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Spare tyres with a hole: investment
funds under stress and credit to firms

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Abstract

We study the impact of a liquidity shock affecting investment funds on the financing conditions of firms. The abrupt liquidity needs of investment funds, triggered by the outbreak of the Covid-19 pandemic, prompted a retrenchment from bond purchases of firms and a withdrawal of short term funds from banks, impacting firm financing costs directly via bond markets, and indirectly via banks. According to our results, the spreads of corporate bonds held by investment funds increased. Furthermore, an increase in the short term funding exposure of a bank to investment funds triggered a contraction in new loans to euro area firms. Overall, our results show that while non-banks in general support firm financing by acting as a *spare tyre* when banks do not, their own stress can trigger a contractionary credit supply effect for firms.

JEL: E52; G23; G30

Keywords: Firm financing; Investment funds; Bank lending channel; Bond lending channel; Monetary policy.

Non-technical summary

Although the euro area financial sector remains largely bank-based, the importance of non-banks¹ in providing financing for euro area banks and firms has grown significantly since the global financial crisis (Albertazzi et al. (2020), Cappiello et al. (2021)). As of the third quarter of 2022, non-banks held around 80% of bonds issued by euro area firms. At the same time, the share of bank funding from non-banks stood at more than 10% of bank total assets.

Given their importance in overall firm and bank financing, we focus in this paper on the *investment fund* segment. Despite the funding diversification benefits investment funds bring (acting as "spare tyre" when needed), as their importance increases, the risks they carry are more likely to impact firm financing. Eventually, the pandemic put these concerns to the test exposing firms to strong procyclical risks. In March 2020, global uncertainty linked to the outbreak of the Covid-19 coronavirus triggered an extreme, albeit short-lived, liquidity shock for investment funds as fund-holders started to liquidate their shares.

In this paper we investigate whether liquidity shocks in the investment fund sector impacted firms' financing conditions (1) via their corporate bond holdings and (2) by reducing their short-term deposits to banks. To do so, we combine granular firm, loan, bond and money market transaction level datasets and use difference-in-differences research design methods to estimate the impact of the investment funds related liquidity shocks on credit to firms. First, we compare the reaction of spreads of corporate bonds concentrated in investment funds, relative to all other holders, over the period 3 February-17 March. Second, we compare the lending of banks differently affected by the outflow of investment fund deposits over the same period. In both exercises, we trace the effect of the pandemic up to the announcement of the European Central Bank's pandemic emergency purchase programme (PEPP).

Our findings have important policy implications. We show that shocks in the euro area non-bank sector can spill over to firms and banks, raising ultimately financial stability concerns and highlighting the importance of regulation for non-banks.

¹By non-banks we refer to investment funds (IF), insurance corporations and pension funds (ICPFs), money market funds (MMF) and other financial institutions (OFI).

1 Introduction

Although the euro area financial sector remains largely bank-based, the importance of non-banks² in providing financing for euro area banks and firms has grown significantly since the global financial crisis (Albertazzi et al. (2020), Cappiello et al. (2021)). As of the third quarter of 2022, non-banks held around 80% of bonds issued by euro area firms, with investment funds (IFs) holding the lion share of this amount (Figure 1, left panel).³ At the same time, the share of bank funding from non-banks stood at more than 10% of bank total assets (Figure 1, right panel, and Figure 2), mainly in the form of deposits by investment funds (Figure 3).

[Insert Figure 1, Figure 2 and Figure 3 here]

Given their importance in overall firm and bank financing, we focus in this paper on the *investment fund* segment. Despite the funding diversification benefits it afford firms (acting as "spare tyre" when needed), the risk that turmoil in investment funds impacts firm financing increases with their importance. Liquidity risks linked to easy redemption policies, procyclical margining, fire-sale dynamics, lack of regulation, are just a few among the many concerns that surround their growing footprint (see for example Brunnermeier and Pedersen (2008), Fecht and Wedow (2014), Gennaioli et al. (2013), Pozsar and Singh (2011)). Adverse dynamics in the investment fund segment are also expected to jeopardise the smooth transmission of monetary policy (Falato et al., 2020). Eventually, the pandemic put these concerns to the test exposing firms to even stronger procyclical risks.

In March 2020, global uncertainty linked to the outbreak of the Covid-19 coronavirus triggered an extreme, albeit short-lived, liquidity shock for investment funds as fund-holders started to liquidate their shares (Figure 4). In parallel, corporate bond yield spreads soared overall (Figure 5), as markets briskly re-assessed corporate risks against an expected global fall of corporate sales. To meet these redemptions and the negative revaluations on their investments, investment funds were forced to either fire-sell bonds or resort to their cash-holdings in banks. Transaction level repo data confirms that in the days after the Covid-19

²By non-banks we refer to investment funds (IF), insurance corporations and pension funds (ICPFs), money market funds (MMF) and other financial institutions (OFI).

³Contrary to the US, non-banks providing direct loans to households and firms are still very limited in the euro area.

outbreak, investment funds' short term deposits in banks (both secured and unsecured) declined significantly (Figure 6).

[Insert Figure 4, 5 and Figure 6 here]

Did this liquidity shock on investment funds have an independent effect on firms financing conditions? More specifically, did funds' fire-sale behaviour accelerate the increase of corporate bond yields for firms that relied on investment funds the most? And furthermore, were the banks most affected by investment fund deposit outflows forced to reduce their supply of new loans to firms more than other banks? In this paper we try to address these questions by looking at the reaction of corporate spreads and bank lending to firms during the short-lived event window offered by the pandemic's outbreak and the large scale interventions of central banks world-wide. We set out to understand whether liquidity shocks in the investment fund sector impacted firms' financing conditions (1) via their corporate bond holdings and (2) by reducing their short-term deposits to banks. We refer to these channels as the *direct* and *indirect* investment fund liquidity shock channels.

By combining granular firm, loan, bond and money market transaction level datasets and using difference-in-differences research design methods we estimate the impact of the investment funds related liquidity shocks on credit to firms. First, we compare the reaction of spreads of corporate bonds concentrated in investment funds, relative to all other holders, over the period 3 February-17 March, after controlling for pre-existing bond characteristics. Second, we compare the lending of banks differently affected by the outflow of investment fund deposits over the same period. In both exercises, we trace the effect of the pandemic up to the announcement of the European Central Bank's pandemic emergency purchase programme (PEPP).⁴ The key identifying assumption of these exercises is that there are no time varying shocks which affect the outcomes of interest that are correlated with the exposure to investment funds. As we show later, conditional on observable characteristics, in the pre-crisis period, the difference between outcomes is statistically not significant.

⁴In the Euro Area, the ECB introduced a comprehensive package of monetary policy measures to support liquidity and funding conditions for households, businesses and banks which involved refinancing operations and additional net asset purchases in the form of a pandemic emergency purchase programme (PEPP), initiated on March 18th 2020 and further expanded in the June of the same year. These actions, complemented by strong fiscal policy responses, were effective in restoring liquidity, reversing fund flows and interrupting ensuing fire-sale dynamics on a global stage.

Answering our research questions requires overcoming several empirical challenges. In our bond market analysis, we need to control for any bond-specific characteristic potentially driving our results. To do so, we rely on granular data on non-banks' holdings of corporate bonds as collected in the ECB's Securities Holdings Statistics by Sector (SHSS) database. In our bank-level analysis, we need to control for firms' credit demand to appropriately capture the credit supply constraints that emerged over the period. For this we use granular loan-level data taken from the analytical credit register (*AnaCredit*) of the European System of Central Banks.

We find that stress in the investment fund sector negatively impacted the financing conditions of euro area firms: bond market conditions tightened for firms whose bonds were mostly held by investment funds. Between 10 and 17 March 2020, euro area banks that are part of the ECB's Money Market Survey Reporting (MMSR) experienced a significant outflow of deposits from investment funds. At the most affected banks, there was a contraction in firm loan growth by almost 6%. At the same time, in this relatively short period after the start of the pandemic, there is no significant change in lending rates and maturities for new loans.

While a growing literature is documenting the effect of the COVID-19 turmoil in the investment fund sector, few papers have investigated the implications of this stress for firm financing conditions via bond or bank lending markets. By shedding light on the sources of fund fragility and on the beneficial effects of the monetary policy interventions, Breckenfelder et al. (2023) find that the share of assets eligible for central bank purchases contributed to halting fund outflows and improving fund performance. We take these insights one step further: we zoom into the period that preceded these interventions and trace the transmission channels that connect firms and investment funds via bond and loan markets. We link transaction level data of fund-bank contracts in money markets to *AnaCredit* to add important insights on the interactions between banks and investment funds from a monetary policy perspective.

Frameworks to investigate system wide contagion have put their emphasis on losses and systemic risk. Some approaches simulate empirically the mechanisms through which, under stress, the interaction of banks and investment funds (Sydow et al. (2021)) dampens or amplifies the transmission of shocks. Other approaches model the interactions of key representative agents (such as banks, funds and insurers) who face solvency and liquidity shocks in asset,

funding, and derivatives markets (Aikman et al. (2019), di Iasio et al. (2022)). Neither of these approaches explores how the financing conditions of firms evolve in the aftermath of shocks which is a novel focus of our paper.

We complement papers that have investigated the impact of investor concentration of flow movements on bond pricing by bringing granular information on euro area bonds/investors to the table. Coppola (2022) demonstrates a strong link between investor base composition and bond price dynamics using US data. The paper shows that during crises, firms whose bonds are owned by patient investors who are less prone to fire sales face relatively better credit conditions. Our analysis complements and reinforces these findings by looking at the impact of holding concentration on the bond prices of euro area firms during Covid-19. As such, we complement a long list of papers that study how bond investors shape pricing (and fire-sale) outcomes (Ellul et al. (2011), Bretscher et al. (2021), Falato et al. (2021) and Jiang et al. (2022)). Our findings also speak to the very recent work of Gabaix and Koijen (2022) that examines how flow effects can impact stock market value if demand is inelastic.

Moreover, we expand our earlier knowledge of the bank lending channel (e.g. Khwaja and Mian (2008), Jiménez et al. (2020) and Cingano et al. (2016)) by digging deeper into the non-bank lending channel and its interaction with banks. Existing papers so far have focused on the direct impact of non-banks in the transmission of monetary policy, showing that non-banks increase their credit supply with a monetary policy tightening ((Cucic and Gorea, 2022) and (Elliott et al., 2012)). Chernenko et al. (2022) draw our attention to the importance of regulation that constrains banks from lending to unprofitable and highly levered borrowers in accounting for two-thirds of non-bank lending. Nevertheless, Aldasoro et al. (2023) show that non-banks contract their syndicated lending more than banks during financial shocks, as non-banks serve riskier borrowers and have more volatile funding. Few of these papers explore the role of non-banks, and more specifically investment funds, in explaining the evolution of banks' credit provision to firms.

The rest of the paper is organised as follows. Section 2 introduces the granular datasets we combine and provides descriptive statistics. Section 3 presents the empirical strategy with Section 4.1 reviewing results on the financing impact faced euro area firms in bond markets

and Section 4.2 in loan markets. Section 5 presents a number of robustness checks and Section 6 concludes.

2 Data sources and setup

Our analysis combines multiple proprietary datasets established by the ECB and prudential authorities, as well as market data sources. This section provides an overview on the key information needed to perform our analyses which was extracted from these datasets. The dictionary in appendix A provides additional background information on the data sources used.

2.1 Data to analyse non-bank shocks via bond markets

To analyse whether the COVID-19 shock impaired non-banks in their purchases of corporate bonds, we use data collected under the *Securities Holdings Statistics* (SHSS) framework, a confidential ECB dataset reporting security-level (i.e. ISIN level) holdings at the country-sector level. With these data we identify and track all bonds at ISIN-by-ISIN level which were held by non-banks prior to the COVID-19 shocks and, among those, we can assess which issued bond was mostly held in the hands of the investment fund or insurance sector prior to the COVID-shock.

Issuance information of firms is obtained from the *Centralised Security Database* (CSDB) which we exploit to be able to measure the share of an ISIN which is held by selected non-bank sectors. Refinitiv data is used to cross-check this consolidation of the population of bond issuers, i.e. to link seemingly different issuers to the same head non-financial company. These three information sources (SHSS, CSDB and Refinitiv) are critical to constructing our main explanatory variable (see more details below). Finally, CSDB data also allows us to monitor firms' capacity to issue new bonds after the Covid-19 outbreak. On the pricing side, we use spreads relative to the Overnight Index Swap to measure bond market funding costs of corporate issuers. They are obtained by combining SHSS ISIN-level information with iBOXX, a dataset provided by Markit which contains traded prices data at daily frequency for the constituents of all iBOXX indices.

By combining these data sources, we construct a daily firm level dataset which provides information on bond financing costs faced by a certain firm in the period commencing on 3 February until 17 March 2020 or its new issuance over the same period for more than 23,000 firm-ISIN-time observations. Exposure to a given non-bank institutional sector is given by the share of total investment fund or insurance corporation holdings in total holdings. Firm level controls are mainly ratings and expected default frequencies of the issuer companies, while balance sheet variables are not used - they are not available at high frequency and their role is absorbed by firm fixed effects. Finally, bond-level variables, capturing pricing factors of bonds, as reported in iBOXX are included to the regression: this mainly includes variables identified by Berndt et al. (2018) and Gilchrist and Zakrajšek (2012) when investigating the drivers of the excess bond premium: coupon size, maturity of the bond and rating of the bond.

Table 1 provides summary statistics on the bond-firm level. Overall, the information we have on bond holdings of non-banks refers to the complete universe for what concerns both outstanding amounts of individual ISINs and their holdings of non-bank institutions. When merging this information with daily yields in iBOXX, we obtain a sample of 1140 firms in this analysis. This roughly accounts for around 70% percent of the volume of bonds outstanding at the time of the analysis with maturity higher than one year⁵. While coverage is reduced from the full universe, we exclude in this way bonds which are rarely transacted and whose prices would likely reflect market imperfections and large liquidity premia.

[Insert Table 1 here]

2.2 Data to analyse non-bank shocks via banks

We use daily transaction-level information on euro denominated money market activity from the *money market statistical reporting (MMSR)* to measure short term funding developments from funds to banks. We analyse transactions where banks stand on the borrowing side of each contract and exclude cleared repo trades.⁶ *AnaCredit*, the credit register of the European System

⁵As the markets are segmented and the commercial paper and short term notes markets are quite small in the euro area, we abstract here from those markets.

⁶Limiting the analysis to bilateral transactions is not particularly restrictive in our case since non-banks are unlikely to engage in cleared trades which are the purview of clearing house members. Non-banks very rarely act as clearing house members. See for example the list of [members](#) by London Clearing House, a leading clearing house in Europe)

of Central Banks, is our main source of information on bank lending to NFCs. It provides information on key borrower characteristics, such as firm location (zip code), industry (NACE Rev. 2 code), size (employment), annual turnover and balance sheet total which is critical to our identification strategy. Finally, data from *ECB Supervisory Reporting* are used to control for bank-specific characteristics that may have influence a bank's capacity to supply credit. This data includes bank-level information on banks' balance sheet, profitability, asset quality, funding conditions and capital adequacy.

In combining these three sources, we construct a daily bank-firm level dataset which provides information on new loans obtained by a certain firm from a certain bank in the period commencing on 3 February until 17 March 2020. New lending is defined using the exact starting date when a loan contract for a new instrument is signed which is reported in *AnaCredit*. Throughout the analysis, we focus on loans, credit lines and revolving credit. For firm-bank pairs, we aggregate up on a daily basis the full volume of new loans, as well as the associated maturities and rates to reach a sample of around 300,000 firm-bank-time observations.⁷ We add to this dataset firm level controls from *AnaCredit* for employment, turnover and assets which reflect the situation of the firm at end-2019.⁸

We define banks' exposure to investment funds as the share of secured and unsecured borrowing from IFs to total money market borrowing as of 31 January 2020, based on transactions reported in MMSR. Finally, bank level variables (size, asset quality, profitability, capitalisation metrics, debt securities) as reported for Q4 2019 - the last quarter before the shock - are added as controls to the regression and are derived from Supervisory statistics. Table 2 provides summary statistics on the loan, firm and bank level. Overall, after consolidating the MMSR reporters, we cover a sample of 34 significant institutions which account for around 65 percent of outstanding loans in *AnaCredit* for the period of interest.

[Insert Table 2 here]

⁷The volume of the new loans is defined as the total outstanding nominal amount and off balance sheet amount on the day of loan origination. As an alternative definition, we also construct a new loan volume variable without off balance sheet amounts. Firm-bank level new loan related maturities and rates are weighted by the outstanding nominal amount at origination.

⁸In some cases, firm characteristics and loan performing status are not reported.

3 Econometric specification and identification

To identify the impact of the liquidity shock that affected non-banks at the outbreak of the Covid-19 pandemic on bond spreads and bank lending, we estimate a differences-in-differences (DiD) model. Our stylised model can be described as follows:

$$Y_{xt} = \alpha_x + \beta ExposureIF \times Post_t + \Gamma Controls + \varepsilon_{xt}, \quad (1)$$

where outcome variables, controls and x , the cross sectional dimension of our regression differ depending on whether we estimate the impact on bond spreads or on bank lending. t denotes daily time for the period 3 February-17 March 2020, with the post period referring to 11-17 March 2020. *ExposureIF* denotes the exposure of firms or banks to investment funds⁹.

Before turning to the bond and bank level specifications, it is useful to recall some key dates from early 2020 to justify our event window. On March 11, the World Health Organisation declared the coronavirus outbreak a global pandemic. On 18 March the ECB announced its Pandemic Emergency Purchase Programme, which was implemented on March 24 for the first time. As such, March 11 marks the treatment date in our set-up, separating the pre- and post-treatment periods.

For the analysis of the impact on bond spreads, the regressions are estimated at the firm level.¹⁰ The outcome variable is $\log(Spreads)$, which measures firm level bond prices relative to a risk free bond of similar maturity (i.e. bond spreads).¹¹ In addition, the regression includes firm level controls and then progressively expands in saturation to add bond characteristics, such as coupon, and firms' risk profile, including its rating, similarly to Gilchrist and Zakrajšek (2012). The parameter of interest is β , which gives the effect of IF concentration (relative to

⁹For the bond spreads we also analyse the case of bonds being held by insurance and pension funds. This is not sensible for the case of bank deposits as ICPFs do not have a relevant amount of overnight deposits in the banking system.

¹⁰The regression is on the firm level, as the amount of bonds outstanding contemporaneously for the same firm is limited, leading to the lack of sufficient information to run regressions at the bond level which would allow us to include firm-time fixed effects.

¹¹Using spreads allows us to control for the effective maturity of each bond and to control for the possibly heterogeneous changes along the risk-free curve for bonds of different duration. The idea of using a log specification for spreads relies on the observation that spreads over risk-free rates should only be positive, so a normal distribution would not be suitable to represent them. Gilchrist and Zakrajšek (2012) explains further elements of the log specification for the credit risk component of bonds.

all bonds of the firm), for the post-outbreak period (11 -17 March 2020) relative to the period before the crisis (3 February - 10 March 2020).¹² Standard errors are clustered at the firm level.

To shed light on how banks' lending behaviour responded, we estimate regressions on the firm-bank-time level. Our outcome variable of interest is $\log(Newloans)$. The continuous treatment $ExposureIF$ indicates the share of investment fund exposure in total money market borrowing defined at the bank level as of 31 January 2020, before the escalation of the health emergency. We include a vector of bank characteristics measured in Q4 2019, the last available quarter before the shock. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. In addition, borrower firm level characteristics for end-of-year 2019 are also included in the regression. Firm controls refer to firm turnover and assets at the end of 2019, while fixed effects refer to firm size -industry - country - time fixed effects. The parameter of interest is again β , which now gives the effect of IF exposure for treated relative to control banks, for the post-outbreak period (11 -17 March 2020) relative to the period before the crisis (3 February - 10 March 2020). In all specifications robust standard errors are included.¹³ In some cases, we also assess the dynamic effect of investment fund exposure for banks and for each day, we show the difference in outcomes between treated and control banks relative to the difference in outcomes for March 10. The above regressions are estimated using around 127,000 bank-firm-time observations, depending on the exact specification. Keeping the firm dimension in our dataset allows us to introduce firm fixed effects to control for credit demand. First, in the spirit of Khwaja and Mian (2008), we exploit multiple bank-firm relationships and compare the outcomes of the same firm borrowing from banks affected differently by the IF funding outflow. In this setup, firm specific demand is accounted for by firm fixed effects, however, this specification excludes firms with single bank relationships. Since the majority of single-bank relationships involve small and medium enterprises (SMEs) which are predominant in most European countries, we follow the approach of Degryse et al. (2019), Popov and Van Horen (2015) and Acharya et al. (2019) and construct

¹²The share of bonds held by investment funds is measured prior to the Covid-19 shock, at the end of 2019, the latest point in Securities Holdings Statistics available before the outbreak of the COVID-19 pandemic.

¹³As our sample comprises only 34 banks, throughout the regressions we use robust standard errors to avoid the downward bias induced by the small number of clusters. We have nonetheless checked the robustness of our results by using bootstrapped cluster standard errors by clustering on the bank level. The coefficient of interest stays significant at 1 percent significance level.

firm size-industry-country-time fixed effects as an alternative way to control for credit demand. While the specification with firm fixed effects gets rid of firms with single bank observations, the multi-way fixed effect cannot be defined for firms which do not report their size, industry or country. For our sample, firm size in terms of employment is sometimes not reported. Therefore, while our preferred specification uses size-industry-country-time fixed effects to control for firm demand, in most of the cases we will report results for both specifications.

Concerning the estimations of the bank lending impact, the key identifying assumption for the employed difference-in-differences strategy is that the new lending related outcomes for treated and control banks would have evolved similarly, had there been no shock affecting the liability side of the banks due to IFs (see also Figure 7). In our regression, we control for a wide set of bank level observable characteristics. In the preferred specification, difference-in-difference estimates are conditional on bank capital positions, profitability, non-performing exposures and debt securities held in Q4 2019. Further on, the dataset allows to test for the presence of parallel trends for treated and control banks for the period before the Covid-19 shock, covering 3 February - 10 March 2020. As we show later, conditional on observable characteristics, in the period leading to the outbreak of the pandemic, the difference between the outcomes for treated and control groups is statistically not significant.¹⁴

[Insert Figure 7 here]

For the bond spread analysis, our identification strategy relies on the fact that different types of non-financial intermediaries were differently affected by the liquidity pressures which followed the pandemic outburst. As such, we aim to test whether firms whose bonds were predominantly held by investment funds became relatively less valuable after the Covid-19 shock (see also Figure 8). The key identifying assumption for the difference-in-differences strategy used for the bond yield analysis is that bond spreads for treated and control firms would have evolved similarly, had there been no shock affecting the liquidity of IFs. Besides controlling for a wide set of bond level observable characteristics, as an additional check, we also use exact matching on the individual bond ratings to control for potential non-linear

¹⁴Tables 16 and 17 show tests for sample balancedness. While firms or banks are significantly different along some characteristics, we control for those in our regressions. In addition, normalized means are small and in general below the usually acceptable values.

effects of the firms' risk characteristics. In addition, it is also key that the assignment of bonds to insurers or investment funds is random, and not endogenous to the bonds' characteristics. The inclusion of firm and bond level controls allows us to absorb any confounding variation at the issuer and bond level and address this concern.¹⁵

[Insert Figure 8 here]

4 Results

This section presents the main results of our identification strategy for the bond financing and bank lending impacts on NFCs of shocks to non-banks. With regards to bond financing, we discuss results according to the variation in corporate spreads. With regards to bank lending, we discuss results for the quantity, price and maturity of new loans.

4.1 Bond financing results

Our results suggest that for bonds largely held by the investment fund sector spread largely increased after the outbreak of the COVID-19 pandemic. This is in line with the procyclical nature of investment funds (see Goldstein et al. (2017)) which need to sell bonds to match outflows, quite often during the COVID-19 crisis.

[Insert Table 4 here]

In particular, as marginal effect of concentration, a 1 percentage point increase in the share of outstanding amounts held by investment funds, is estimated to have increased bond spreads by about between 0.33% to 0.40%, depending on the specification, after the outbreak of the COVID-19 (see Table 4).¹⁶ A firm whose bonds had just the median concentration in IFs (about 40%), saw an increase in their bond funding costs by almost 16 bps. This is an economically significant increase entirely explained by the fact that a procyclical investor, i.e. investment funds, rather than other investors, hold the bonds.

As shown in Table 4, impact estimates are relatively stable to the progressive inclusion of

¹⁵Tables 18 and 19 show tests for sample balancedness on the bond and issuer firm level. While characteristics are significantly different in some cases, we control for those in our regressions. In addition, normalized means are small and in general below the usually acceptable values.

¹⁶Repeating the regressions directly at bond level does not change the conclusions substantially.

more controls. In particular, in column (2) we add bond-level controls such as the bond rating (and coupon and maturity) as these are possible confounding factors for the results. We control for ratings linearly, while in the third specification we implement exact-matching on the rating to control for it non-linearly.¹⁷ We compute the marginal effect of having a progressively higher concentration in investment funds together with its confidence interval, as shown in Figure 3.

[Insert Figure 9 here]

Finally, we document that the impact of bond concentration is heterogeneous across bond risk categories and it affects much more strongly bonds with a rating quality below the median. This echoes and confirms results on a different shock by Giuzio et al. (2021), which find that investment fund outflows (triggered by monetary policy) can affect more than proportionally assets with ratings of lower quality.

[Insert Figure 5 here]

4.2 Bank lending results

New lending related outcomes Table 6 summarises the results for the volume of new lending, defined as the sum of drawn (on-) and committed (off-balance sheet) loans, for Equation (1) under different specifications. Column (1) reports our baseline results without controlling for firm or bank characteristics, whereas in column (2) we add bank level controls to capture the size, capital position, profitability, NPL share and bank's reliance on market funding (i.e. debt securities issued) all taken in Q4 2019. Column (3) reports the estimates from the specification with firm fixed effects to control for loan demand in the spirit of Khwaja and Mian (2008), while columns (4) and (5) the results with size-industry-country-time fixed effects, following Degryse et al. (2019). Our preferred specification in column (5) controls for size-industry-country-time fixed effects, as well as a set of bank- and firm-specific characteristics (firm turnover and assets at end-2019, in addition to the bank-characteristics reported above).

[Insert Table 6 here]

The coefficient of interest, *treatedxpost*, gives the effect of IF exposure for treated relative to

¹⁷We use the Coarsened Exact Matching approach as in Blackwell et al. (2009). Matching variables are time and rating, so that bonds of exactly same rating in close periods are compared across treatment and control groups. To define treatment and control groups, in this case a discrete treatment is used, based on above/below median share of bonds held by investment funds.

control banks, for the post-outbreak period (11 -17 March 2020) relative to the period before the crisis (3 February - 10 March 2020). According to the results presented in column (5), this coefficient suggests that a 10 percentage point increase in IF exposure reduces the volume of new lending by 5.5 percent. Results related to new lending are consistently negative and significant across all specifications.^{18 19}

[Insert Figure 11 here]

We also shows that there is a decline in new lending 5 days after Covid-19 is declared a pandemic by the WHO. The effect on new lending on a daily basis is depicted in Figure 11. The chart also confirms the parallel trends assumption, as coefficients are not significantly different from zero in the weeks before 11 March 2020.

[Insert Table 8 here]

In addition, we estimate the effect of investment fund exposure on rates and maturities associated with new lending but find mixed results. Results for rates, reported in Table 8, show no significant effect under our preferred specification in column (5). We see a small decrease with respect to the maturity of the new loans granted, however this effect is also not significant in column (5) in Table 9. These results are in line with our expectations, as it is likely that banks can adjust very quickly by reducing the quantity of loans on offer, however, transmission of shocks to credit standards and terms and conditions for new loans is likely to take more time to pass-through.

[Insert Table 9 here]

Heterogeneous effects related to bank characteristics We provide results for the heterogeneous impact of new lending related to some bank-specific characteristics.²⁰ We use as key bank balance sheet strength variable the bank capital-to-total-assets ratio (e.g. Bernanke et al.

¹⁸One standard deviation for investment fund share in our sample equals 9.8 percentage point.

¹⁹Our results are confirmed when new lending volumes are defined only by looking at drawn (on-balance sheet) exposures, see Appendix table 7 The effects are somewhat smaller than in Table 6, confirming that our main results are also driven by off-balance sheet loans, i.e. committed credit lines which are not necessarily drawn down immediately.

²⁰According to the existing literature, the transmission of monetary policy is stronger for smaller, less liquid and less well capitalised intermediaries (e.g. Altavilla et al. (2019), Jiménez et al. (2012), Kashyap and Stein (1995), Gambacorta and Shin (2018), Michelangeli and Sette (2016), Kashyap and Stein (2000), Stein (1998), Peek and Rosengren (1995), Kishan and Opiela (2000), Van den Heuvel (2002)).

(1996), Kashyap and Stein (2000)) and show that for more capitalised banks²¹ the negative impact of being more exposed to funding from investment funds is dampened (column 1 in Table 10). Bank profitability, measured by return on equity (ROE), can also interfere with banks' credit supply to the real economy, as it affects the extent to which banks can boost their capital organically (e.g. Altavilla et al. (2018), Borio et al. (2017)). According to Table 10 column 2, higher end-2019 profitability does not dampen the lending effect of the funding shock stemming from investment funds. Finally, Table 10 column 3 shows that the intermediation capacity is impaired for banks with higher NPL ratios, whereas the negative effect on lending is not significant for banks with below median NPL ratios, in line with Huljak et al. (2020) and Sánchez Serrano (2021).

[Insert Table 10 here]

Heterogeneous effects related to firm characteristics In this section, to better understand which firms are more affected, we explore the effect of the shock by firm characteristics. We look at the effect by (i) firm size,²² (ii) asset quality history, (iii) by their historical relationship to a specific bank, (iv) turnover and (v) industry of activity (see Table 11). Column 1 coefficients show that our main results are driven by lending to small and medium enterprises. These findings corroborate the results of the Survey on the Access to Finance of Enterprises in which SMEs indicated concerns related to access to bank loans as the pandemic broke out.²³ At the same time, firms' past creditworthiness does not appear to amplify the effect of the shock (column 3).²⁴ Results for relationship lending (e.g. Degryse and Van Cayseele (2000), Ongena and Smith (2001), Bolton et al. (2016), Dass and Massa (2011), Santos and Farinha (2000), Cole (1998), Agarwal and Ann Elston (2001), Boot (2000)) suggest that being already connected to the bank in the quarter before the shock has a small positive impact on new lending, however, the effect is not significant. Column (4) shows that the negative lending effect is dampened

²¹A more capitalised bank is a bank with an above median capital ratio as of 2019 Q4, the quarter before the crisis hit.

²²Size is defined based on headcount, turnover and balance sheet figures, following Eurostat's definition. For more details, see https://ec.europa.eu/growth/smes/sme-definition_en.

²³For more details, see the SAFE survey covering the period October 2019 to March 2020 https://www.ecb.europa.eu/stats/accesstofinancesofenterprises/pdf/ecb.safe202005~c4b89a43b9_en.pdf

²⁴We consider firms non-performing exposures with any bank in 2018 Q4, 2019 Q2 or 2019 Q4 and while the effect of NPLs is negative, it is not significant.

for firms having above median turnover in 2019, as banks might be still willing to give loan to firms with better prospects to repay their debts. Finally, we show that the negative impact on lending is associated with firms in the manufacturing and construction sectors²⁵ (column 4). This is in line with our expectations, as firms in these sectors are generally more credit dependent because of physical investment and their buyer-supplier links, which need to be financed with short term credit (e.g. Rajan and Zingales (1998), Braun and Larrain (2005)).

[Insert Table 11 here]

5 Robustness checks

5.1 Investor base for bonds

To complement our findings on the impact of being mostly held by investment funds on bond spreads, we show that when bonds are more concentrated in the hands of ICPFs, the results are quite the opposite to what we found for investment funds. On average, spreads decrease by 0.3% for firms with bonds mostly held by insurance companies/pension funds (See Table 3). The marginal effect of concentration for ICPFs is almost symmetrically the opposite to the one for investment funds (see Figure 10). The result squares with a 'buy-and-hold' approach of ICPFs and it is consistent with findings for the US for the period of the Great Financial Crisis Coppola (2022).

[Insert Figure 10 Here]

[Insert Table 3 here]

5.2 Placebo test for bank lending using different periods

To show further evidence on the validity of the parallel trends assumption in the employed difference-in-differences strategy for the estimation of loan supply, we provide a placebo test focusing on "fake" outcomes. For Equation 1, while keeping the RHS of the regression unchanged, we add lending outcomes for the same days of interest (1 February - 18 March), however we focus on years 2019 and 2021. First, we choose to focus on the same months as

²⁵We consider firms sectoral specialisation based on their NACE2 sectoral classification in 2019. Firms in all other sectors, including firms in financial services are excluded.

in our original regression as bank balance sheet developments might differ across quarters (e.g. end-year window dressing). Second, neither for 2019, nor for 2021 were there other major shocks that might have influenced differently the lending of the treatment and control banks. Using a "fake" outcome, we expect no significant on lending from investment fund exposure. Figures 12 and 13 show the differences in lending on a daily basis for February-March 2019 and 2021 for the treatment group, relative to the control group and relative to the day before Covid-19 has been declared a pandemic. Both for 2019 and 2021, the coefficients are small, positive and insignificant, supporting the parallel trends assumption.

[Insert Figure 12 here]

[Insert Figure 13 here]

5.3 Bank consolidation

For our analysis, we use a consolidated sample of banks. The ECB is responsible for the supervision of a credit institution depending on its significance status, which is assessed at the highest level of consolidation. Therefore, it is customary to assess banks on the consolidated level in the euro area. However, given the merging of the various datasets, in some cases consolidation had to be performed manually. In addition, consolidation could change our sample, as depending on specification, might lead to more firms having one bank relationship. We repeat our main regressions on an unconsolidated sample of banks and show that our results are unchanged for new loans and maturities and rates associated with new volumes (see Tables 12, 14 and 13).

[Insert Table 12 here]

[Insert Table 13 here]

[Insert Table 14 here]

5.4 Lending vs. borrowing from non-banks

Could loans to non-banks crowd out loans to the non-financial private sector? So far we have argued that the COVID-19 shock affects banks through their funding from non-banks. However, in this turbulent period, an alternative channel explaining lower new lending to NFCs could

be an increase in lending to non-banks. To rule out this mechanism, we add as a control the share of loans to other financial corporates to total assets in Q4 2019 to the regressions. Table 15 summarises our results and shows that coefficients are unchanged compared to the baseline.

[Insert Table 15 here]

5.5 Firm credit lines

Firms could have tapped the credit lines which were already agreed upon before the shock, including credit lines from other banks. This might lead to less new loan contracts being signed immediately after the liquidity shock, whereas banks cannot object the drawdown on pre-agreed credit lines. We re-estimate our main regression on new lending by controlling for total off-balance sheet amount and show an even larger negative lending impact (Table 20).

[Insert Table 20 here]

5.6 Bank liquidity

Were banks really liquidity constrained in this period, as a result of investment fund deposit withdrawals? We test indirectly that banks were liquidity constrained and there was no substitution available for the lost funding from IFs in this short period. We extend our post period until end-March, so that it covers both the PEPP announcement (18 March 2020) and PEPP implementation (25 March 2020) periods. We expect that the PEPP alleviated banks' liquidity problems and we confirm that on a longer post-period, the new lending impact is much less negative (see Table 21).

[Insert Table 21 here]

6 Conclusion

In this paper we show that the turmoil in financial markets that occurred at the outbreak of the Covid-19 pandemic affected both bond financing and bank lending to firms because of the procyclical effects exerted by the investment fund sector. As investment funds experienced unprecedented investor outflows, the pricing of corporate bonds rose more strongly for more exposed firms, likely as a consequence of redemption pressures and asset fire-selling. At the

same time, short term funding by investment funds was abruptly withdrawn from euro area banks, thus impacting their new lending decisions towards firms. Instead of being the spare tyre of the financial system, non-banks, and in particular funds, amplified liquidity shocks for firms.

To capture these effects, we combine several extremely granular datasets to trace out the liquidity shocks and transmission channels from non-banks to firms. We bring together for the first time key firm, loan, bond and transaction level datasets such as AnaCredit, MMSR, SHSS, CSDB, Refinitiv, iBOXX and Supervisory statistics. Armed with this wealth of data, we set up two sets of difference-in-differences regressions which are then saturated by a wide range of bank, firm and bond specific controls and fixed-effects. First, we ask if the pricing of corporate bonds is affected by whether securities are mostly held by insurers or investment funds after Covid-19 and find that yields increased for firms whose bonds were mostly held by investment funds. Secondly, we compare the new lending of banks differently affected by the outflow of investment fund deposits and show that banks most affected by this outflow curtailed their lending to firms more than others. At the same time, we do not find significant changes in the lending rates or maturities of new loans that were granted.

While our results are based on a short period of time, which compare the post-outbreak period (11 -17 March 2020) to the period before the crisis (3 February - 10 March 2020), they provide useful insights into the financial system's reaction to a global confidence shock. They show that a diversified financial sector is both more resilient (as bonds widely held by insurers were largely unaffected by the shock) but also more exposed to risks (as banks more exposed to short term funding withdrawal by investment funds contracted lending more strongly). Overall, we show that shocks in the euro area non-bank sector can spill over to firms and banks, raising financial stability concerns and highlighting the importance of regulation for non-banks.

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A Dataset construction

Our analysis combines multiple granular proprietary datasets established by the ECB and prudential authorities, as well as on market data sources. To investigate the direct effects via bond markets, we rely on securities holdings statistics data at the sector level to identify the holder sectors of NFC bonds; iBOXX data to track the evolution of NFC bond financing costs at daily frequency; EIKON Thompson Reuters and the Centralised Securities Database (CSDB) to control for firm and bond specific characteristics, respectively, as well as for new bond issuances. Instead, to investigate the indirect effects, we use the money market statistical reporting (MMSR) data on money market transactions between banks and non-banks; we use the EU wide credit register (AnaCredit) to study the impact on new lending by banks to firms and ECB Supervisory statistics to control for bank specific characteristics. This data dictionary provides useful background information to researches planning to make use of the following datasets:

- ECB securities holdings statistics at the sector level (SHSS) at quarterly frequency;
- iBOXX data on NFC bond financing costs at daily frequency;
- EIKON Thompson Reuters/Refinitiv on firm balance sheet information at quarterly frequency;
- Centralised Securities Database (CSDB) on bond issuances at daily frequency;
- Money market statistical reporting (MMSR) data on money market transactions at daily frequency;
- Analytical credit register (AnaCredit) at daily frequency;
- ECB Supervisory statistics at quarterly frequency.

Securities Holdings Statistics at the sector level (SHSS) is reported on a quarterly basis and provides information on selected categories of euro area investors, broken down by country of residence. The data for debt securities also contains information on interest rates, original and residual maturity.

The **Centralised Security Database (CSDB)** is a proprietary database of the ECB that collects information on outstanding bonds and their issuance, and is used to build official euro area statistical aggregates for corporate bonds.

iBOXX is a dataset provided by Markit which contains traded prices data at daily frequency for the constituents of all iBOXX indices.

The **money market statistical reporting (MMSR)** includes daily transaction-level information on euro denominated money market activity of 47 euro area banks with all counterparts since mid-2016. The reported transactions cover the vast majority of euro area money market activity and provide information on the counterpart (including for example the sector and jurisdiction) and on the transaction itself (including for example data on transacted amounts, rates, underlyings, maturity/tenor, etc.). We analyse transactions where banks stand on the borrowing side of each contract. Reporting banks provide information on the secured (repurchase agreement transactions), unsecured, foreign exchange swap and overnight index swap euro money market segments. The list of reporters as well as additional information on the dataset can be found here: https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/money_market/html/index.en.html.

We only use bilateral funding data between institutions and exclude cleared repo trades.²⁶ Finally, we eliminate outliers by winsorizing the upper and lower first percentiles of transactions with respect to their repo rates, and remove all rates that are above zero and below minus one, as these values are implausible over the period investigated.

AnaCredit is the credit register of the European System of Central Banks which contains information on all individual bank loans to firms at a monthly frequency. It contains information on all individual bank loans to firms with a reporting threshold above €25,000. Additional documentation can be found here: https://www.ecb.europa.eu/stats/money_credit_banking/anacredit/html/index.en.html. In addition, *AnaCredit* provides information on key borrower characteristics: (1) the 2-digit NACE code of the firm; (2) the location of the firm based on 4 or 5-digit postal code for the largest countries in the sample and for the

²⁶Limiting the analysis to bilateral transactions is not particularly restrictive in our case since non-banks are unlikely to engage in cleared trades which are the purview of clearing house members. Non-banks very rarely act as clearing house members. See for example the list of [members](#) by London Clearing House, a leading clearing house in Europe)

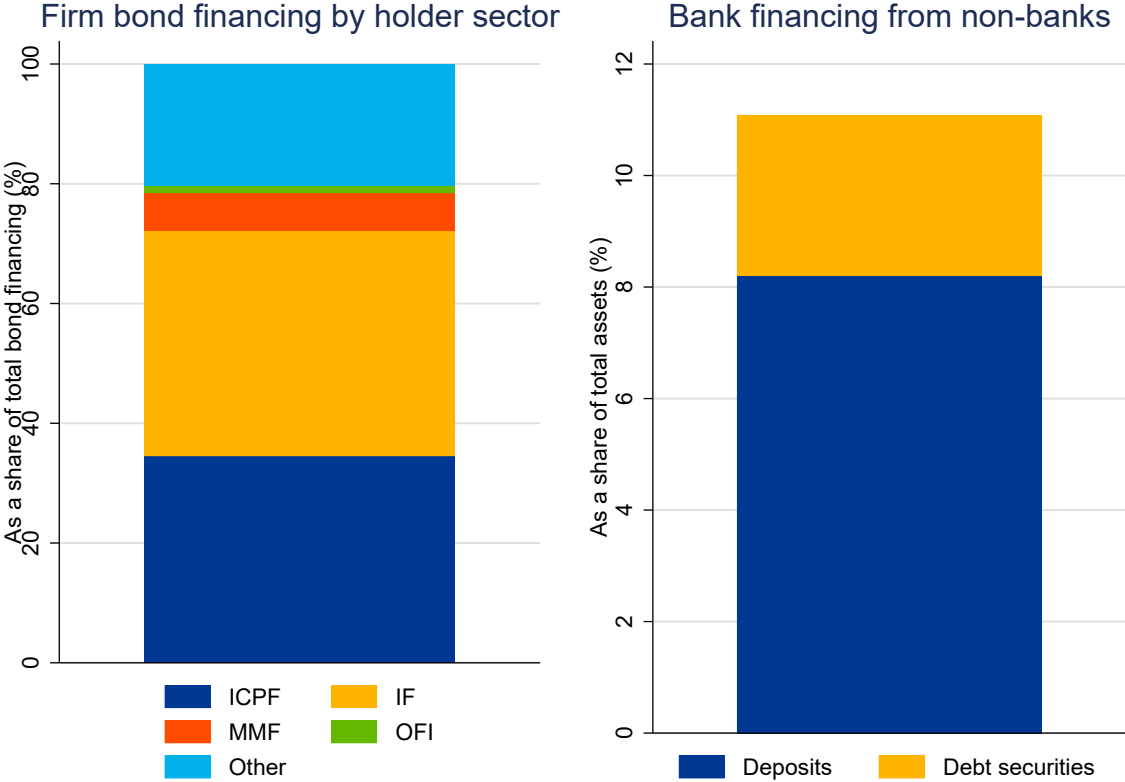
smallest (Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta, Slovakia and Slovenia) on the firm's country headquarter; (3) the classification of firm size based on the Eurostat definition, for more information see https://ec.europa.eu/growth/smes/sme-definition_de.

ECB Supervisory Reporting is available on a quarterly basis, includes bank-level information on banks' balance sheet, profitability, asset quality, funding conditions and capital adequacy. It is based on common reporting (COREP) and financial reporting (FINREP) frameworks and is collected at the highest level of consolidation.²⁷

²⁷ Additional documentation for Supervisory statistics can be found here <https://www.bankingsupervision.europa.eu/banking/statistics/html/index.en.html>.

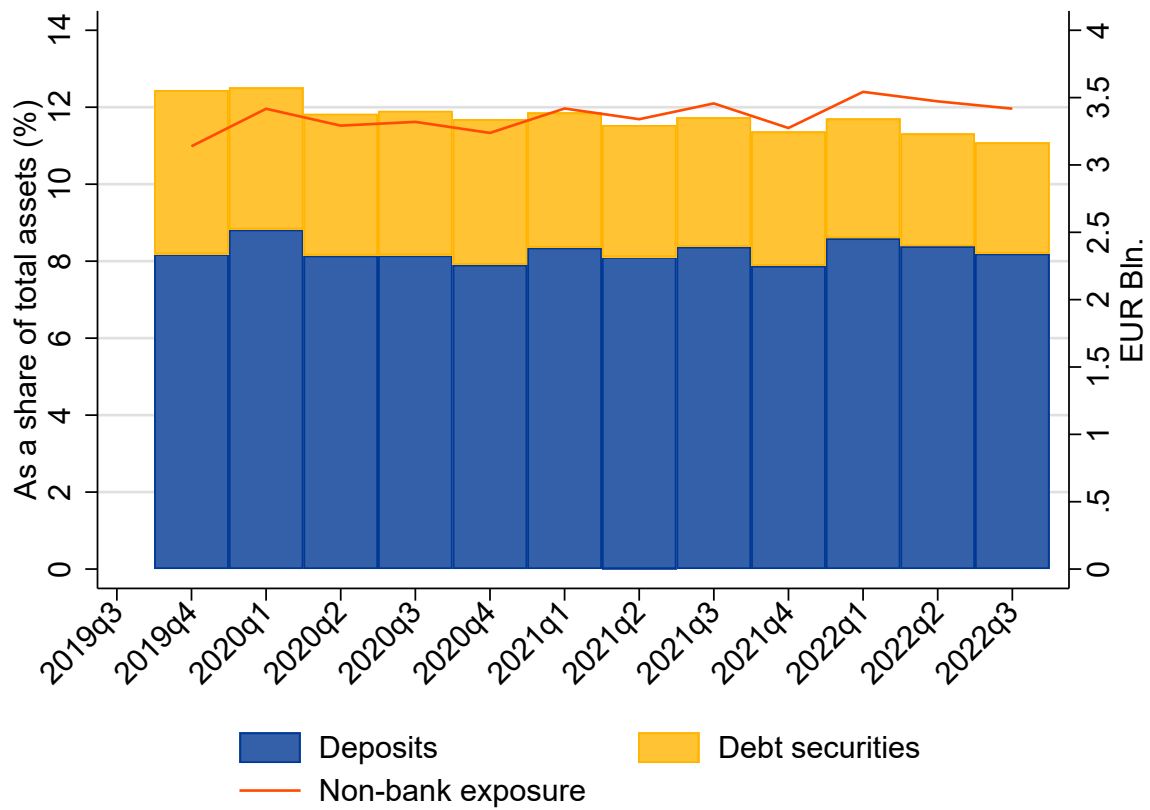
B Figures

Figure 1: The importance of non-banks in firm and bank financing (2022 Q3)



Notes: The left-hand side panel shows the distribution of corporate bonds by holder sector in the euro area. The right hand side panel shows deposits and debt securities of non-banks in banks' balance sheets as a share of banks' total assets. Own calculations based on ECB Supervisory Reporting and Securities Holding Statistics by Sector.

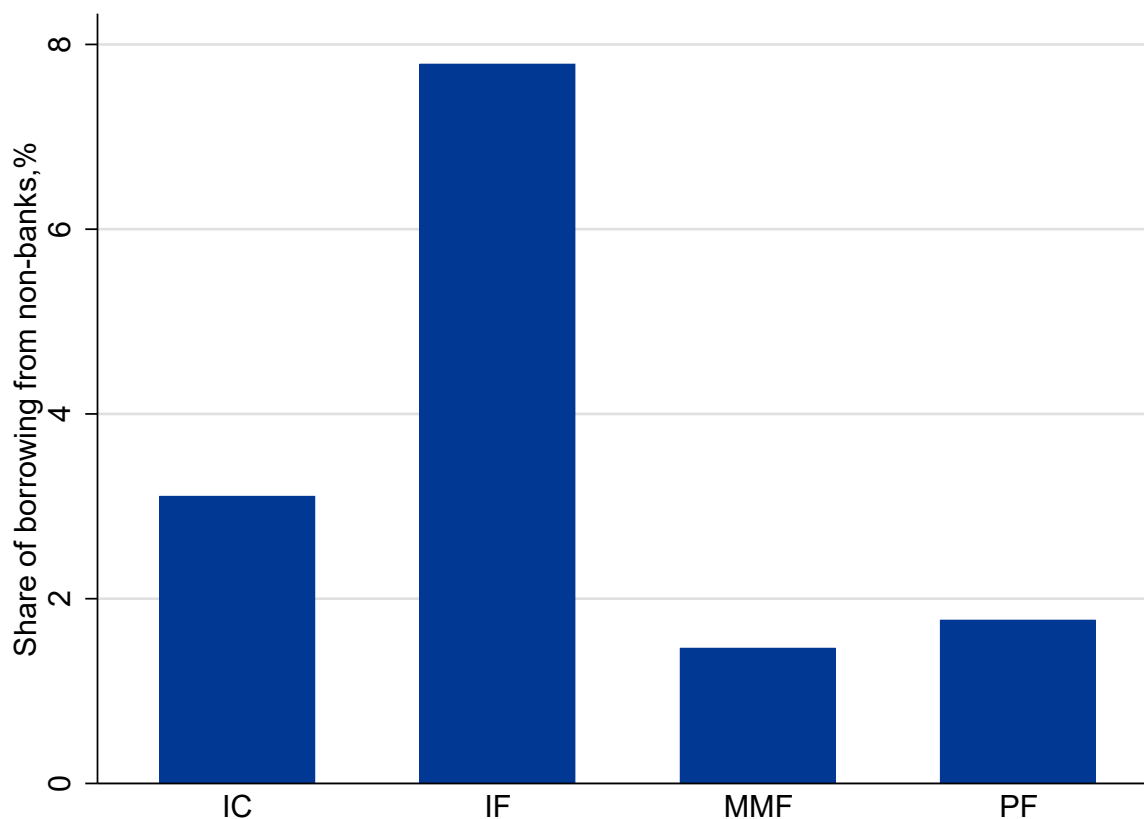
Figure 2: Non-bank related liabilities of banks



Notes: The bars show deposits and debt securities of non-banks in banks' balance sheets as a share of banks' total assets, whereas the line show the value of non-bank related bank liabilities. Own calculations based on ECB Supervisory Reporting.

C Tables

Figure 3: Euro area banks' exposure to non-banks in January 2020



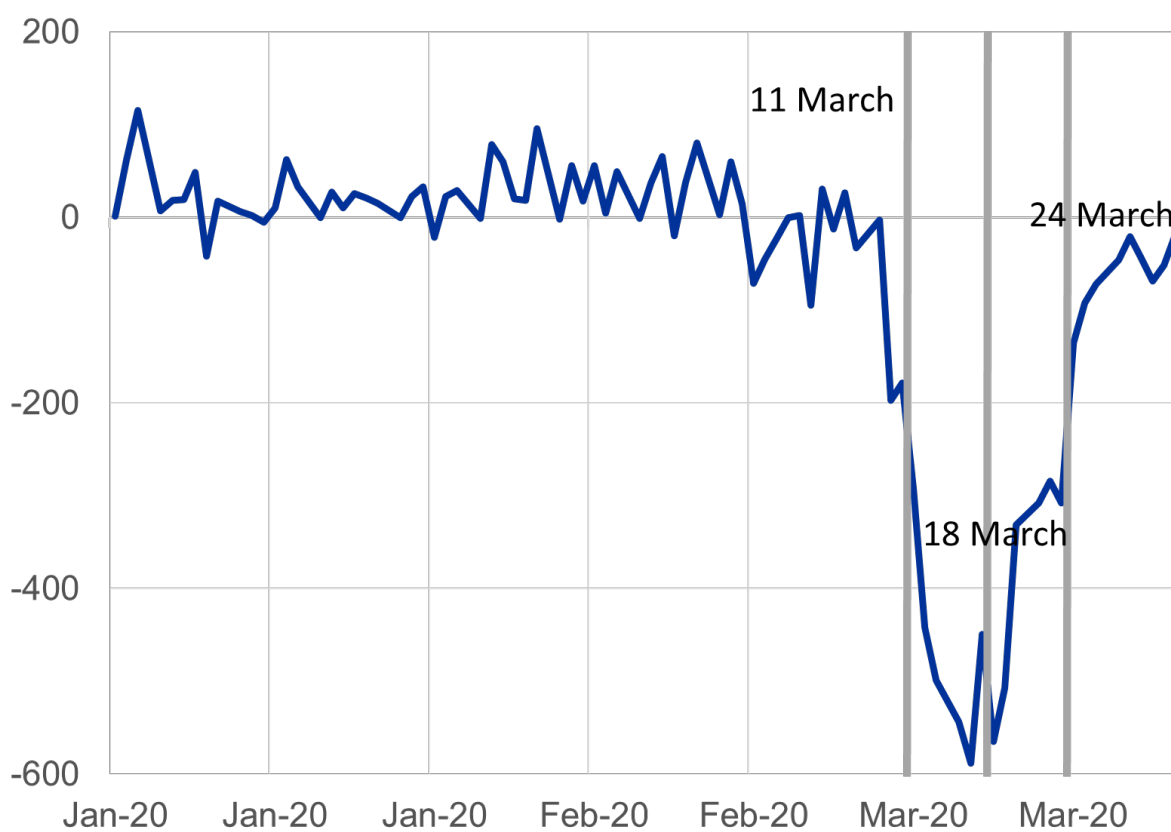
Notes: Average share of banks' secured and unsecured deposits from funds, to total money market deposits on 31 January 2020. Own calculations for all reporting agents based on Money Market Statistical Reporting.

Table 1: Descriptive statistics for bond dataset

	(1)	(2)	(3)	(4)
	mean	p50	sd	count
Spreads	65.2	23.0	120.9	23640
rating	-0.1	0.0	0.3	23640
maturity	1.7	1.1	1.7	23640
share of investment funds ownership	0.3	0.4	0.2	23640

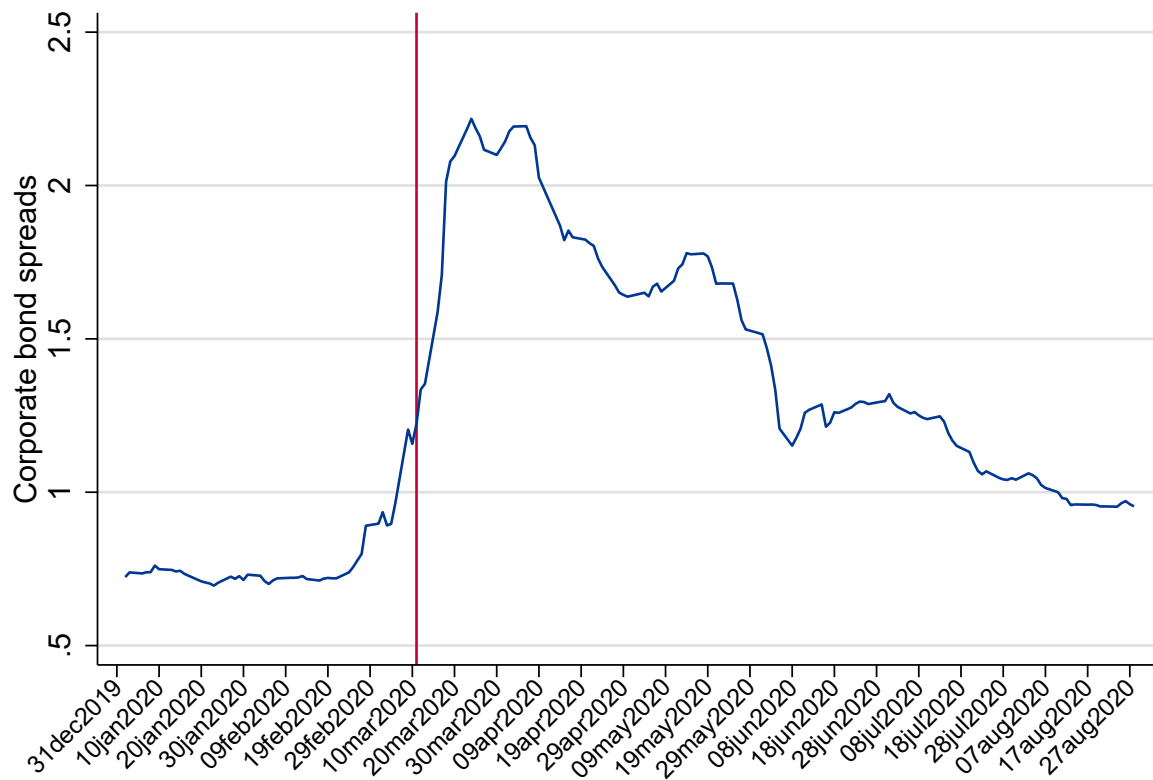
Notes: The table provides descriptive statistics for bonds, and for firms that issue bonds. Bond level statistics refer to daily spreads on long term bonds, i.e. above 1 year, outstanding in the period 2 February - 17 March 2020. For firm level statistics, the dataset is aggregated on the firm-bond-day level. The shares of bonds held by different NBFIs are defined for Q4 2019 based on Securities Holdings Statistics.

Figure 4: Outflows from investment funds at the outbreak of COVID-19



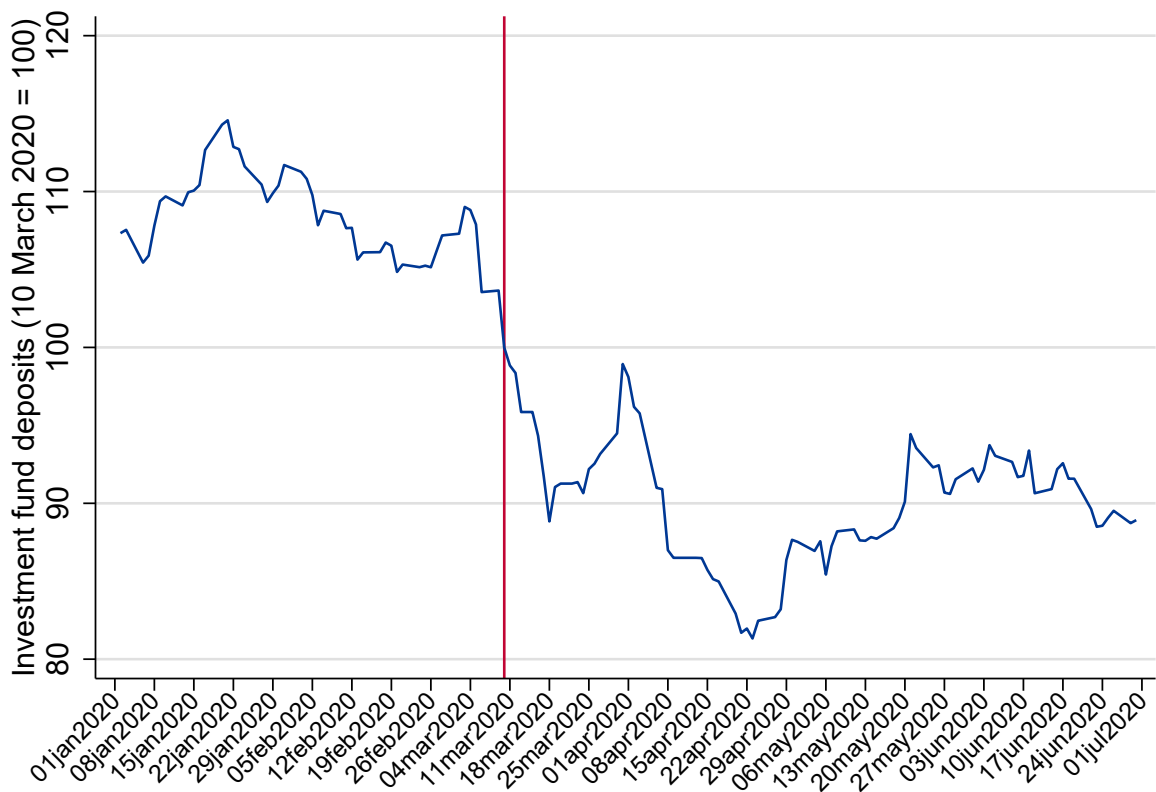
Notes: Daily outflows of euro area corporate bond funds recorded in Lipper IM (Thomson Reuters/Refinitiv).

Figure 5: Evolution of corporate bond spreads



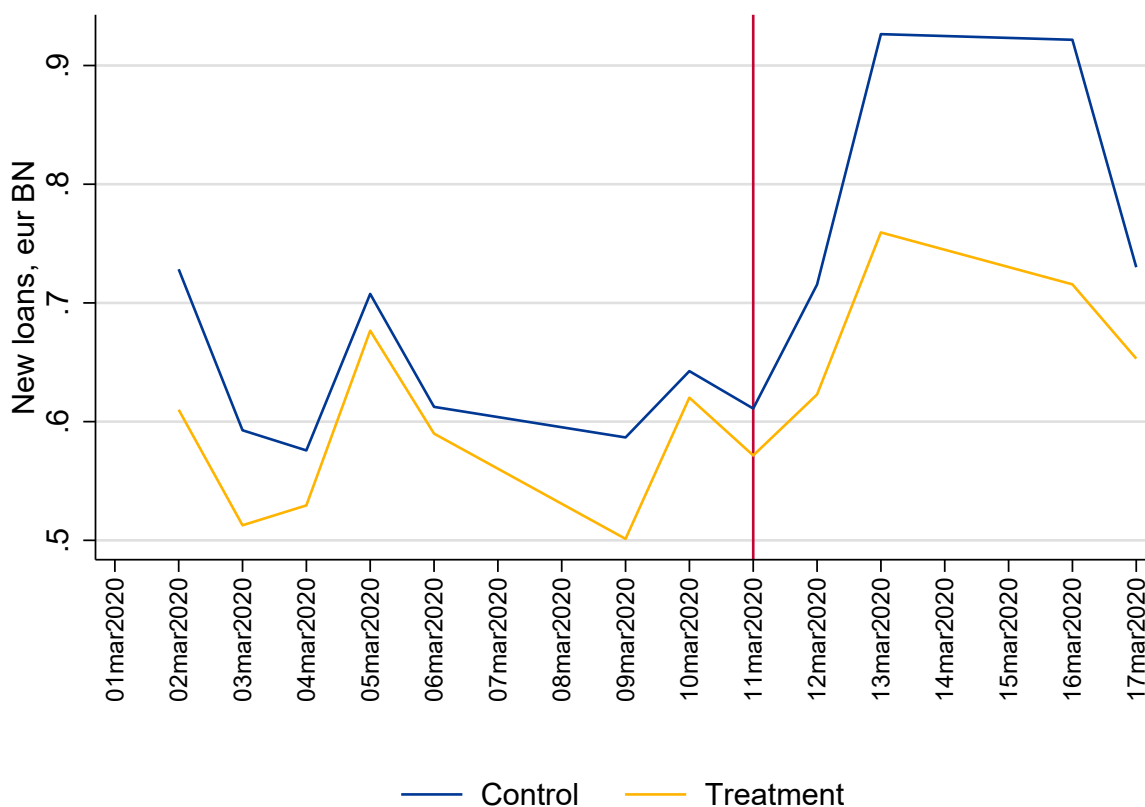
Notes: The chart shows daily data for corporate bond spreads. Spreads are calculated relative to a risk-free bond with similar maturity and are weighted by outstanding amount. Own calculations based on iBOXX.

Figure 6: Evolution of euro area banks' deposits from investment funds



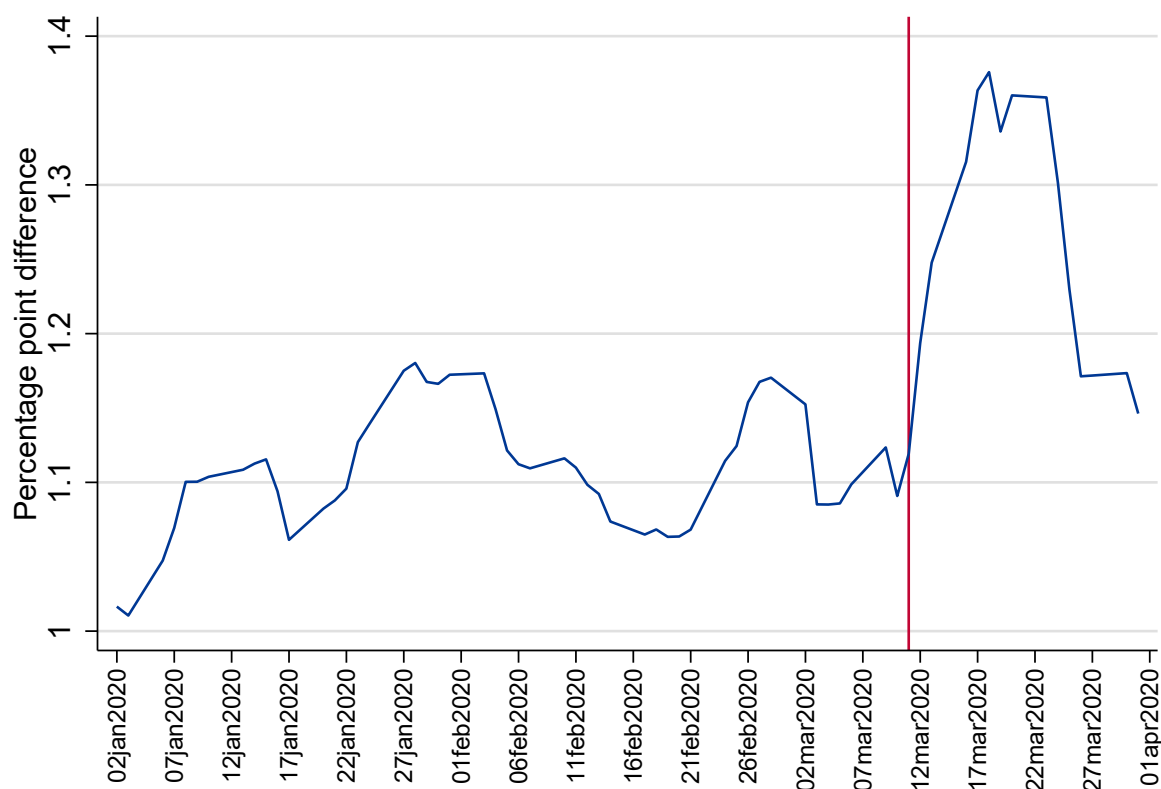
Notes: The chart shows daily data for investment funds' secured and unsecured money market deposits and certificates of deposits held at banks. Own calculations based on Money Market Statistical Reporting.

Figure 7: Evolution of new lending by treated and control banks around the shocks



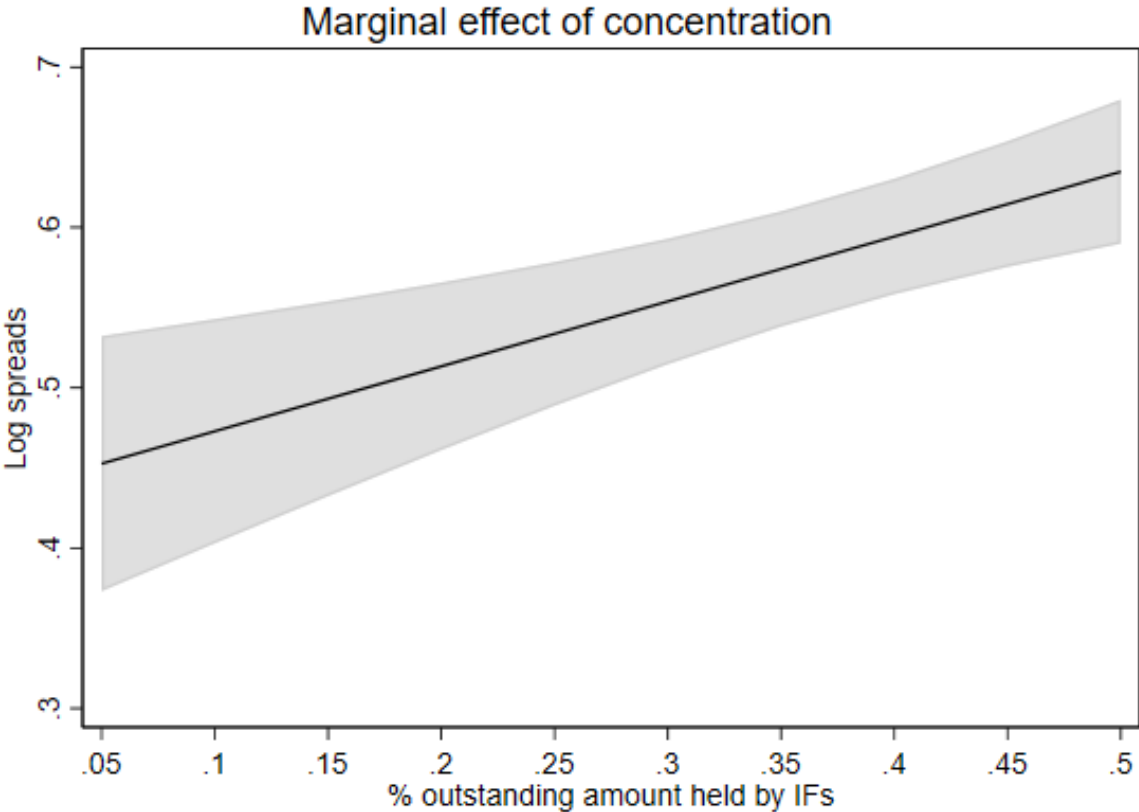
Notes: The chart shows daily new lending by treated and control banks. Treated banks are defined as having above median share of deposits held by investment funds. Own calculations based on AnaCredit.

Figure 8: Difference in spreads



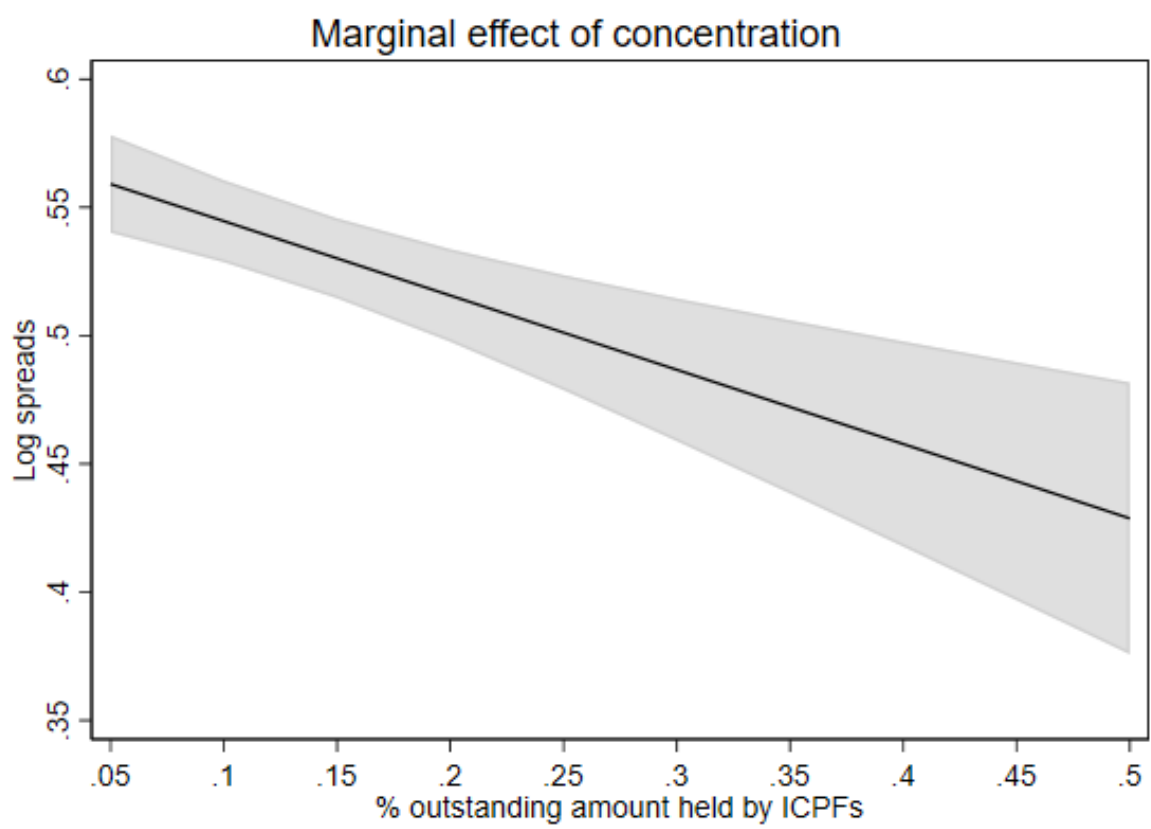
Notes: The chart shows the difference in spreads between bonds mostly held by investment funds vs. the rest of non-banks. Cutoff for the share of investment fund holder is median. Own calculations based on iBOXX.

Figure 9: Marginal effect on spreads of concentration in ICPEs



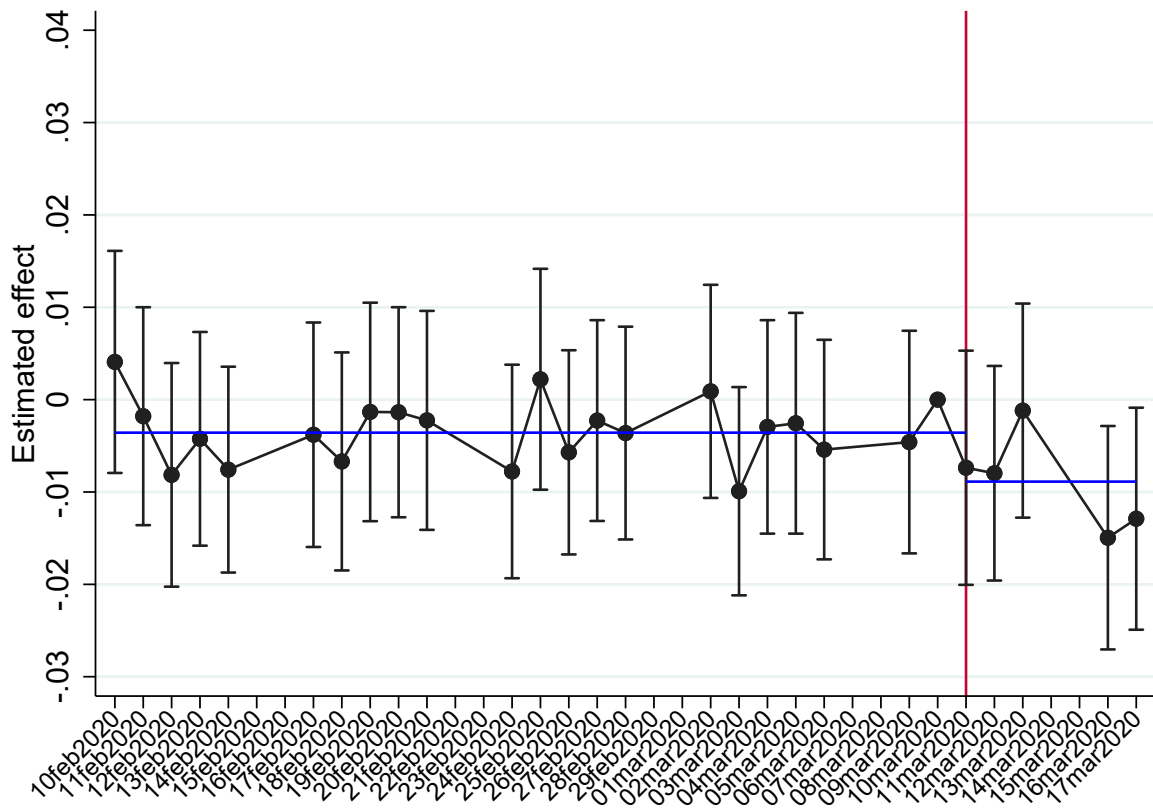
Notes: The chart shows the marginal effect of concentration in IFs on corporate bond spreads.

Figure 10: Marginal effect on spreads of concentration in ICPFs



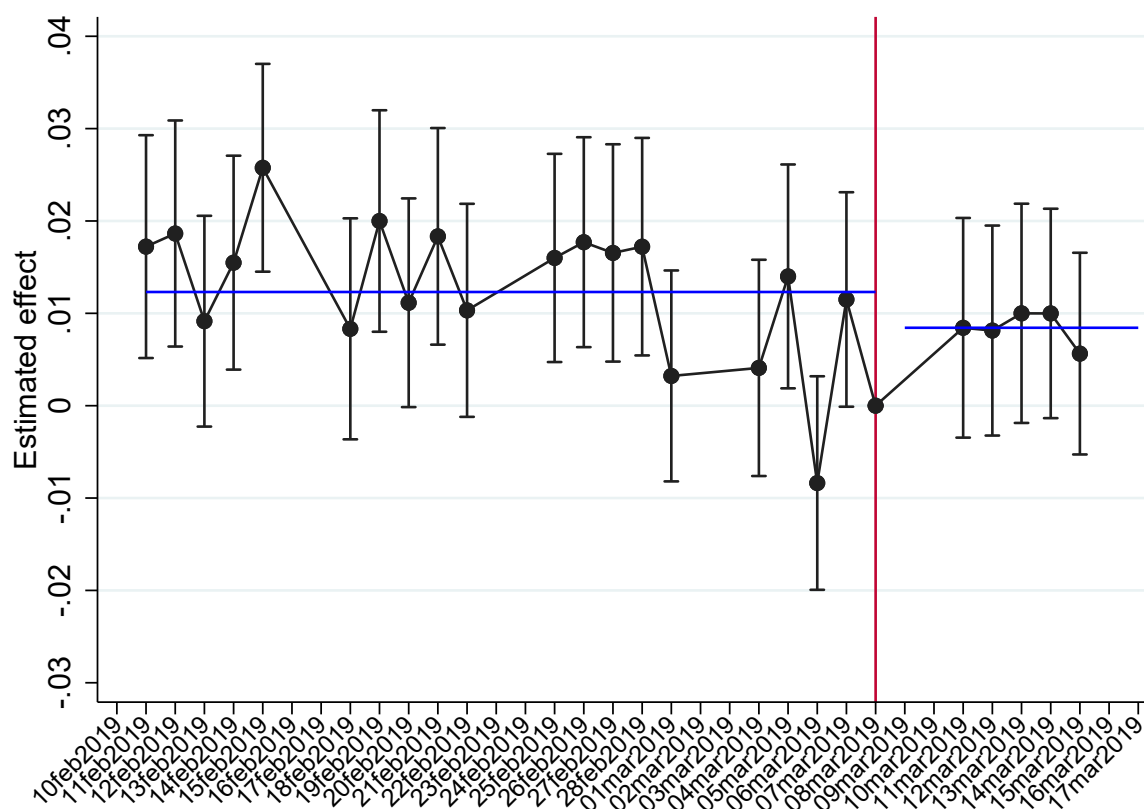
Notes: The chart shows the marginal effect of concentration in ICPFs on corporate bond spreads.

Figure 11: Volume of new lending



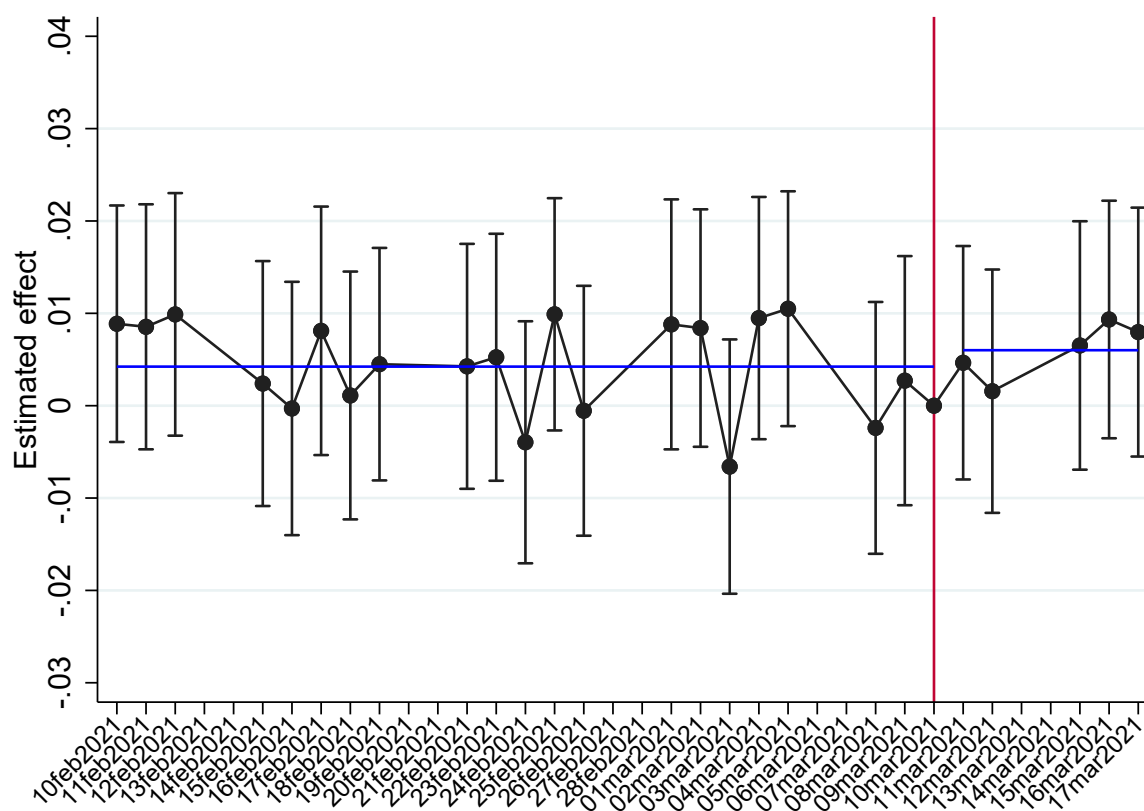
Notes: The outcome variables is log volume of new loans. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. Horizontal lines represent pre- and post-treatment average effects across days. Error bars represent 95 percent confidence intervals. Robust standard errors.

Figure 12: Volume of new lending in February - March 2019



Notes: The figure shows estimated β coefficients for the period 2 February - 17 March 2019, a year before our period of focus. The outcome variables is log volume of new loans. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. Horizontal lines represent pre- and post-treatment average effects across days. Error bars represent 95 percent confidence intervals. Robust standard errors.

Figure 13: Volume of new lending in February - March 2021



Notes: The figure shows estimated β coefficients for the period 2 February - 17 March 2021, a year after our period of focus. The outcome variables is log volume of new loans. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. Horizontal lines represent pre- and post-treatment average effects across days. Error bars represent 95 percent confidence intervals. Robust standard errors.

Table 2: Descriptive statistics for bank lending dataset

	Mean	Median	SD	Number of obs.
Loan level				
Volume (Th. EUR)	93.8	23.2	241.6	467,795
Volume, wo off-bs. (Th. EUR)	72.8	15.8	217.6	467,795
Maturity (Months)	24.8	10.0	41.1	460,586
Rate (Percent)	3.3	1.6	8.1	379,575
Firm level				
Volume (Th. EUR)	124.1	30.0	347.5	345,496
Volume, wo off-bs. (Th. EUR)	97.4	18.0	317.3	345,496
Maturity (Months)	26.0	9.2	42.9	345,496
Rate (Percent)	1.8	1.0	3.6	345,496
Employment (Th.)	152.0	0.0	3894.8	279,747
Turnover (Bn. EUR)	484.9	0.0	26881.7	294,680
Assets (Bn. EUR)	624.2	0.0	36916.0	284,657
NPL share (Percent)	1.1	0.0	9.3	289,876
Bank level				
Assets, (Bn. EUR)	485.9	263.0	461.2	32
Capital share (Percent)	1.5	1.0	1.8	32
ROE (percent)	4.4	5.8	4.8	31
Sh. non-performing (Percent)	6.2	4.7	4.9	34
Debt securities (Bn. EUR)	82.5	49.6	74.0	32

Notes: The table provides descriptive statistics for *new* loans, and for firms that borrow and banks that give a new loan in our period of interest. Loan level statistics refer to new loans granted on a daily basis in the period 2 February - 17 March 2020. For firm level statistics, the dataset is aggregated on the firm-bank-day level. The volume of new loans refers to the sum of outstanding and off-balance sheet amounts. Firm-bank level new loan related maturities and rates are weighted by the outstanding nominal amount at origination. Bank level variables are defined for Q4 2019 based on Supervisory reporting. Capital share refers to total capital to total assets. The share of non-performing loans is defined based on AnaCredit for December 2019.

Table 3: Spreads on firm bonds concentrated in ICPF

	(1)	(2)	(3)
	Log(spread)	Log(spread)	Log(spread)
treatedXpost	-0.3019*** (0.0701)	-0.2897*** (0.0702)	-0.2756*** (0.0702)
N	7023	7023	6930
R ²	0.930	0.930	0.927
Firm FE	Yes	Yes	Yes
Bond controls	No	Yes	Yes
Matching	No	No	Yes

Notes: The table shows the results for the spreads of firms' bonds mostly held by insurance companies and pension funds (ICPFs), referring to the week 11-17 March 2020 as the post period. Spreads are defined relative to the OIS rate of closest maturity as in the Markit iBOXX data. The concentration of bond holdings in ICPF is computed as the share of market value of total outstanding held by ICPF in 2019Q4. Columns refer to an increasing degree of controls: the first column is firm level regression including firm-level fixed effects, the second column adds also bond level controls, maturity coupon and ratings. The third column includes also exact matching on the rating of the bond. In all specifications robust standard errors are included.*** = significant at 1 percent level; ** = significant at 5 percent level; * = significant at 10 percent level.

Table 4: Bond spreads of firms whose bonds are concentrated in investment funds

	(1)	(2)	(3)
	Log(spread)	Log(spread)	Log(spread)
treatedXpost	0.3741*** (0.0452)	0.4034*** (0.0589)	0.3300*** (0.0690)
N	7086	7086	6801
R ²	0.926	0.926	0.909
Firm FE	Yes	Yes	Yes
Bond controls	No	Yes	Yes
Matching	No	No	Yes

Notes: The table shows the results for the spreads of firms' bonds mostly held by non-money market mutual funds (investment funds or IFs), referring to the week 11-17 March 2020 as the post period. Spreads are defined relative to the OIS rate of closest maturity as in the Markit iBOXX data. The concentration of bond holdings in IFs is computed as the share of market value of total outstanding held by euro area IFs in 2019Q4. Columns refer to an increasing degree of controls: the first column is firm level regression including firm-level fixed effects, the second column adds also bond level controls, maturity coupon and ratings. The third column includes also exact matching on the rating of the bond. In all specifications robust standard errors are included.*** = significant at 1 percent level; ** = significant at 5 percent level; * = significant at 10 percent level.

Table 5: Heterogeneous spread effects by bond risk

	(1) Log(spread)
IF concentrated	
treatedXpost	0.3522*** (0.0456)
SaferXtreatedXpost	-0.3990*** (0.0377)
ICPF concentrated	
treatedXpost	-.2903024 (.0765603)***
SaferXtreatedXpost	.0040616 (0.1574)
<i>N</i>	28251
<i>R</i> ²	0.970
Firmfe	Yes
BondControls	Yes
Matching	No

Notes: for the spreads of firms' bonds mostly held by non-money market mutual funds (investment funds or IFs), referring to the week 11-17 March 2020 as the post period. Spreads are defined relative to the OIS rate of closest maturity as in the Markit iBOXX data. The concentration of bond holdings in IFs is computed as the share of market value of total outstanding held by euro area IFs in 2019Q4. Columns refer to an increasing degree of controls: the first column is firm level regression including firm-level fixed effects, the second column adds also bond level controls, maturity coupon and ratings. The third column includes also exact matching on the rating of the bond. In all specifications robust standard errors are included. treatedxpost + SaferXtreatedxpost give the effect for bonds with above median rating, which is between AAA and A. In all specifications robust standard errors are included. *** = significant at 1 percent level; ** = significant at 5 percent level; * = significant at 10 percent level.

Table 6: Volume of new lending

	(1)	(2)	(3)	(4)	(5)
	Volume	Volume	Volume	Volume	Volume
treatedXpost	-0.0031*** (0.0010)	-0.0034*** (0.0013)	-0.0029** (0.0012)	-0.0061*** (0.0020)	-0.0055*** (0.0021)
N	308381	249727	138212	146997	127113
R ²	0.000	0.037	0.764	0.434	0.453
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for the volume of new lending for the post period, which refers to 11-17 March 2020. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 7: New lending volumes, alternative definition

	(1)	(2)	(3)	(4)	(5)
	Volume	Volume	Volume	Volume	Volume
treatedXpost	-0.0033*** (0.0012)	-0.0024* (0.0014)	-0.0022* (0.0012)	-0.0042** (0.0021)	-0.0046** (0.0022)
N	265413	226385	131809	137189	119730
R ²	0.000	0.036	0.771	0.436	0.469
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for new lending for the post period, starting on 11 March 2020. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. New lending is defined as new exposures in the balance sheet granted on a daily basis. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 8: Rates for new lending

	(1)	(2)	(3)	(4)	(5)
	Rate	Rate	Rate	Rate	Rate
treatedXpost	-0.0001*** (0.0000)	-0.0001** (0.0000)	-0.0001*** (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
N	345496	274364	149178	161356	137875
R ²	0.012	0.018	0.676	0.317	0.322
Firm FE	No	No	Yes	Yes	Yes
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for rates for new loans for the post period, starting on 11 March 2020. Results to be multiplied by 100 to read as percentage change in rates. Rates associated with on and off balance sheet new loans. The period covered in the analysis is 3 February - 17 March 2020. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 9: Maturity for new lending

	(1)	(2)	(3)	(4)	(5)
	Maturity	Maturity	Maturity	Maturity	Maturity
treatedXpost	3.2935*** (0.7598)	4.2388*** (0.7615)	-0.7799** (0.3946)	0.5030 (1.0109)	-0.9266 (0.8557)
N	345496	274364	149178	161356	137875
R ²	0.000	0.093	0.705	0.466	0.391
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for the maturity of new lending for the post period, starting on 11 March 2020. Maturity is measured in days. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. Maturities associated with on and off balance sheet new loans. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 10: Heterogeneous lending effects by bank characteristics

	(1)	(2)	(3)
	Volume	Volume	Volume
treatedXpost	-0.0099*** (0.0023)	-0.0051** (0.0024)	-0.0002 (0.0038)
CapitalXtreatedXpost	0.0083*** (0.0023)		
ROEXtreatedXpost		-0.0016 (0.0023)	
NPLXtreatedXpost			-0.0076** (0.0037)
<i>N</i>	127063	127063	146988
<i>R</i> ²	0.454	0.453	0.433
Firm FE	No	No	No
Bank controls	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Size-industry-country-time FE	Yes	Yes	Yes

Notes: The table shows the results for the volume of new lending for the post period, which refers to 11-17 March 2020. In addition, in each column, it reports the differential impact on the volume of new lending by higher bank capitalisation, higher ROE and higher NPL share. Capital, ROE and NPL are dummy variables taking value 1 for above median values. All bank-level variables defined in Q4 2019. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. New lending is defined as the sum of new on and off balance sheet amounts, granted on a daily basis. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. The coefficient for Treatedxpost gives the result for the bank who is below the median in those characteristics, whereas the coefficient treatedxpost + *Characteristic*xreatedxpost give the effect for banks with above median characteristic. In all specifications robust standard errors are included.*** = significant at 1 percent level; ** = significant at 5 percent level; * = significant at 10 percent level.

Table 11: Heterogeneous lending effects by firm characteristics

	(1)	(2)	(3)	(4)	(5)
	Volume	Volume	Volume	Volume	Volume
treatedXpost	0.0193*** (0.0053)	-0.0058*** (0.0021)	-0.0067* (0.0037)	-0.0128*** (0.0028)	-0.0175*** (0.0037)
SMEXtreatedXpost	-0.0264*** (0.0053)				
NPLXtreatedXpost		-0.0024 (0.0048)			
ConnectedXtreatedXpost			0.0009 (0.0034)		
HighturnoverXtreatedXpost				0.0099*** (0.0027)	
ServicesXtreatedXpost					0.0140*** (0.0043)
<i>N</i>	126907	127063	127063	127063	118006
<i>R</i> ²	0.454	0.454	0.462	0.453	0.451
Firm FE	No	No	No	No	No
Bank controls	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Size-industry-country-time FE	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the results for the volume of new lending for the post period, which refers to 11-17 March 2020. In addition, in each column, it reports the differential impact on the volume of new lending for SMEs, firms with non-performing exposures, firms with past connection to the bank, firms with high turnover and for firms in the services sector. In column (1), *SME* is a dummy variable indicating small- and medium sized enterprises according to the Eurostat definition based on headcount, turnover and balance sheet total. In column (2), *NPL* is a dummy variable which takes value 1 if the firm had some non-performing exposure in Q4 2018, Q2 2019 or Q4 2019. In column (3), *Connected* is a dummy variable which takes value 1 if the firm had an outstanding exposure with the bank in Q4 2019. In column (4), high turnover is a dummy variable which takes value 1 if the firm had above median sales in 2019. In column (5), *Services* indicated the additional impact for firms in the services sector, relative to firms in manufacturing and construction. Outcome variable is log volume of new lending. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included. *** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 12: Volume of new lending, unconsolidated sample

	(1)	(2)	(3)	(4)	(5)
	Volume	Volume	Volume	Volume	Volume
treatedXpost	-0.0063*** (0.0018)	-0.0049*** (0.0018)	-0.0041*** (0.0015)	-0.0071*** (0.0023)	-0.0077*** (0.0024)
N	161591	157695	87478	95041	82581
R ²	0.021	0.042	0.777	0.425	0.471
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for the volume of new lending for the post period, which refers to 11-17 March 2020. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 13: Rates for new lending, unconsolidated sample

	(1)	(2)	(3)	(4)	(5)
	Rate	Rate	Rate	Rate	Rate
treatedXpost	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
N	176605	172136	92921	102725	88421
R ²	0.001	0.099	0.672	0.295	0.305
Firm FE	No	No	Yes	Yes	Yes
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for rates for new loans for the post period, starting on 11 March 2020. Results to be multiplied by 100 to read as percentage change in rates. Rates associated with on and off balance sheet new loans. The period covered in the analysis is 3 February - 17 March 2020. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 14: Maturity for new lending, unconsolidated sample

	(1)	(2)	(3)	(4)	(5)
	Maturity	Maturity	Maturity	Maturity	Maturity
treatedXpost	4.2481*** (0.8694)	3.5284*** (0.8641)	0.1194 (0.4775)	-2.1783** (1.0592)	-2.1170** (0.9595)
N	176605	172136	92921	102725	88421
R ²	0.020	0.052	0.674	0.452	0.377
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for the maturity of new lending for the post period, starting on 11 March 2020. Maturity is measured in days. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. Maturities associated with on and off balance sheet new loans. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 15: Volume of new lending, additional controls

	(1)	(2)	(3)	(4)	(5)
	Volume	Volume	Volume	Volume	Volume
treatedXpost	-0.0031*** (0.0010)	-0.0054*** (0.0012)	-0.0028** (0.0012)	-0.0061*** (0.0020)	-0.0056*** (0.0021)
N	308381	249727	138212	146970	127086
R ²	0.000	0.076	0.764	0.433	0.453
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for the volume of new lending for the post period, which refers to 11-17 March 2020. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 16: Balance table, firm characteristics

	Control mean/sd	Treatment mean/sd	Difference T-statistics	Normalized difference
Volume (Th. EUR)	138.76 (311.41)	125.24 (357.26)	8.56***	0.03
Volume, wo off-bs. (Th. EUR)	100.63 (275.52)	99.62 (327.59)	0.72	0.00
Maturity (Months)	45.89 (54.55)	23.59 (40.30)	84.93***	0.33
Rate (Percent)	2.17 (2.26)	1.81 (3.87)	28.71***	0.08
Employment (Th.)	257.65 (5067.64)	100.96 (3174.15)	5.53***	0.03
Turnover (Bn. EUR)	951.57 (51638.36)	324.48 (18008.90)	2.43*	0.01
Assets (Bn. EUR)	1496.68 (83969.34)	410.74 (20261.39)	2.51*	0.01
NPL share (Percent)	1.16 (9.62)	1.15 (9.28)	0.24	0.00
Observations	48350	295809	344159	344159

Notes: Balance table for the characteristics of firms in the sample. Firms in the control group are those for which banks have no exposure with investment funds in 2019Q4. The normalized difference in the last column refers to $\Delta X = \frac{\bar{X}_1 - \bar{X}_0}{\sqrt{s_0^2 + s_1^2}}$ recommended by Imbens and Wooldridge (2009).

Table 17: Balance table, bank characteristics

	Control mean/sd	Treatment mean/sd	Difference T-statistics	Normalized difference
Assets, (Bn. EUR)	755.35 (75.77)	878.97 (576.28)	-98.35***	-0.21
Capital share (Percent)	1.43 (0.18)	0.92 (1.27)	184.10***	0.40
ROE (percent)	6.70 (0.90)	5.89 (4.24)	81.98***	0.19
Sh. non-performing (Percent)	7.80 (6.19)	7.25 (3.54)	19.39***	0.08
Debt securities (Bn. EUR)	147.78 (29.92)	128.12 (99.53)	78.94***	0.19
Observations	48543	296953	345496	345496

Notes: Balance table characteristics of banks in the sample. Control banks have no exposure with investment funds in 2019Q4. The normalized difference in the last column refers to $\Delta X = \frac{\bar{X}_1 - \bar{X}_0}{\sqrt{S_0^2 + S_1^2}}$ recommended by Imbens and Wooldridge (2009).

Table 18: Balance table, bond characteristics

	Control mean/sd	Treatment mean/sd	Difference/T-statistics t	Normalized difference
Spreads (bps)	136.27 (290.23)	270.47 (370.87)	-164.53***	-0.28
Coupon, in %	2.28 (1.59)	2.16 (1.55)	32.06***	0.05
Maturity (Years)	6.16 (5.08)	5.26 (4.19)	78.43***	0.14
Rating (logistic transformation)	-0.48 (0.42)	-0.11 (0.51)	-318.60***	-0.55
Observations	333662	333329	666991	666991

Notes: Balance table characteristics of bonds in the sample. Control bonds are held by investment funds in a proportion inferior to the median bond in 2019Q4. The normalized difference in the last column refers to $\Delta X = \frac{\bar{X}_1 - \bar{X}_0}{\sqrt{S_0^2 + S_1^2}}$ recommended by Imbens and Wooldridge (2009).

Table 19: Balance table, bond finance characteristics at the firm level

	Control mean/sd	Treatment mean/sd	Difference/T-statistics t	Normalized difference
Spreads (bps)	193.72 (411.90)	405.41 (492.07)	-100.16***	-0.33
Coupon, in %	2.07 (1.23)	2.87 (1.63)	-119.04***	-0.39
Maturity (Years)	5.22 (2.51)	3.98 (1.57)	127.61***	0.40
Rating (logistic transformation)	-0.33 (0.46)	0.13 (0.51)	-204.53***	-0.68
Observations	92443	92027	184470	184470

Notes: Balance table characteristics for bond finance consolidated at the level of each firm in the sample. Control firms are those whose bonds are held by investment funds in a proportion inferior to the median firm in 2019Q4. The normalized difference in the last column refers to $\Delta X = \frac{\bar{X}_1 - \bar{X}_0}{\sqrt{s_0^2 + s_1^2}}$ recommended by Imbens and Wooldridge (2009).

Table 20: Volume of new lending, control for firms' outstanding credit lines

	(1) Volume	(2) Volume	(3) Volume	(4) Volume	(5) Volume
treatedXpost	-0.0031*** (0.0010)	-0.0034*** (0.0013)	-0.0029** (0.0012)	-0.0069*** (0.0020)	-0.0093*** (0.0022)
N	308381	249727	138212	146058	97122
R ²	0.000	0.037	0.764	0.431	0.491
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for the volume of new lending for the post period, which refers to 11-17 March 2020. The period covered in the analysis is 3 February - 17 March 2020. Outcome variable is log volume of new lending. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover, assets and undrawn credit lines at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

Table 21: Volume of new lending, including the PEPP introduction period

	(1)	(2)	(3)	(4)	(5)
	Volume	Volume	Volume	Volume	Volume
treatedXpost	-0.0008 (0.0007)	0.0025*** (0.0009)	0.0004 (0.0010)	-0.0050*** (0.0014)	-0.0035** (0.0014)
<i>N</i>	401614	330706	250500	193433	168855
<i>R</i> ²	0.001	0.040	0.631	0.433	0.459
Firm FE	No	No	Yes	No	No
Bank controls	No	Yes	Yes	Yes	Yes
Firm controls	No	No	No	No	Yes
Size-industry-country-time FE	No	No	No	Yes	Yes

Notes: The table shows the results for the volume of new lending for the post period, which refers to 11-31 March 2020, considering also the post PEPP announcement and implementation period. Outcome variable is log volume of new lending. New lending is defined as the sum of new on and off balance sheet amounts granted on a daily basis. Bank controls refer to ROE, non-performing loan shares, total assets, capital ratio and debt securities for Q4 2019. Firm controls refer to firm turnover and assets at the end of 2019. In all specifications robust standard errors are included.*** = significant at 1-percent level; ** = significant at 5-percent level; * = significant at 10-percent level.

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