h=12$	$h=24$
shock^{IR}	0.515	2.989	2.694	-9.288*	2.389	4.747	-9.198	3.717
	(0.561)	(4.949)	(6.329)	(5.613)	(2.682)	(7.220)	(10.053)	(7.532)
shock^{IR}*L.B/D	-0.003	-0.433	-0.464	-0.647	0.434	0.879	2.989	-0.411
	(0.049)	(0.524)	(0.697)	(1.113)	(0.368)	(0.805)	(1.956)	(0.884)
L.shock^{IR}	0.334	-2.211	-2.595	-9.475	2.224	1.020	-7.027	1.639
	(0.612)	(3.832)	(5.415)	(6.168)	(2.602)	(7.579)	(9.983)	(7.287)
L2.shock^{IR}	-0.099	-4.068	-4.372	-9.234	-1.589	8.143	4.251	2.461
	(0.519)	(3.523)	(4.660)	(6.453)	(2.109)	(7.273)	(7.911)	(5.366)
L.shock^{IR}*L2.B/D	-0.167***	-0.671	-0.735	-1.087	0.688**	0.590	1.921	-0.456
	(0.055)	(0.646)	(0.848)	(1.348)	(0.284)	(0.901)	(1.330)	(0.953)
L2.shock^{IR}*L3.B/D	-0.098	-0.274	-0.309	-0.540	0.540	-0.989	0.325	-0.540
	(0.081)	(0.589)	(0.749)	(1.169)	(0.415)	(1.160)	(0.680)	(0.780)
L.3-month OIS	0.104	2.905	3.051	-2.329	-1.055	0.970	1.002	1.661
	(0.172)	(1.779)	(2.675)	(2.539)	(0.890)	(2.152)	(2.532)	(3.207)
L2.3-month OIS	-0.021	-2.656	-3.026	-0.175	1.375	0.596	0.291	-2.465
	(0.172)	(1.639)	(2.447)	(2.486)	(0.961)	(2.497)	(2.794)	(3.116)
L.Intermediation wedge	-0.029	0.010	-0.046	-0.578	-0.046	0.041	-0.231	-1.364**
	(0.036)	(0.172)	(0.218)	(0.456)	(0.161)	(0.536)	(0.566)	(0.636)
L2.Intermediation wedge	0.025	-0.130	-0.290	-0.734	-0.180	-2.289***	-2.611***	-1.790**
	(0.036)	(0.179)	(0.246)	(0.507)	(0.212)	(0.671)	(0.753)	(0.765)
L.Loans	1.114***	2.832***	3.164***	4.532***	-0.010	-0.132	0.215	0.362
	(0.034)	(0.328)	(0.454)	(0.909)	(0.147)	(0.333)	(0.412)	(0.603)
L2.Loans	-0.121***	-1.913***	-2.283***	-3.873***	0.017	0.140	-0.218	-0.409
	(0.034)	(0.326)	(0.453)	(0.889)	(0.145)	(0.322)	(0.387)	(0.544)
L.Bonds	0.002	0.012	0.009	-0.013	0.847***	0.689***	0.544***	0.315***
	(0.004)	(0.012)	(0.018)	(0.030)	(0.160)	(0.135)	(0.113)	(0.107)
L2.Bonds	-0.002	-0.017	-0.021	-0.023	0.115	0.100	0.180**	0.148
	(0.004)	(0.011)	(0.014)	(0.021)	(0.147)	(0.108)	(0.080)	(0.101)
L.GDP	0.010	0.092	0.137*	0.159	0.523*	0.559*	0.115	0.448**
	(0.014)	(0.066)	(0.081)	(0.155)	(0.306)	(0.297)	(0.336)	(0.226)
L2.GDP	0.002	0.032	0.039	0.169*	-0.478	-0.441	-0.025	-0.287
	(0.014)	(0.058)	(0.066)	(0.096)	(0.310)	(0.277)	(0.310)	(0.231)
L.Deflator	0.182***	1.195***	1.504***	2.627***	-0.867	-0.138	-0.610	0.869
	(0.049)	(0.365)	(0.482)	(0.812)	(0.942)	(1.465)	(1.554)	(1.543)
L2.Deflator	-0.156***	-1.055***	-1.325***	-2.147***	0.879	0.561	1.186	-0.024
	(0.048)	(0.339)	(0.434)	(0.758)	(0.964)	(1.630)	(1.826)	(1.723)
L.GDP (EA)	0.089*	0.856***	1.075***	1.562***	-0.452	-1.291**	-1.229*	0.544
	(0.046)	(0.197)	(0.258)	(0.531)	(0.371)	(0.564)	(0.674)	(0.498)
L2.GDP (EA)	-0.015	-0.217	-0.238	0.514	0.240	0.436	0.582	-0.006
	(0.047)	(0.180)	(0.241)	(0.494)	(0.339)	(0.529)	(0.625)	(0.551)
L.Deflator (EA)	-0.241	-1.150*	-1.149	-3.401**	1.045	4.610*	4.561**	0.900
	(0.153)	(0.666)	(0.924)	(1.604)	(0.871)	(2.387)	(2.286)	(2.397)
L2.Deflator (EA)	0.165	0.680	0.595	1.961	-0.679	-3.611	-3.849	-0.758
	(0.151)	(0.648)	(0.889)	(1.562)	(0.794)	(2.503)	(2.464)	(1.960)
L.EUR-USD	-0.126	-0.535	-0.618	1.869	2.252	-3.223	-9.013	-8.355
	(0.606)	(3.134)	(4.425)	(7.841)	(2.961)	(7.871)	(8.305)	(11.995)
L2.EUR-USD	0.291	4.072	6.066	15.099**	-3.386	-12.719**	-12.010	-8.785
	(0.582)	(3.615)	(4.988)	(7.054)	(3.245)	(6.239)	(7.819)	(9.914)
L.Commodity price index	-0.001	0.030	0.032	-0.061	0.037	-0.015	-0.030	0.167
	(0.005)	(0.029)	(0.036)	(0.065)	(0.027)	(0.056)	(0.062)	(0.110)
L2.Commodity price index	0.003	-0.036	-0.046	0.006	-0.037	0.096	0.159**	0.040
	(0.004)	(0.026)	(0.031)	(0.061)	(0.023)	(0.065)	(0.080)	(0.075)
L.CISS bond market	0.783	-5.289	-14.206	-70.786***	-21.322**	-45.652**	-62.754**	1.957
	(1.272)	(6.002)	(9.056)	(21.110)	(9.061)	(21.258)	(27.851)	(21.526)
L2.CISS bond market	-1.451	-17.571*	-26.629**	-40.474**	6.455	27.356	60.077*	10.610
	(1.366)	(8.957)	(12.250)	(19.110)	(8.663)	(17.431)	(34.563)	(25.605)
L.Bank capitalization	0.134	1.549	1.455	0.267	-0.126	-6.205	-5.719	-4.591
	(0.125)	(1.046)	(1.484)	(3.155)	(0.819)	(4.690)	(4.856)	(5.228)
L2.Bank capitalization	-0.140	-1.805*	-1.882	-1.079	0.063	6.806	6.811	6.283
	(0.125)	(1.035)	(1.462)	(3.204)	(0.839)	(4.694)	(4.927)	(5.009)
L.Bank concentration	0.789	-282.368***	-484.111***	-1432.896***	-53.425	222.476	537.757	1386.168**
	(9.863)	(98.907)	(156.849)	(394.460)	(50.016)	(326.026)	(368.130)	(578.537)
L2.Bank concentration	-3.596	253.955***	447.249***	1378.657***	50.425	-229.934	-548.111	-1460.446**
	(9.709)	(97.039)	(154.958)	(397.526)	(49.416)	(334.547)	(380.376)	(604.058)
R^2	1.00	0.98	0.96	0.87	0.99	0.94	0.93	0.88
N-obs	1,965	1,875	1,845	1,725	1,965	1,875	1,845	1,725

Note: The Driscoll and Kraay (1998) standard errors are given in parenthesis. ***/**/* indicate the 1%/5%/10% significance level. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Table B.3: Regression coefficients (baseline – 3).

	Bond share			
	$h = 0$	$h = 9$	$h = 12$	$h = 24$
shock^{IR}	0.875	0.057	-0.191	0.860
	(1.024)	(1.158)	(1.069)	(1.394)
shock^{IR}*L.B/D	0.239	0.467***	0.557***	0.326**
	(0.252)	(0.177)	(0.175)	(0.154)
L.shock^{IR}	0.612	-0.262	-0.301	0.557
	(0.937)	(1.071)	(1.254)	(1.597)
L2.shock^{IR}	0.554	1.027	1.435	1.036
	(0.853)	(0.873)	(1.056)	(1.168)
L.shock^{IR}*L2.B/D	0.292	0.466**	0.553***	0.336**
	(0.262)	(0.185)	(0.184)	(0.164)
L2.shock^{IR}*L3.B/D	0.267	0.333*	0.405**	0.278*
	(0.255)	(0.194)	(0.169)	(0.152)
L.3-month OIS	0.117	-0.129	0.079	0.259
	(0.216)	(0.403)	(0.532)	(0.612)
L2.3-month OIS	-0.276	-0.022	-0.251	-0.389
	(0.214)	(0.418)	(0.536)	(0.580)
L.Intermediation wedge	-0.015	-0.108	-0.118	-0.170*
	(0.064)	(0.083)	(0.084)	(0.086)
L2.Intermediation wedge	-0.090	-0.271***	-0.279***	-0.152*
	(0.062)	(0.084)	(0.071)	(0.087)
L.Loans	0.149**	0.091	0.143	0.072
	(0.062)	(0.114)	(0.124)	(0.134)
L2.Loans	-0.227***	-0.165	-0.216*	-0.139
	(0.061)	(0.112)	(0.121)	(0.126)
L.Bonds	0.082***	0.074***	0.061***	0.045***
	(0.018)	(0.015)	(0.011)	(0.010)
L2.Bonds	0.022	0.015	0.022**	0.009
	(0.018)	(0.013)	(0.009)	(0.009)
L.GDP	-0.012	0.028	-0.007	0.077**
	(0.047)	(0.031)	(0.033)	(0.031)
L2.GDP	0.002	-0.011	0.026	-0.030
	(0.048)	(0.026)	(0.028)	(0.028)
L.Deflator	-0.155	-0.094	-0.170	-0.046
	(0.165)	(0.188)	(0.167)	(0.149)
L2.Deflator	0.272	0.205	0.289	0.150
	(0.167)	(0.213)	(0.201)	(0.222)
L.GDP (EA)	-0.010	-0.184**	-0.234***	-0.140*
	(0.080)	(0.082)	(0.090)	(0.074)
L2.GDP (EA)	-0.018	0.007	0.040	-0.117
	(0.077)	(0.077)	(0.093)	(0.077)
L.Deflator (EA)	0.205	0.607**	0.598**	0.242
	(0.198)	(0.275)	(0.237)	(0.353)
L2.Deflator (EA)	-0.320	-0.584*	-0.583**	-0.108
	(0.199)	(0.329)	(0.274)	(0.255)
L.EUR-USD	-1.068*	-1.543	-2.532*	-1.632
	(0.632)	(1.277)	(1.468)	(1.179)
L2.EUR-USD	-0.200	-2.136**	-1.886	-2.155
	(0.648)	(1.028)	(1.397)	(1.865)
L.Commodity price index	0.015***	-0.007	-0.007	0.030*
	(0.005)	(0.010)	(0.011)	(0.017)
L2.Commodity price index	-0.006	0.026**	0.033***	0.006
	(0.005)	(0.010)	(0.012)	(0.016)
L.CISS bond market	-3.984*	-4.968	-2.901	10.793***
	(2.026)	(3.731)	(4.273)	(3.235)
L2.CISS bond market	-1.713	2.965	5.985*	2.010
	(2.025)	(2.850)	(3.223)	(3.172)
L.Bank capitalization	2.020***	1.510*	1.271	0.084
	(0.431)	(0.852)	(0.914)	(1.007)
L2.Bank capitalization	-2.041***	-1.501*	-1.206	0.093
	(0.434)	(0.817)	(0.867)	(0.975)
L.Bank concentration	87.617**	145.450	247.357*	465.632***
	(43.457)	(138.972)	(135.759)	(174.162)
L2.Bank concentration	-107.049**	-165.926	-268.670*	-499.881***
	(44.037)	(142.071)	(138.670)	(176.405)
R^2	0.85	0.81	0.81	0.79
N-obs	1,965	1,875	1,845	1,725

Note: The Driscoll and Kraay (1998) standard errors are given in parenthesis. ***/**/* indicate the 1%/5%/10% significance level. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Table B.4: Regression coefficients (baseline – 4).

	GDP				Deflator			
	$h=0$	$h=9$	$h=12$	$h=24$	$h=0$	$h=9$	$h=12$	$h=24$
shock^{IR}	0.545	-1.504	-0.502	-9.979*	-0.380	-0.975	-0.570	-1.561**
	(0.906)	(3.723)	(3.143)	(5.419)	(0.279)	(1.574)	(1.098)	(0.655)
shock^{IR}*L.B/D	-0.110	0.392*	0.257	0.557***	0.024	0.007	-0.062	-0.008
	(0.087)	(0.228)	(0.173)	(0.203)	(0.028)	(0.093)	(0.104)	(0.162)
L.shock^{IR}	-0.466	1.040	-0.640	-8.152	0.289	-0.986	-0.065	-1.173
	(1.040)	(3.591)	(3.967)	(6.379)	(0.354)	(1.126)	(0.981)	(0.750)
L2.shock^{IR}	-0.854	-0.138	-0.919	-6.567	-0.106	-0.595	-0.014	-0.802
	(1.064)	(2.981)	(3.511)	(5.129)	(0.579)	(0.945)	(0.962)	(0.610)
L.shock^{IR}*L2.B/D	-0.049	0.287	0.403**	0.828***	0.024	-0.045	-0.057	-0.061
	(0.074)	(0.240)	(0.195)	(0.246)	(0.021)	(0.106)	(0.124)	(0.207)
L2.shock^{IR}*L3.B/D	-0.013	0.407**	0.363*	0.594***	-0.007	-0.080	-0.022	-0.042
	(0.069)	(0.201)	(0.209)	(0.220)	(0.019)	(0.106)	(0.111)	(0.179)
L.3-month OIS	1.583***	-0.602	-0.075	-1.713	-0.199*	-0.166	-0.629*	-0.912***
	(0.340)	(1.916)	(1.718)	(1.427)	(0.117)	(0.257)	(0.326)	(0.218)
L2.3-month OIS	-1.533***	0.572	0.127	1.780	0.194	0.075	0.498	0.468***
	(0.339)	(1.775)	(1.593)	(1.357)	(0.119)	(0.293)	(0.359)	(0.176)
L.Intermediation wedge	-0.085	0.199	0.178	0.016	0.031**	0.078*	0.087	-0.025
	(0.075)	(0.135)	(0.150)	(0.203)	(0.015)	(0.044)	(0.072)	(0.089)
L2.Intermediation wedge	0.107	-0.183	-0.357	-0.328	-0.017	-0.085*	-0.128***	-0.197***
	(0.075)	(0.166)	(0.236)	(0.219)	(0.016)	(0.044)	(0.048)	(0.071)
L.Loans	0.025	0.142*	0.085	0.069	0.022**	0.289***	0.329***	0.487***
	(0.042)	(0.074)	(0.086)	(0.151)	(0.010)	(0.042)	(0.069)	(0.139)
L2.Loans	-0.028	-0.170**	-0.129	-0.192	-0.021**	-0.292***	-0.335***	-0.517***
	(0.042)	(0.071)	(0.081)	(0.139)	(0.010)	(0.043)	(0.070)	(0.140)
L.Bonds	0.005	0.010	-0.001	-0.030	0.003	-0.003	-0.005	-0.002
	(0.009)	(0.019)	(0.018)	(0.024)	(0.002)	(0.006)	(0.006)	(0.008)
L2.Bonds	-0.002	-0.004	0.009	0.031	-0.003	0.002	0.004	0.001
	(0.009)	(0.020)	(0.023)	(0.025)	(0.002)	(0.007)	(0.007)	(0.005)
L.GDP	0.842***	0.689***	0.531***	0.431***	0.012	0.071**	0.030	0.032
	(0.097)	(0.089)	(0.085)	(0.101)	(0.010)	(0.035)	(0.024)	(0.031)
L2.GDP	0.134	0.272***	0.393***	0.326***	-0.009	-0.065*	-0.024	-0.025
	(0.097)	(0.100)	(0.074)	(0.069)	(0.010)	(0.038)	(0.023)	(0.019)
L.Deflator	0.182	0.011	-0.059	0.213	1.441***	1.064***	1.003***	1.097***
	(0.366)	(0.270)	(0.356)	(0.476)	(0.036)	(0.158)	(0.170)	(0.204)
L2.Deflator	-0.174	-0.102	-0.011	-0.009	-0.466***	-0.211	-0.197	-0.392**
	(0.372)	(0.272)	(0.327)	(0.410)	(0.038)	(0.158)	(0.156)	(0.190)
L.GDP (EA)	-0.037	0.183	0.110	-0.690**	-0.016	0.008	0.119**	0.133*
	(0.113)	(0.215)	(0.182)	(0.315)	(0.026)	(0.049)	(0.052)	(0.079)
L2.GDP (EA)	0.030	-0.303	-0.309	0.229	0.029	0.082*	-0.002	0.049
	(0.117)	(0.235)	(0.195)	(0.201)	(0.026)	(0.047)	(0.052)	(0.091)
L.Deflator (EA)	-0.181	-0.195	0.344	0.046	-0.313***	-0.388*	-0.480**	-0.672***
	(0.332)	(0.664)	(0.977)	(1.061)	(0.086)	(0.217)	(0.213)	(0.231)
L2.Deflator (EA)	0.202	0.524	0.098	0.471	0.317***	0.416*	0.525**	0.736***
	(0.337)	(0.671)	(0.963)	(0.858)	(0.085)	(0.214)	(0.209)	(0.207)
L.EUR-USD	-0.621	0.986	-0.467	0.633	-0.027	-0.995	-1.103	0.212
	(1.018)	(2.962)	(4.013)	(4.275)	(0.341)	(0.989)	(1.053)	(1.003)
L2.EUR-USD	1.578	2.321	5.002	4.957	-0.194	0.120	0.066	-1.010
	(0.993)	(3.571)	(3.721)	(3.554)	(0.341)	(0.973)	(1.074)	(1.270)
L.Commodity price index	0.002	-0.012	-0.035	-0.070**	0.002	-0.003	0.009	0.004
	(0.012)	(0.024)	(0.032)	(0.031)	(0.003)	(0.011)	(0.010)	(0.006)
L2.Commodity price index	-0.009	-0.021	-0.007	0.019	-0.001	0.011	0.002	0.010
	(0.010)	(0.026)	(0.034)	(0.032)	(0.003)	(0.010)	(0.009)	(0.007)
L.CISS bond market	0.370	-19.845***	-30.502***	-33.502***	0.326	-4.864**	-4.952*	-8.558***
	(2.548)	(7.010)	(8.321)	(7.119)	(0.710)	(2.226)	(2.778)	(2.900)
L2.CISS bond market	-0.792	-15.870*	-14.492**	0.781	-1.024	-1.859	-5.560**	-8.758***
	(2.704)	(8.557)	(6.698)	(11.268)	(0.822)	(1.977)	(2.317)	(3.039)
L.Bank capitalization	-0.082	0.100	0.562	-0.220	0.009	-0.129	-0.323	-1.175
	(0.190)	(0.681)	(0.900)	(1.427)	(0.042)	(0.448)	(0.596)	(0.899)
L2.Bank capitalization	0.124	-0.009	-0.395	0.867	-0.011	0.155	0.349	1.236
	(0.187)	(0.688)	(0.904)	(1.469)	(0.042)	(0.448)	(0.599)	(0.935)
L.Bank concentration	5.261	-175.035*	-246.871*	-103.191	-1.896	-49.533	-97.810*	-238.932***
	(11.913)	(103.000)	(126.219)	(127.971)	(3.667)	(41.705)	(55.676)	(82.728)
L2.Bank concentration	-4.763	176.145*	249.436**	118.831	1.776	48.169	96.575*	243.381***
	(11.924)	(102.922)	(126.316)	(127.692)	(3.629)	(42.561)	(56.992)	(82.672)
R^2	0.98	0.93	0.90	0.81	1.00	0.98	0.98	0.96
N-obs	1,965	1,875	1,845	1,725	1,965	1,875	1,845	1,725

Note: The Driscoll and Kraay (1998) standard errors are given in parenthesis. $^{***}/^{**}/^{*}$ indicate the 1%/5%/10% significance level. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Table B.5: Regression coefficients (baseline – 5).

	Loan spread				Bond spread			
	$h=0$	$h=9$	$h=12$	$h=24$	$h=0$	$h=9$	$h=12$	$h=24$
shock^{IR}	-1.744	1.495*	1.591**	1.076	-4.473**	3.588*	2.362	2.601
	(1.308)	(0.814)	(0.761)	(1.133)	(1.819)	(1.931)	(2.142)	(2.335)
shock^{IR}∗L.B/D	-0.061*	-0.040	-0.040	-0.055**	0.070	-0.091**	-0.066	-0.085*
	(0.032)	(0.025)	(0.034)	(0.023)	(0.062)	(0.044)	(0.046)	(0.047)
L.shock^{IR}	0.696	1.627	0.636	0.198	0.150	1.572	1.052	1.398
	(0.735)	(1.080)	(0.915)	(0.998)	(0.980)	(1.887)	(2.398)	(1.891)
L2.shock^{IR}	1.134	1.218	0.288	-0.023	1.240	0.747	-0.716	0.220
	(0.952)	(0.981)	(0.749)	(1.081)	(0.859)	(1.402)	(1.586)	(1.903)
L.shock^{IR}∗L2.B/D	-0.032	-0.036	-0.055*	-0.082***	-0.023	-0.143**	-0.078	-0.052
	(0.022)	(0.030)	(0.030)	(0.028)	(0.045)	(0.058)	(0.049)	(0.044)
L2.shock^{IR}∗L3.B/D	-0.065***	-0.042	-0.040	-0.058**	-0.146***	-0.095**	-0.045	-0.035
	(0.022)	(0.027)	(0.029)	(0.025)	(0.029)	(0.046)	(0.041)	(0.051)
L.3-month OIS	-1.696***	0.262	0.339	0.589	-2.253***	1.781**	0.845	0.904
	(0.214)	(0.333)	(0.294)	(0.481)	(0.248)	(0.710)	(0.697)	(1.109)
L2.3-month OIS	1.631***	-0.211	-0.285	-0.666*	2.205***	-1.529**	-0.563	-0.634
	(0.219)	(0.365)	(0.318)	(0.372)	(0.256)	(0.661)	(0.774)	(0.912)
L.Intermediation wedge	0.111**	0.029	0.048	-0.007	-0.777***	-0.190*	-0.075	0.029
	(0.050)	(0.053)	(0.053)	(0.040)	(0.064)	(0.105)	(0.098)	(0.048)
L2.Intermediation wedge	0.043	0.070	0.042	-0.055	0.096	0.128	0.101	-0.134
	(0.047)	(0.049)	(0.034)	(0.062)	(0.079)	(0.106)	(0.086)	(0.137)
L.Loans	-0.117***	-0.111***	-0.099***	-0.063**	-0.116***	-0.051	-0.013	-0.011
	(0.018)	(0.030)	(0.028)	(0.031)	(0.022)	(0.038)	(0.043)	(0.061)
L2.Loans	0.124***	0.123***	0.114***	0.083***	0.124***	0.065	0.032	0.033
	(0.018)	(0.031)	(0.030)	(0.030)	(0.022)	(0.040)	(0.042)	(0.059)
L.Bonds	0.001	0.004**	0.004**	0.004	0.000	0.001	0.002	0.004
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.006)
L2.Bonds	0.006***	0.005***	0.006**	0.004	0.007**	0.008	0.007	0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)	(0.003)
L.GDP	-0.008	-0.014	-0.011	-0.007	-0.015	-0.006	0.006	0.033
	(0.008)	(0.010)	(0.009)	(0.005)	(0.009)	(0.008)	(0.008)	(0.023)
L2.GDP	-0.006	-0.001	-0.002	0.008	0.002	-0.004	-0.004	0.001
	(0.008)	(0.008)	(0.007)	(0.010)	(0.009)	(0.007)	(0.009)	(0.018)
L.Deflator	-0.112***	-0.101**	-0.162***	-0.131***	-0.084**	-0.074	-0.019	-0.134**
	(0.033)	(0.046)	(0.050)	(0.039)	(0.040)	(0.057)	(0.055)	(0.062)
L2.Deflator	0.086**	0.068	0.125**	0.110**	0.049	0.019	-0.079	0.003
	(0.035)	(0.046)	(0.050)	(0.046)	(0.040)	(0.059)	(0.066)	(0.060)
L.GDP (EA)	-0.046	-0.016	0.010	0.080*	-0.033	0.068	0.271	0.235***
	(0.046)	(0.049)	(0.073)	(0.047)	(0.049)	(0.109)	(0.174)	(0.080)
L2.GDP (EA)	-0.034	-0.034	-0.059	-0.057	-0.030	-0.023	-0.223	-0.169
	(0.046)	(0.039)	(0.063)	(0.045)	(0.049)	(0.084)	(0.150)	(0.113)
L.Deflator (EA)	0.214	-0.082	0.324**	0.363**	0.398**	-0.182	0.068	0.314
	(0.131)	(0.228)	(0.163)	(0.173)	(0.153)	(0.463)	(0.398)	(0.536)
L2.Deflator (EA)	-0.162	0.106	-0.297**	-0.404***	-0.358**	0.165	-0.025	-0.174
	(0.130)	(0.224)	(0.150)	(0.140)	(0.152)	(0.406)	(0.367)	(0.490)
L.EUR-USD	-0.662	0.472	0.995	-0.362	-1.098	0.903	3.466	0.267
	(0.690)	(0.911)	(0.770)	(0.638)	(0.780)	(1.794)	(2.225)	(1.764)
L2.EUR-USD	-0.610	-1.869**	-2.599***	-0.338	-0.218	0.352	-2.211	1.687
	(0.668)	(0.904)	(0.913)	(1.189)	(0.694)	(1.750)	(2.250)	(2.410)
L.Commodity price index	0.000	0.014	0.019*	0.002	-0.006	0.024	0.038	-0.009
	(0.005)	(0.009)	(0.010)	(0.006)	(0.007)	(0.015)	(0.026)	(0.023)
L2.Commodity price index	0.008*	-0.003	-0.008	0.007	0.015**	-0.019	-0.037	0.001
	(0.004)	(0.008)	(0.010)	(0.006)	(0.006)	(0.016)	(0.026)	(0.023)
L.CISS bond market	4.504***	6.281***	6.066***	-0.291	4.824**	12.755***	12.123***	-10.569
	(1.425)	(2.196)	(1.185)	(3.203)	(1.898)	(3.637)	(4.379)	(10.012)
L2.CISS bond market	1.923	2.096	2.470	2.133	4.122**	5.360	1.293	0.329
	(1.367)	(1.411)	(1.768)	(1.820)	(2.090)	(3.600)	(3.363)	(2.902)
L.Bank capitalization	-0.039	-0.036	-0.101	0.038	-0.154*	0.323*	0.395**	-0.056
	(0.074)	(0.189)	(0.185)	(0.219)	(0.088)	(0.185)	(0.182)	(0.291)
L2.Bank capitalization	0.044	0.048	0.096	-0.092	0.162*	-0.281	-0.420**	-0.116
	(0.073)	(0.192)	(0.184)	(0.215)	(0.088)	(0.198)	(0.177)	(0.309)
L.Bank concentration	22.217**	32.433**	24.930	-22.990	27.613**	109.361**	76.119**	-121.839*
	(9.256)	(16.355)	(17.175)	(26.881)	(11.745)	(47.299)	(36.856)	(71.489)
L2.Bank concentration	-22.392**	-32.904**	-25.513	21.792	-27.605**	-109.967**	-78.119**	116.916*
	(9.169)	(16.309)	(17.214)	(27.253)	(11.589)	(47.319)	(36.864)	(69.975)
R^2	0.72	0.63	0.65	0.61	0.84	0.50	0.46	0.31
N-obs	1,965	1,875	1,845	1,725	1,965	1,875	1,845	1,725

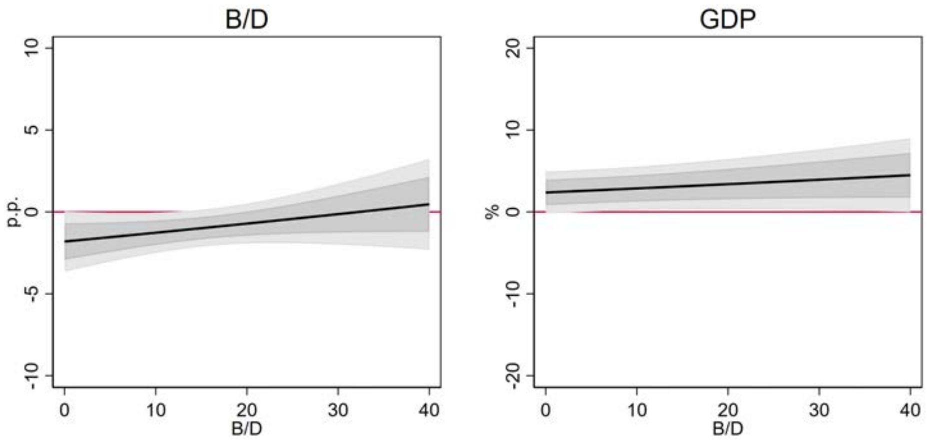
Note: The Driscoll and Kraay (1998) standard errors are given in parenthesis. ***/**/* indicate the 1%/5%/10% significance level. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Table B.6: Baseline estimates for coefficients on monetary policy shock and interaction with bond share (longer horizons).

$Y_{i,t}$		$h = 30$	$h = 36$	$h = 42$	$h = 48$
Intermediation	$\beta_{0,h}$	1.002	1.986	2.465	0.933
wedge		(0.935)	(3.168)	(1.811)	(1.508)
	β_h	-0.052*	-0.103*	-0.024	-0.173**
		(0.027)	(0.057)	(0.088)	(0.083)
Loans	$\beta_{0,h}$	-18.316*	-21.467*	-20.364**	-14.425**
		(10.127)	(12.259)	(10.200)	(6.099)
	β_h	-0.636	-0.775	-1.701	-2.134
		(1.230)	(1.388)	(1.756)	(1.916)
Bonds	$\beta_{0,h}$	-0.093	-9.418*	-10.798*	-18.608**
		(5.767)	(5.023)	(6.328)	(9.022)
	β_h	0.878	0.459	0.466	0.475
		(0.769)	(0.557)	(0.895)	(0.688)
B/D	$\beta_{0,h}$	2.295	0.961	0.477	-1.365
		(2.018)	(2.501)	(1.804)	(1.365)
	β_h	0.380**	0.193	0.177	0.108
		(0.167)	(0.130)	(0.127)	(0.112)
GDP	$\beta_{0,h}$	-8.600	-2.245	3.336	6.305*
		(6.261)	(2.544)	(2.275)	(3.453)
	β_h	0.328	0.374**	-0.125	0.088
		(0.222)	(0.150)	(0.221)	(0.108)
N		1,665	1,605	1,545	1,485

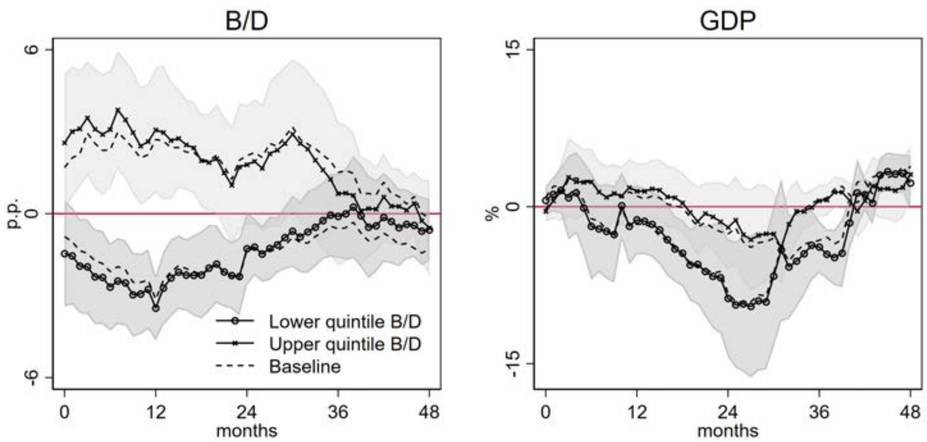
Note: The Driscoll and Kraay (1998) standard errors are given in parenthesis. ***/**/* indicate the 1%/5%/10% significance level. Following the notation in equation (1), $\beta_{0,h}$ corresponds to the coefficient on the monetary policy shock and β_h to the coefficient on the interaction of the monetary policy shock with the bond share. The column $Y_{i,t}$ lists the dependent variables, while h refers to the horizon of the IRF. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Figure B.2: Impulse responses across bond shares (baseline – longer horizon).



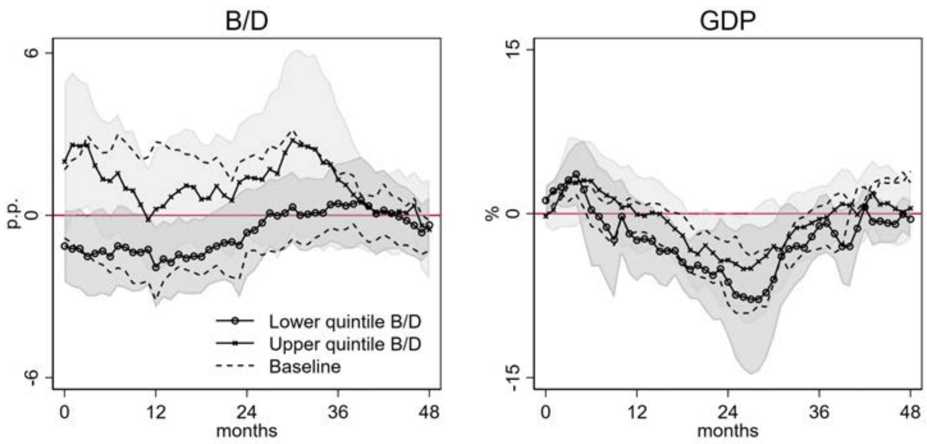
Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at each point of the bond share. The response horizon is $h = 48$. The light (dark) grey area is the 90% (68%) confidence interval. B/D denotes the bond share.

Figure B.3: Impulse responses to short-rate shock at upper and lower quintile of bond share distribution (also controlling for long-rate shock).



Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at the respective bond share. The grey area is the 90% confidence interval. The dashed line shows the point estimate from the baseline. B/D denotes the bond share. The IRFs are estimated from a model where the baseline specification has been augmented by the monetary policy surprises in the 5-year Bund rate and its interaction with the bond share as well as the 5-year Bund rate in levels.

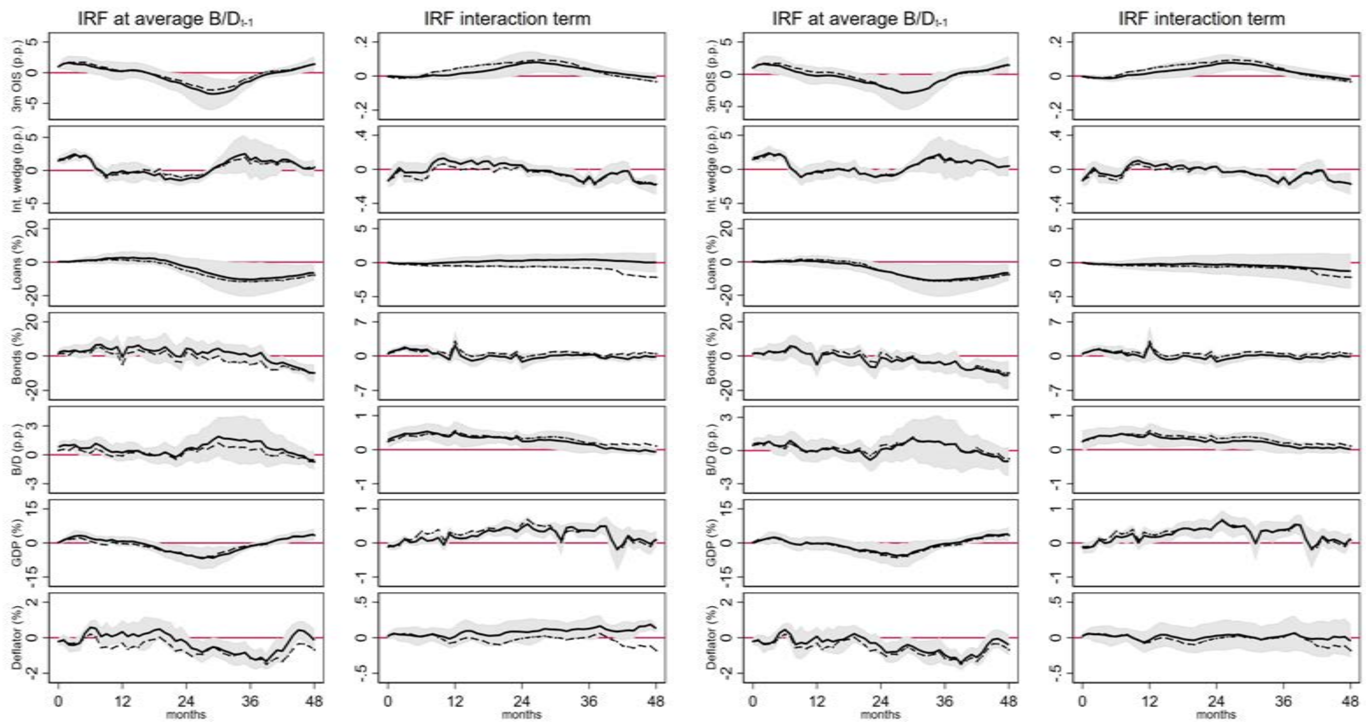
Figure B.4: Impulse responses at upper and lower quintile of bond share distribution (asymmetries).



Note: The IRFs are normalized to a 100 bps impact response in the 3-month OIS rate at the respective bond share. The grey area is the 90% confidence interval and the dashed line shows the point estimates from the baseline model. B/D denotes the bond share. The IRFs are estimated from the same model specification as the baseline, relying only on zero or negative surprises in the 1-month OIS rate. Specifically, we extend the baseline model with a dummy that captures the direction of the shock, as well as the interaction of that dummy with all model parameters. To facilitate the comparison of the easing-shock surprises with the baseline estimates, both are scaled to a positive monetary policy shock (*i.e.* a policy tightening). Using easing or zero surprises, we can assure a significant effect on the policy rate in the initial horizons, which is not the case if we instead restrict the sample to tightening shocks.

Appendix C. Additional figures robustness

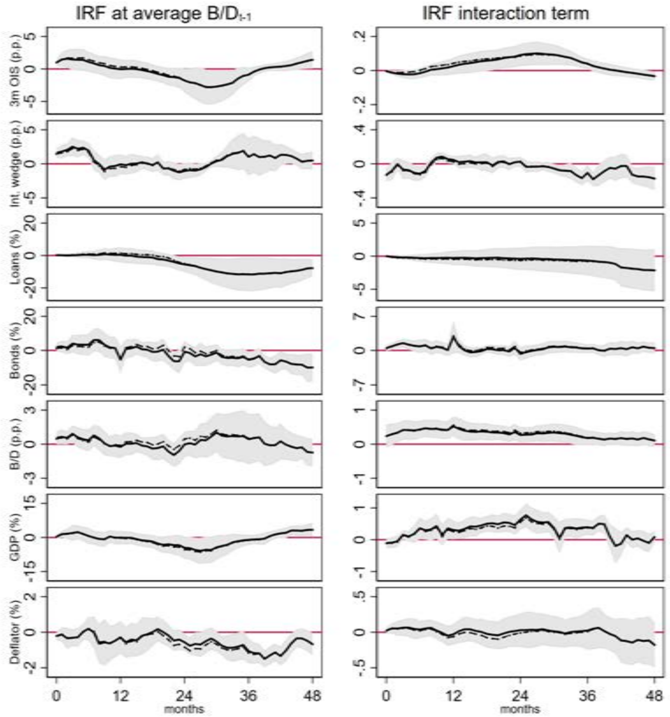
Figure C.1: Impulse responses (robustness: monetary policy environment – 1).



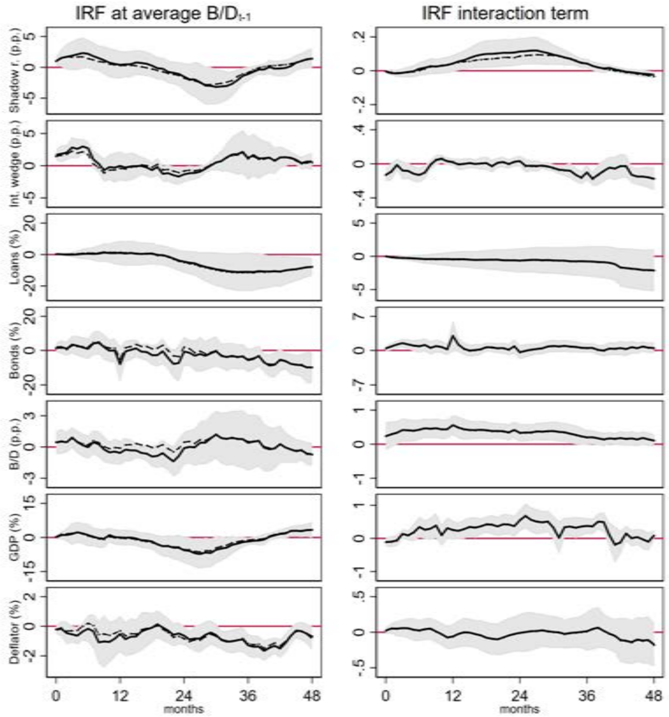
(a) Pre-UMP (b) Pre-APP

Note: The IRFs in the left column are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval and the dashed line shows the point estimates from the baseline model. In panel (a) (panel (b)) the sample ends in October 2011 (August 2014).The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Figure C.2: Impulse responses (robustness: monetary policy environment – 2).



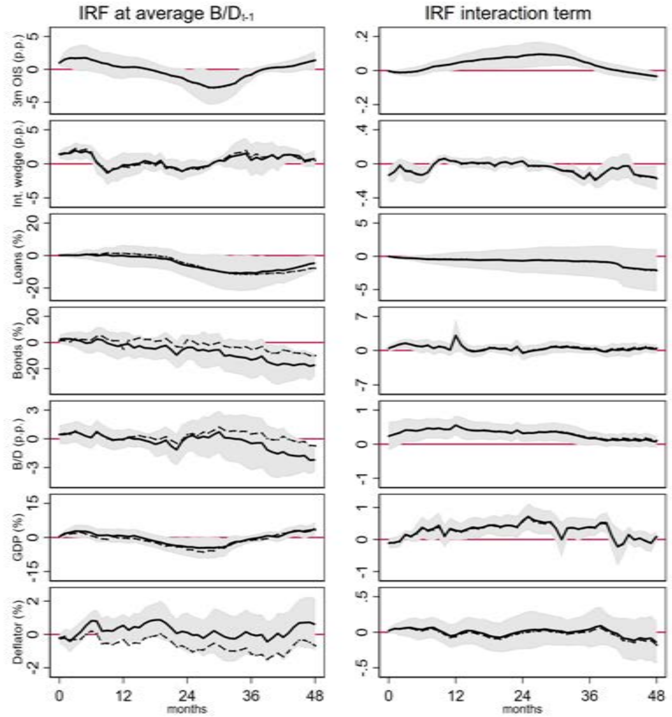
(a) Pre-CSPP



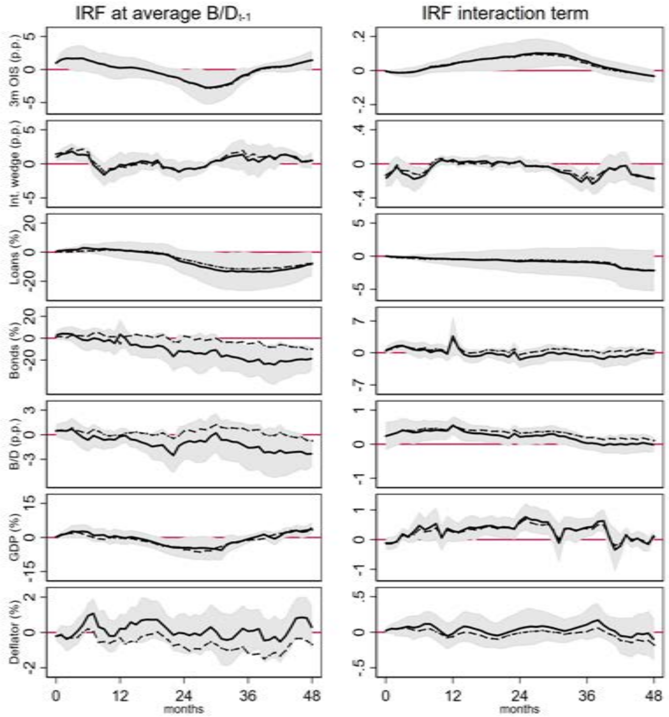
(b) Shadow rate

Note: The IRFs in the left column are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval and the dashed line shows the point estimates from the baseline model. In panel (a) the sample ends in February 2016. In panel (b) The policy indicator of the baseline model has been exchanged with a shadow rate measure. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Figure C.3: Impulse responses (robustness: cross-country heterogeneity – 1).



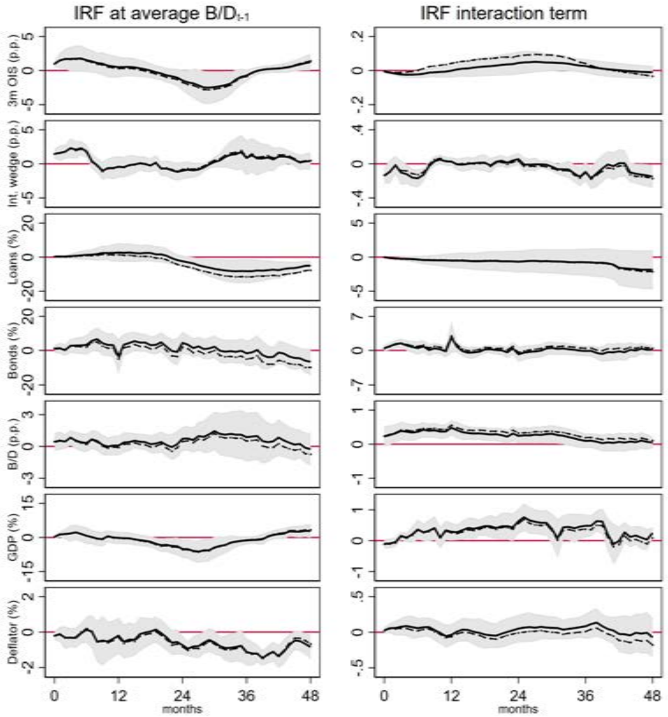
(a) Share of large firms



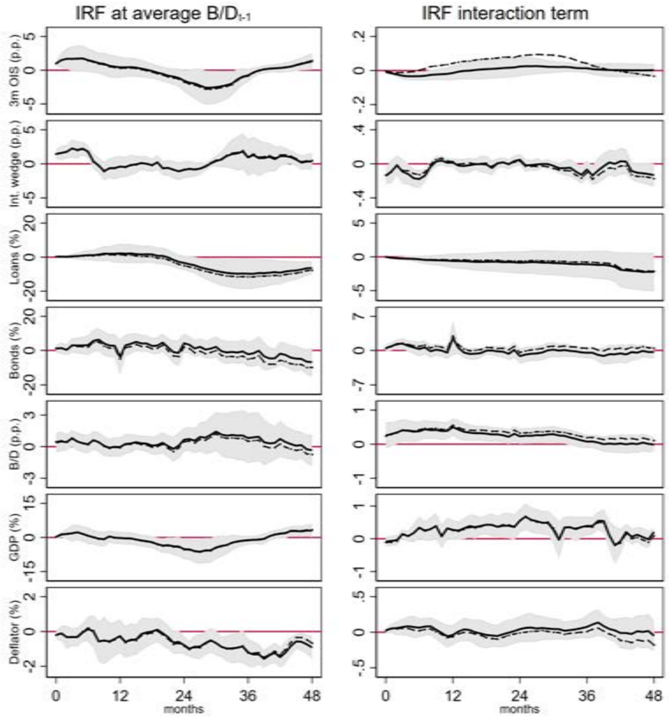
(b) Share of large firms in value added

Note: The IRFs in the left column are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval and the dashed line shows the point estimates from the baseline model. In panel (a) (panel (b)) the baseline model has been augmented by a dummy variable that is equal to one if the time-series median of a country's share of large firms in the total number of firms (share of value added by large firms in total value added of the business economy) is above the sample median and the interaction of this dummy with the monetary policy shock. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Figure C.4: Impulse responses (robustness: cross-country heterogeneity – 2).



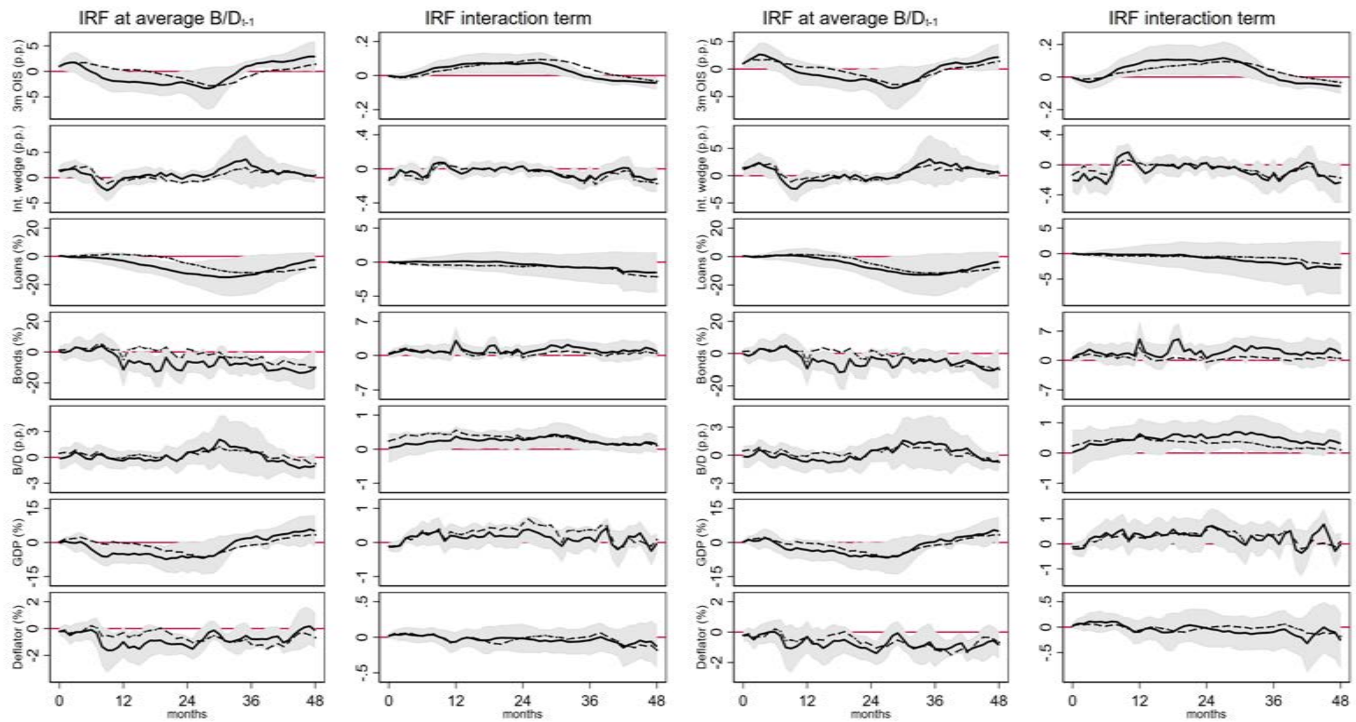
(a) Maturity of credit



(b) Maturity of bank lending

Note: The IRFs in the left column are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval and the dashed line shows the point estimates from the baseline model. In panel (a) (panel (b)) the baseline model has been augmented by the share of short-term debt in total debt (the share of short-term loans in total loans) and the interaction of this share with the monetary policy shock. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Figure C.5: Impulse responses (robustness: alternative monetary policy shocks – 1).

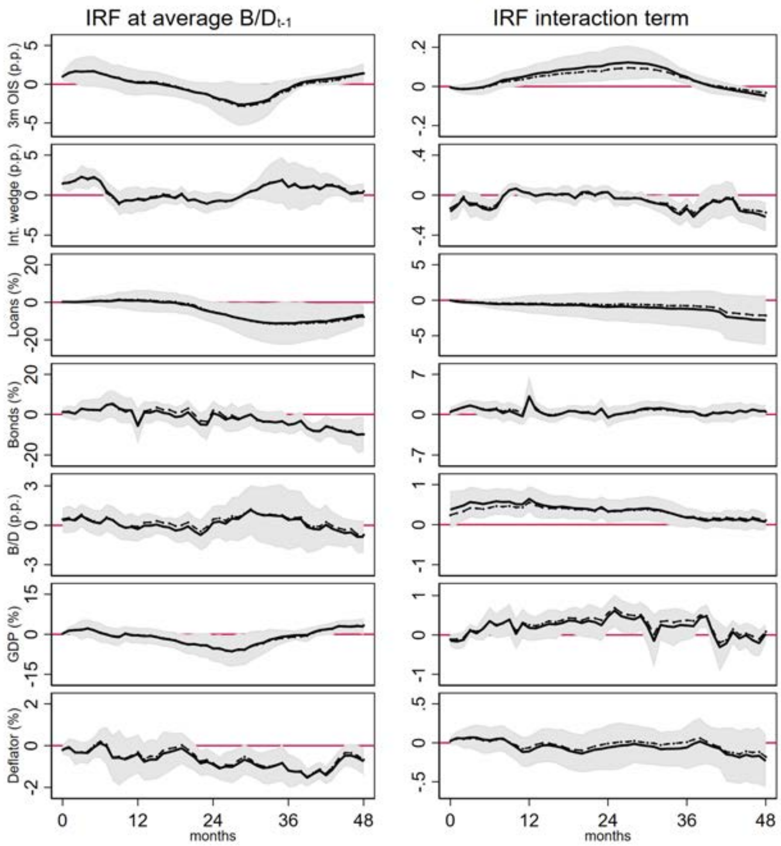


(a) 3-month OIS

(b) Principal component

Note: The IRFs in the left column are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval and the dashed line shows the point estimates from the baseline model. In panel (a) (panel (b)) the monetary policy shock is identified through changes in the 3-month OIS rate (first principal component of the 1-week to 2-year OIS rate). The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

Figure C.6: Impulse responses (robustness: alternative monetary policy shocks – 2).



Note: The IRFs in the left column are normalized to a 100 bps impact response in the 3-month OIS rate. The grey area is the 90% confidence interval. The monetary policy shock is identified through changes in the time-weighted 1-month OIS rate. The intermediation wedge is computed as loan spread minus bond spread. B/D denotes the bond share.

References

Adrian, T., Colla, P., Shin, H. S., 2013. Which financial frictions? Parsing the evidence from the financial crisis of 2007 to 2009. NBER Macroeconomics Annual 27 (1), 159–214.

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

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

Arce, O., Mayordomo, S., Gimeno, R., 2020. Making room for the needy: The credit-reallocation effects of the ECB's Corporate QE. Review of Finance 25 (1), 43–84.

Auer, S., Bernardini, M., Cecioni, M., 2019. Corporate leverage and monetary policy effectiveness in the euro area. Banca d'Italia Working Paper No. 1258.

Barakchian, S. M., Crowe, C., 2013. Monetary policy matters: Evidence from new shocks data. Journal of Monetary Economics 60 (8), 950–966.

Becker, B., Ivashina, V., 2014. Cyclicality of credit supply: Firm level evidence. Journal of Monetary Economics 62, 76–93.

Berger, A. N., Udell, G. F., 1995. Relationship lending and lines of credit in small firm finance. The Journal of Business 68 (3), 351–381.

Berger, A. N., Udell, G. F., 2002. Small business credit availability and relationship lending: The importance of bank organisational structure. The Economic Journal 112 (477), F32–F53.

Berlin, M., Mester, L. J., 1992. Debt covenants and renegotiation. Journal of Financial Intermediation 2 (2), 95–133.

Bernanke, B. S., Blinder, A. S., 1992. The federal funds rate and the channels of monetary transmission. The American Economic Review 82 (4), 901–921.

Betz, F., De Santis, R. A., forthcoming. ECB corporate QE and the loan supply to bank-dependent firms. International Journal of Central Banking.

Bolton, P., Freixas, X., 2006. Corporate finance and the monetary transmission mechanism. The Review of Financial Studies 19 (3), 829–870.

Boot, A. W., Greenbaum, S. I., Thakor, A. V., 1993. Reputation and discretion in financial contracting. The American Economic Review 83 (5), 1165–1183.

Brambor, T., Clark, W. R., Golder, M., 2006. Understanding interaction models: Improving empirical analyses. Political Analysis 14 (1), 63–82.

Chow, G. C., Lin, A.-L., 1971. Best linear unbiased interpolation, distribution, and extrapolation of time series by related series. The Review of Economics and Statistics 53 (4), 372–75.

Christiano, L. J., Eichenbaum, M., Evans, C., 1996. The effects of monetary policy shocks: Evidence from the flow of funds. The Review of Economics and Statistics 78 (1), 16–34.

Cochrane, J. H., Piazzesi, M., 2002. The fed and interest rates - A high-frequency identification. The American Economic Review 92 (2), 90–95.

Crouzet, N., 2017. Aggregate implications of corporate debt choices. The Review of Economic Studies 85 (3), 1635–1682.

Crouzet, N., 2021. Credit disintermediation and monetary policy. IMF Economic Review 69 (1), 23–89.

Crouzet, N., Mehrotra, N., 2020. Small and large firms over the business cycle. The American Economic Review 110 (11), 3549–3601.

Darmouni, O., Giesecke, O., Rodnyansky, A., 2020. The bond lending channel of monetary policy. CEPR Discussion Paper No. 14659.

De Fiore, F., Uhlig, H., 2011. Bank finance versus bond finance. Journal of Money, Credit and Banking 43 (7), 1399–1421.

De Fiore, F., Uhlig, H., 2015. Corporate debt structure and the financial crisis. Journal of Money, Credit and Banking 47 (8), 1571–1598.

De Santis, R. A., 2018. Unobservable country bond premia and fragmentation. Journal of International Money and Finance 82, 1–25.

De Santis, R. A., 2020. Impact of the asset purchase programme on euro area government bond yields using market news. Economic Modelling 86, 192–209.

Dewatripont, M., Maskin, E., 1995. Credit and efficiency in centralized and decentralized economies. The Review of Economic Studies 62 (4), 541–555.

Diamond, D. W., 1984. Financial intermediation and delegated monitoring. The Review of Economic Studies 51 (3), 393–414.

Diamond, D. W., 1991. Monitoring and reputation: The choice between bank loans and directly placed debt. Journal of Political Economy 99 (4), 689–721.

Drechsler, I., Savov, A., Schnabl, P., 2017. The deposits channel of monetary policy. The Quarterly Journal of Economics 132 (4), 1819–1876.

Driscoll, J. C., Kraay, A. C., 1998. Consistent covariance matrix estimation with spatially dependent panel data. The Review of Economics and Statistics 80 (4), 549–560.

ECB, 2016. Trends in the external financing structure of euro area non-financial corporations. In: Economic Bulletin. Vol. 5.

Gertler, M., Gilchrist, S., 1993. The cyclical behavior of short-term business lending: Implications for financial propagation mechanisms. European Economic Review 37 (2-3), 623–631.

Gertler, M., Gilchrist, S., 1994. Monetary policy, business cycles, and the behavior of small manufacturing firms. The Quarterly Journal of Economics 109 (2), 309–340.

Gertler, M., Karadi, P., 2015. Monetary policy surprises, credit costs, and economic activity. American Economic Journal: Macroeconomics 7 (1), 44–76.

Greenwood, R., Vayanos, D., 2010. Price pressure in the government bond market. The American Economic Review 100 (2), 585–90.

Grjebine, T., Szczerbowicz, U., Tripier, F., 2018. Corporate debt structure and economic recoveries. European Economic Review 101, 77–100.

Grosse-Rueschkamp, B., Steffen, S., Streitz, D., 2019. A capital structure channel of monetary policy. Journal of Financial Economics 133 (2), 357–378.

Gürkaynak, R. S., Sack, B., Swanson, E., 2005. The sensitivity of long-term interest rates to economic news: Evidence and implications for macroeconomic models. The American Economic Review 95 (1), 425–436.

Hartmann, P., Smets, F., December 2018. The first twenty years of the European Central Bank: Monetary policy. ECB Working Paper Series No. 2219.

Holmstrom, B., Tirole, J., 1997. Financial intermediation, loanable funds, and the real sector. The Quarterly Journal of Economics 112 (3), 663–691.

Jarocinski, M., Karadi, P., 2020. Deconstructing monetary policy surprises - The role of information shocks. American Economic Journal: Macroeconomics 12 (2), 1–43.

Jordà, Ò., 2005. Estimation and inference of impulse responses by local projections. The American Economic Review 95 (1), 161–182.

Kashyap, A. K., Stein, J. C., 1994. Monetary policy and bank lending. In: Mankiw, N. G. (Ed.), Monetary policy. The University of Chicago Press, pp. 221–261.

Kashyap, A. K., Stein, J. C., Wilcox, D. W., 1993. Monetary policy and credit conditions: Evidence from the composition of external finance. The American Economic Review 83 (1), 78–98.

Kashyap, A. K., Stein, J. C., Wilcox, D. W., 1996. Monetary policy and credit conditions: Evidence from the composition of external finance: Reply. The American Economic Review 86 (1), 310–314.

Kortela, T., 2016. A shadow rate model with time-varying lower bound of interest rates. Bank of Finland Research Discussion Paper No. 19.

Kremer, M., Lo Duca, M., Holló, D., 2012. CISS - A composite indicator of systemic stress in the financial system. ECB Working Paper Series No. 1426.

Krippner, L., 2015. Zero lower bound term structure modeling: A practitioner's guide. Palgrave Macmillan US.

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.

Lane, P., 2019. The yield curve and monetary policy. Lecture for the Centre for Finance and the Department of Economics at UCL. 25 November 2019.

Lemke, W., Vladu, A. L., January 2017. Below the zero lower bound: A shadow-rate term structure model for the euro area. ECB Working Paper Series No. 1991.

Lhuissier, S., Szczerbowicz, U., October 2018. Monetary policy and corporate debt structure. Banque de France Working Paper Series No. 697.

Lucas Jr., R. E., 12 1995. Monetary neutrality. Lecture to the memory of Alfred Nobel, Stockholm.

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

Oliner, S. D., Rudebusch, G. D., 1996. Monetary policy and credit conditions: Evidence from the composition of external finance: Comment. The American Economic Review 86 (1), 300–309.

Piazzesi, M., Swanson, E. T., 2008. Futures prices as risk-adjusted forecasts of monetary policy. Journal of Monetary Economics 55 (4), 677–691.

Rajan, R. G., 1992. Insiders and outsiders: The choice between informed and arm's-length debt. The Journal of Finance 47 (4), 1367–1400.

Ramey, V. A., 2016. Macroeconomic shocks and their propagation. In: Taylor, J. B., Uhlig, H. (Eds.), Handbook of Macroeconomics. Vol. 2. Elsevier, pp. 71–162.

Repullo, R., Suarez, J., 2000. Entrepreneurial moral hazard and bank monitoring: A model of the credit channel. European Economic Review 44 (10), 1931–1950.

Rocheteau, G., Wright, R., Zhang, C., 2018. Corporate finance and monetary policy. The American Economic Review 108 (4-5), 1147–86.

Rodriguez-Palenzuela, D., Darracq Pariès, M., Carboni, G., Ferrando, A., Köhler-Ulbrich, P., et al., 2013. Corporate Finance and Economic Activity in the Euro Area: ECB Structural Issues Report 2013. Occasional Paper Series No. 151.

Sharpe, S. A., 1990. Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships. The Journal of Finance 45 (4), 1069–1087.

Swanson, E. T., 2021. Measuring the effects of federal reserve forward guidance and asset purchases on financial markets. Journal of Monetary Economics 118, 32–53.

Vayanos, D., Vila, J.-L., 2021. A preferred-habitat model of the term structure of interest rates. Econometrica 89 (1), 77–112.

Wu, J. C., Xia, F. D., 2020. Negative interest rate policy and the yield curve. Journal of Applied Econometrics 35 (6), 653–672.

Acknowledgements

We are grateful for comments by Carlo Altavilla, Florin Bilbiie, Lorenzo Burlon, Nicolas Crouzet, Maren Froemel, Michael Halling, Peter Karadi, Per Krusell, Ricardo Reis, Massimo Rostagno, Mika Tujula, Natacha Valla, Thomas Vlassopoulos, and seminar participants at the European Central Bank, the Institute for International Economic Studies, the European Economic Association Annual Congress 2020, the World Finance Conference 2020, and the 23rd Central Bank Macro Modelling Workshop, as well as two anonymous referees. We thank Roberto De Santis and Wolfgang Lemke and Andreea Vladu for providing us with data on the cost of bond finance and shadow rates, respectively. We also thank Filippo Claps for valuable research assistance.

Fédéric Holm-Hadulla
European Central Bank, Frankfurt am Main, Germany; email: federic.holm-hadulla@ecb.europa.eu

Claire Thürwächter
Institute for International Economic Studies, Stockholm University, Stockholm, Sweden; email: claire.thurwachter@iies.su.se

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

This paper can be downloaded without charge from www.ecb.europa.eu, from the Social Science Research Network electronic library or from RePEc: Research Papers in Economics. Information on all of the papers published in the ECB Working Paper Series can be found on the ECB's website.

PDF ISBN 978-92-899-4045-0 ISSN 1725-2806 doi:10.2866/326134 QB-AR-20-054-EN-N