The Rise of Bond Financing in Europe*

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Abstract

Using large panel data of public and private firms, this paper dissects the growth of bond financing in the Euro Area through the lens of the cross-section of issuers. In recent years, the composition of bond issuers has shifted, with the entry of many smaller, private, and unrated issuers. While these firms are key to the capital markets transition, they are largely "invisible" when looking at aggregate data alone. We find that holdings of 'buy-and-hold' bond investors are large in aggregate, but are small for smaller issuers. Banks are strikingly large investors in that segment of the bond market. However, the bond investors' sell-off after March 2020 was largely directed at bonds of larger, safer issuers. Nevertheless, the bond issuance wave that followed the ECB intervention was restricted to large firms, with smaller issuers returning to the loan market. Overall, this evidence has two key implications: (i) smaller issuers are largely disconnected from the aggregate bond market; (ii) they are still heavily bank-dependent in spite of having entered the bond market.

Keywords: Corporate bond market, debt structure, disintermediation, financial fragility, ECB, monetary policy, quantitative easing, bond investors
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1 Introduction

The landscape of corporate borrowing has changed significantly in recent years. Perhaps the most striking trend is the global rise in bond financing. In the Eurozone, since 2000 aggregate market financing has been growing significantly faster than bank lending. This shift is of particular interest in Europe as its financial sector has always been heavily bank-based relative to the United States. While the aggregate growth of the bond market is well understood, less is known about its *cross-sectional* implications. Historically, the European bond market included only the very largest firms. However, the entry of smaller issuers is key to achieving a transition towards more capital markets funding. Is growth concentrated in historical issuers or are new firms entering the bond market? How different is the "top" from the "bottom" of the European bond market in terms of issuer characteristics and investor composition?

Answering these questions is key to draw economic implication of bond markets growth. On the one hand, bond markets can help firms broaden their access to funds beyond bank financing. This was particularly salient in the aftermath of a global banking crisis.[1] It is often thought that the smaller the firm, the more valuable additional funds can be to help them invest and grow. On the other hand, classical work in corporate finance has emphasized that bond markets are not a frictionless "spare tire" and that bank intermediation is valuable to reduce inefficiencies in credit markets [Bolton and Scharfstein, 1996, Holmstrom and Tirole, 1997, Becker and Josephson, 2016]. In fact, 2020 crisis witnessed a corporate bond market turmoil. Interestingly, intermediation is also often thought to be more valuable the smaller the firm. Studying the cross-section of European issuers, beyond simply aggregate growth, is thus central to make progress on these issues.

The contribution of this paper is to document some important micro-facts on new entrants and smaller issuers in Europe, as a first step to draw broader implications of bond markets

[1]For instance, the Expert Group on European Corporate Bond Markets mandated by the European Commission in 2017 stated: "Corporate bonds reduce the over-reliance of the financial system on credit institutions and hence the susceptibility of the wider economy to bank deleveraging. The availability of an alternative source of funding for productive investment in the EU supports the wider economy, enables greater risk sharing and a more sustainable and smoother credit supply throughout the cycle."

growth. We build a large panel of public and private firms over the past two decades and present the first comprehensive study of the rise of bond financing in the euro area. First, the composition of bond issuers has shifted, with the entry of many smaller, private, and unrated issuers in recent years. While these firms are key to the capital markets transition, they are largely "invisible" when looking at aggregate data alone. Second, their investor base is strikingly different compared to larger issuers: holdings of traditional 'buy-and-hold' investors are significantly smaller, while banks are strikingly large investors in that segment of the bond market. Third, the bond market sell-off and rebound in Spring 2020 was concentrated in bonds of larger issuers. This evidence suggests that smaller issuers are largely disconnected from the aggregate bond market, and still heavily bank-dependent.

To document these facts, we construct a panel of firms' debt structure and balance sheets over the past two decades including both public and private firms. The rise is apparent in both aggregate level statistics as well as in firm-level data, suggesting that our micro-data provides a good coverage of the European corporate bond market. The growth of the bond market has been continuous since the turn of the century, and has accelerated after 2008, with roughly a doubling public firms' bonds outstanding from €882 B in 2002 to €1.4 T in 2021. Issuance by private firms has also grown fast.[2] It is well understood that recent macroeconomic trends have driven the rise of bond financing in Europe, such as a fall in bank loan supply and tighter regulation [Becker and Ivashina, 2018, Altavilla et al., 2017], increased investor risk-appetite and loose monetary policy [Grosse-Rueschkamp et al., 2019, De Santis and Zaghini, 2019, Giambona et al., 2020, Todorov, 2020, Pegoraro and Montagna, 2021, Becker and Ivashina, 2015, Bubeck et al., 2020] and bankruptcy reforms [Becker and Josephson, 2016]. The goal of this paper is not to disentangle the different causes of the rise of bond financing in Europe, but instead to investigate its cross-sectional implications through the lens of firm-level data over a long time frame.

The growth of European bond markets has benefited many firms. Our analysis of the micro-data shows that the increase in firms' access to the bond market is not restricted to

[2]The external financing of Euro Area NFCs in the period 1995-2005 has been analyzed at the ECB report by Drudi et al. [2007].

the largest, historical issuers, but is also driven by firms entering the bond market in recent years (the extensive margin of growth). The vast majority of new issuers are significantly smaller than historical issuers, are private firms, and lack a credit rating from a large rating agency.

We then present new evidence that these issuers also have a very different investor base. The fragility of bond supply is a debated issue: while traditional 'buy-and-hold' bond investors such as pension funds and insurance companies have a long-term horizon [Becker and Benmelech, 2021], other bond investors can be responsible for fire sales and price dislocation in bad times [Goldstein et al., 2017, Falato et al., 2020]. We use micro-data investor holdings at the bond-level to investigate how investor composition varies across different types of issuers. Investor composition for smaller issuers is strikingly different from the aggregate. For instance, insurance companies and pensions funds hold only 5% of small private issuers' bonds, relative to 25% of the aggregate. The ECB holds virtually no bonds of the smallest issuers. Intuitively, investment mandates of many long-term investors limit their risk exposure, but can mechanically exclude new issuers because of their bond size or rating status. On the other hand, banks are surprisingly large investors in this segment of the bond market: they hold almost 50% of bonds issued by issuers in the bottom quartile of size. This is striking given that access to the bond market is commonly viewed as a way to make firms less bank-dependent.

The last part of the paper thus investigates some of the cross-sectional impact of the Spring 2020 downturn. We first document the dynamics of bond investors' portfolio holdings around the shock. Given the heterogeneity in investor composition across issuers noted above, there is a concern that smaller firms with a smaller share of 'buy-and-hold' investors might be disproportionately affected. In fact, the micro-evidence paints a different picture: it seems that the pullback of bond investors was primarily aimed at the largest, rated issuers. Insurers, pensions, mutual funds, and banks all reduced holdings of bonds issued by the largest firms. Interestingly, this is consistent with a "reverse flight to quality", in which bonds from the largest firms tend to be sold first, either because they are more liquid, safer and/or have a

lower yield [Falato et al., 2020, Ma et al., 2020, Haddad et al., 2020]. In line with this portfolio data, we find that bond yields for large issuers followed the aggregate market dynamics of an initial spike that reverted quickly after the ECB bond market intervention. On the other hand, yields were stable for smaller issuers. In term of credit access, only large firms tapped the bond market in the subsequent issuance wave; small issuers instead turned back to the loan market.

We conclude by discussing how the facts of this paper relate to some important policy questions. Our micro-evidence suggests that the growth has benefited many firms, broadening firms' access to credit. However, the impact on financial stability is still insufficiently understood. First, it seems important to pay close attention to bond investor composition and behavior. For instance, banks in fact are key investors in the market for small issuers' bonds. This suggests that accessing the bond market has not diversified these firms' source of funds nearly as much as previously thought. Second, small issuers seem largely disconnected from aggregate bond market movements, including both the sell-off and the central bank intervention. There is thus a risk they might be "invisible" to policy makers, even if they track market indicators very closely.

1.1 Related Work

This paper first contributes to the literature on bond financing in Europe. Studying this shift in this region is particularly interesting as the Euro Area financial sector has always been heavily bank-based. In comparison, the U.S. has not witnessed such a significant structural change of its financial system over this time frame. Nevertheless, while the European bond market has grown, it is still significantly less mature than its U.S. counterpart. It is therefore unclear whether all lessons drawn from the U.S. equally apply to the European context. For instance, the European legal framework is substantially different from the United States: the absence of an equivalent of Chapter 11 hampers insolvency resolution in the presence of bond financing [Becker and Josephson, 2016, Ehmke, 2018]. We also show that rating agencies have much smaller coverage in Europe, while classical studies on the U.S. often emphasize

credit rating as a comprehensive measure of bond market access and borrower risk.[3]

We build on recent works by taking as given three important (non-exclusive) macroeconomic factors that have been identified as drivers of bond issuance in Europe, often using variation around specific events: a fall in loan supply [Becker and Ivashina, 2018, Altavilla et al., 2017], bankruptcy reform [Becker and Josephson, 2016], and loose monetary policy and quantitative easing [Grosse-Rueschkamp et al., 2019, De Santis and Zaghini, 2019, Pegoraro and Montagna, 2021].[4] Relative to these works, this paper takes a more holistic view of bond issuance in the Euro Area over a longer time frame. Moreover, contrary to most prior studies we include private issuers that have multiplied in recent years. This allows us to offer the first comprehensive analysis of the rise of bond financing in Europe. We also focus on the key topic of new issuers entering the bond market (the extensive margin of growth), which has received much less attention. Becker and Josephson [2016] is an important exception, although their data stops in 2010 and includes only public firms, many outside the Euro Area. We also share some facts with the independent works of Ongena et al. [2020] and Nobili et al. [2020] who study the introduction of minibonds in Italy in 2012. The two approaches are complementary: our broad sample increases external validity, while detailed data from the Italian central bank helps to narrow down the mechanisms at play.

This paper also contributes to the link between financial fragility and non-banks, broadly defined. While some work on bond issuance abstract from implications for fragility, other strands of the literature see two faces of the same coin. In the context of the Great Recession, Crouzet [2017] shows that the aggregate increase in bond issuance left U.S. firms exposed to a larger risk of financial distress; which quantitatively can account for one-third of the total decline in investment by firms with access to public debt markets. Moreoever, bond markets

[3]See for instance [Denis and Mihov, 2003, Faulkender and Petersen, 2006, Hale and Santos, 2008, Rauh and Sufi, 2010].

[4]Other works studying the link between bond markets and monetary policy include Arce et al. [2018], Ertan et al. [2019], Giambona et al. [2020], Todorov [2020], Becker and Ivashina [2014], Lhuissier and Szczerbowicz [2018], Elliott et al. [2019], Kashyap et al. [1996], Bolton and Freixas [2006]. Becker and Ivashina [2015], Bubeck et al. [2020] and Di Maggio and Kacperczyk [2017] also highlight the role of reach for yield, while Pelizzon et al. [2019] shows the role of collateral eligibility on European corporate bond markets. Crouzet [2019], Holm-Hadulla and Thürwächter [2020] and Darmouni et al. [2019] study the impact of the bond market shift on monetary policy transmission.

can be exposed to "runs" even if they are not funded by deposits: Goldstein et al. [2017] document the fragility in fast-growing corporate bond funds. In fact, bond funds outflows were at the core of credit market disruptions in 2020 [Falato et al., 2020, Ma et al., 2020, Zaghini, 2020].[5] We speak to this literature by providing novel evidence on how investor composition for smaller issuers is quite different from what aggregate data suggest. Finally, our paper is the first to directly link the bond market boom with the downturn of 2020.

2 Data

We construct a firm-level panel of companies in the Eurozone that covers information on firm's balance sheet and debt structure. The main time period spans 2002 to 2021, although the last section of the paper uses data from 2018-2021. We gather information about both public and private firms, and restrict attention to non-financial corporations. Specifically, we use data on bond issuance from the Centralized Securities Database (CSDB) maintained by the ECB and match this with Orbis, Capital IQ and Compustat Global to have complete balance sheet information on the firms' assets, liabilities, and equity. We carefully account for the firms' group structure by identifying multiple subsidiaries of each company and ensuring that we restrict our sample to the parent company of each group. For public firms, in particular, for public firms we use the values of total assets as reported in CapitalIQ.

In the second part of the paper, we complement the analysis examining heterogeneity in investors composition across issuers. To do so, we match our core dataset at the bond ISIN level with the Securities Holdings Statistics data (SHSS), collected by the Eurosystem. In the last part, we focus on the most recent period (2018-2021) using also matched at the firm level information on loan contracts from AnaCredit, the credit registry maintained by the ECB.

One of the main variables of interest is a firm's bond share. We define the bond share as the ratio of total market financing to total debt. Total market financing is estimated as

[5]The fragility of market financing has also been documented through the lens of CLOs [Fleckenstein et al., 2020] or commercial paper [Kacperczyk and Schnabl, 2010].

the sum of debt securities reported in CSDB. For public firms, we compare the consistency of these values with the sum of three types of debt securities as reported in Capital IQ – senior bonds, subordinated bonds, and commercial paper. Total debt is from Compustat Global/Orbis and comes from the firm's balance sheet. The value of total loans is constructed using the AnaCredit data for both public and private firms.

3 The Cross-Section of Bond Issuers

Table 1 presents the summary statistics of the main variables separately for private and public firms. The sample of public firms is composed of 3,336 firms, including 507 historical issuers and 1,028 firms that issue a bond at some point in or after 2010. The sample of private firms contain 1,900 firms that had a bond outstanding some time in 2010-2021. Based on the summary statistics, it becomes clear that there is a significant difference in size and bond share between these groups. Public firms are significantly larger in size with a much higher level of bond share than private issuers. In contrast, private issuers have a higher level of leverage compared to public issuers. Moreover, the median cost of public issuers' debt, measured by yield at offering and interest rate, is lower than the one faced by private issuers. These high-level differences are consistent with classical work on debt structure in the U.S. [Faulkender and Petersen, 2006, Rauh and Sufi, 2010, Hale and Santos, 2008]. We analyse the differences in debt structure in details in the rest of the paper.

Table 1 – Summary Statistics across Type of Issuers - Public & Private

	Private	Public	Entire Sample
Total Assets (Mlns €)	273.6	19,889.3	5,572.1
	(23,5534.7)	(132,9974.5)	(1,085,894.3)
Bond Share (in %)	29.40	75.25	58.81
	(30.65)	(30.36)	(33.35)
Total Credit / Assets (in %)	30.35	5.593	12.52
	(256.0)	(73.25)	(167.3)
Book Leverage (in %)	24.34	20.27	21.78
	(17.30)	(22.78)	(20.95)
Profitability (EBITDA / Assets) (in %)	4.514	2.694	3.218
	(11.06)	(9.654)	(10.19)
Cash / Assets (in %)	3.344	4.221	3.934
	(6.392)	(5.232)	(5.685)
Fixed Assets / Assets (in %)	56.89	65.47	62.38
	(24.80)	(23.35)	(24.02)
Vol. Weighted Avg. Interest Rate (in %)	1.889	1.210	1.439
	(1.494)	(3.451)	(2.893)
Vol. Weighted Avg. Yield at Offering (in %)	3.288	1.212	1.884
	(2.401)	(13.32)	(10.70)
Observations	5,984		
Number of Groups	1,123		

The table reports median and standard deviation of the main variables of interests for the following issuers' categories: (a) Public Issuers with positive bond outstanding during the period 2018-2021 and (b) Private Issuers with positive bond outstanding during the period 2018-2021. The sample and summary statistics for this table are limited to EA non-financial bond issuers in 2018-2019.

3.1 Aggregate Growth in Bond Financing in the Eurozone

At an aggregate level, the amount of bond outstanding issued by firms in the Euro Area has been rising steadily. We compare the micro-level data with comprehensive aggregate data

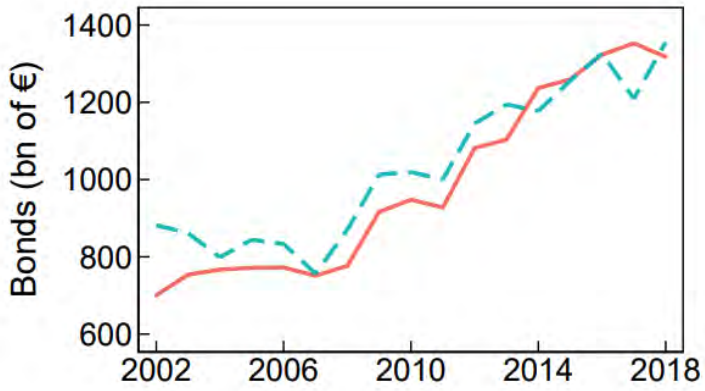

Figure 1 – Aggregate Bond Growth: SDW vs CapIQ

This figure shows the aggregate level of Bonds in the Euro Area for non-financial corporations from 2002 to 2018. The sources are the ECB Statistical Data Warehouse (SDW) Macroeconomic and sectoral statistics and Capital IQ. In SDW, bonds corresponds to the variable Liabilities-Debt; In CapitalIQ, bonds is computed as the sum of Senior Bonds, Subordinated Bonds and Commercial Paper. Data are corrected for inflation, and reported in billions €.

on firms' liabilities from the quarterly sector financial accounts of the ECB Statistical Data Warehouse (SDW). Since we have high-quality data on debt structure in the past twenty years for public firms only, we restrict the comparison in this section to Capital IQ.[6] Figure 1 provides evidence of the rise of the Eurozone corporate bond market. In particular, we document that the rise is secular in the period 2002–2021. The increase of the bond market has been continuous since the early 2000s and has accelerated after the financial crisis. The data shows that the corporate bond market has doubled in size from €882 B in 2002 to €1.4 T in 2021. Both micro-level and aggregate data display similar magnitudes.[7] Because it contains most of the largest firms, Capital IQ covers the vast majority of bond outstanding issued by non-financial corporations in the Euro Area. Nevertheless, the next section shows that private and smaller firms are also important to understand entry patterns in the bond markets in recent years, even if their total contribution to aggregate volumes is smaller.

[6]Berg et al. [2020] provide a more detailed overview of trends in corporate borrowing using data from public firms in the U.S. and Europe.

[7]Total bonds in the firm-level data are slightly higher than in SDW, which might be due to the fact that some firms with foreign subsidiaries often have nationality that is not consistently assigned across data sources.

3.2 Small and First-Time Bond Issuers

The main benefit of micro-data is that it allows to decompose the aggregate growth and unveil firm-level patterns. We first document that the growth of European bond markets seems to have benefited many firms, a fact that motivates the rest of our analysis.

Figure 2 presents the time series of the average bond share of public firms in the Euro area across four quartiles of the firms' size. The average bond share has a steady and significant increase from 10% to 24% between 2002 and 2021.[8] Importantly, this increase in the firms' dependence on the bond market is not concentrated at the very top. While the largest firms have a significantly higher level of bond share and experienced the steepest growth, the bond share has roughly doubled across the size distribution.

[8] A stylized comparison between the United States and the EA is also available in the Internet Appendix. Langfield and Pagano [2016] and De Fiore and Uhlig [2011] discuss the drastic contrast between a bank-based European financial system and the market-based U.S. system. Untabulated results also show that growth in the bond share is visible in virtually all sectors and not driven by a particular industry. The growth is visible in all countries.

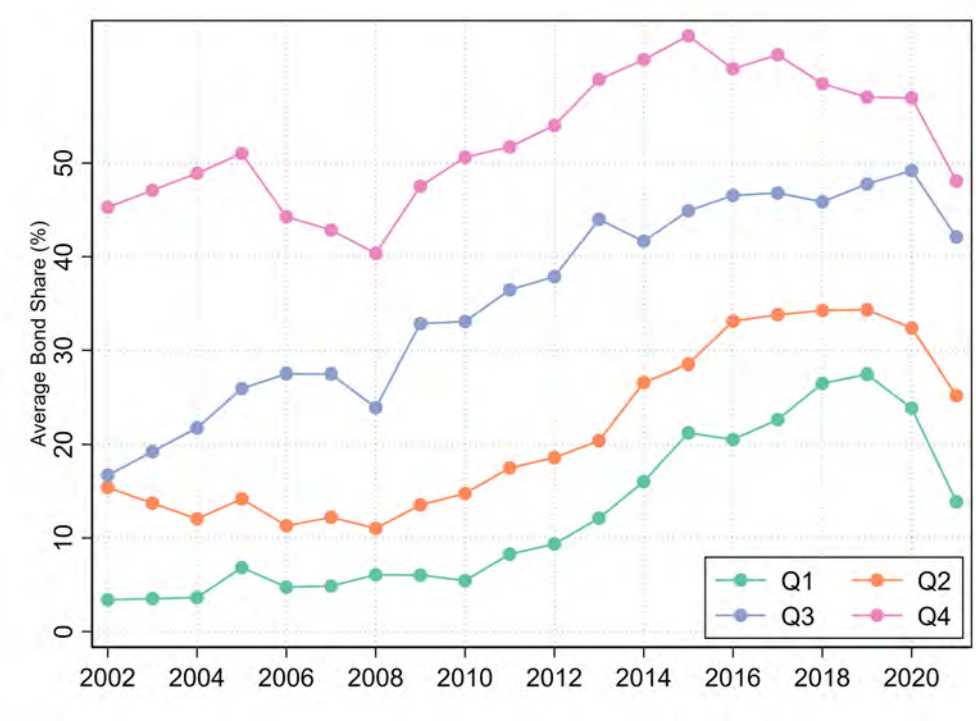

Figure 2 – Bond Share Across Firms' Size in Eurozone

The graph represents the evolution of bond share across quartiles of total assets of public firms in our sample for the period 2002-2021, by plotting within-quartile mean. Quartiles are dynamic over years, i.e. they are computed in each year. The data are collected from Capital IQ. Bonds are defined as the sum of Senior Bonds, Subordinated Bonds and Commercial Papers. The average bond share is expressed in %.

Moreover, the increase in firms' dependence on the bond market is not restricted to historical issuers (intensive margin), but is also driven by firms entering the bond market in recent years (extensive margin). We define as new issuers firms that issued a bond for the first time in the period on or after 2010.[9] Figure 3 shows that there is a constant entry of firms issuing bonds for the first time during our sample period. Every year approximately 10% of issuers entered the bond market for the first time and entry has accelerated in recent years since 2016. Moreover, we see that in count private new issuers exceed public new issuers. Note that the number of private issuers is likely even larger, since our sample is restricted to firms that we could match to Orbis and had a positive bond outstanding in the period 2018 to 2021. Overall, this represents a significant increase at the extensive margin

[9]Although our data starts earlier, we choose 2010 as a cutoff to prevent an excessive number of false positive.

in the bond market.

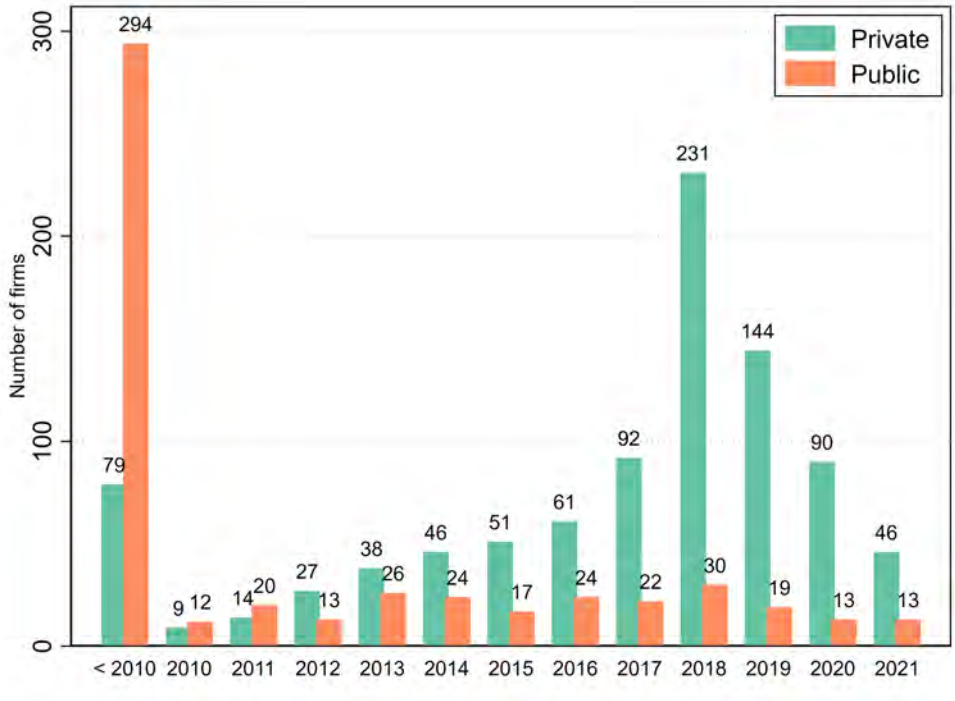

Figure 3 – Eurozone Bond Market Entry

This figure presents the total number of public and private issuers from 2010 to 2021. All firms represent the whole sample of firms included in the analysis, with positive bond outstanding between the period 2018 to 2021. In each year, new issuers are defined as firms that issue bonds for the first time in that year. The first year of issuance was obtained by combining Capital IQ and Centralised Securities Database (CSDB): it corresponds to the earliest issue year one could identify for any subsidiary or branch within the group structure of firms in the sample, i.e. for any group, the date of issuance - either identified directly using the variable *date of issuance* from CSDB or first year with non-zero bond volume outstanding in Capital IQ - which corresponds to the earliest issuance date across all entities within the group is kept. Bonds in Capital IQ correspond to the sum of Senior Bonds, Subordinated Bonds and Commercial Papers. Bonds in CSDB correspond to debt securities.

Next, we investigate which firms selected into bond issuance. Is the bond market restricted to the largest and safest firms, as it has historically been the case [Denis and Mihov, 2003], or has it expanded to serve a broad spectrum of firms?

Trends in credit ratings is the most common approach to study changes in the riskiness of bond issuers. In this vein, we merge our panel with data on ratings from the three main rating agencies (Standard and Poor's, Fitch, Moody's). If applicable, we use the average issuer rating across agencies. Otherwise, we apply the average rating of the firm's

instruments. [10] Table 2 presents a comparison of firms along four characteristics: (i) firms' size quartiles, (ii) private vs public firms, (iii) new vs historical issuers, and (iv) rating status. A significant share of the bond issuers are private and unrated firms, while at the same time the volume of BBB securities has been rising over the years and it has outgrown the rest of the investment grade category. This segment is not the safest issuers, in fact it consists of the potential "fallen angels", which could be downgraded from investment-grade to high-yield status if their creditworthiness deteriorates. This trend has been a concern for policy-makers, including in the United States.[11] Moreover, the high yield market represents a high share of the issuers, even though it still remains significantly smaller in size relative to the United States.

Table 2 – Share of Private, Rated & New Issuers by Size

	Q1	Q2	Q3	Q4
Private Issuers (%)	88	84	58	19
NR (%)	98	99	89	48
HY (%)	0	1	7	18
BBB (%)	1	0.3	2	25
A (%)	1	0.3	2	9
New Issuers (>= 2010) (%)	91	92	76	38

This table shows the share of the following sub-categories of issuers in our sample across quartiles of total assets: (a) private bond issuers; (b) Non-rated issuers; (c) High yield issuers; (d) issuers rated between BBB- and BBB+; (e) Investment grade issuers, rated above BBB+ and (f) isuers whose first date of bond issuance was equal or posterior to 2010. Quartiles are fixed over time, i.e. the total assets quartiles are computed once using total assets values for the year 2019. The data are expressed in %.

However, looking at credit ratings alone understates the underlying shift in risk, for two reasons. First, the coverage of rating agencies in the Euro Area is significantly lower com-

[10] While we use data on ratings from the three main rating agencies, we acknowledge that this does not cover the universe of rated bonds in the Euro area as many bonds may be rated by specialized local agencies that operate at a national level. For example, Franke and Krahnen [2017] document that 52% of the German SME-bonds are rated by the German rating agency Creditform in 2016.

[11] In March 2019, the President of the Federal Reserve of Dallas claimed: "As a central banker, I am carefully tracking the growth in BBB and less-than-investment-grade debt. In a downturn, some proportion of BBB bonds may be at risk of being downgraded, creating dislocations."

pared to the United States. While the largest issuers are rated, Table 2 suggests that less than 15% of new issuers have a rating.[12] Credit rating are thus far from being a comprehensive measure of risk in the Euro Area, while in the United States there is, according to Rauh and Sufi [2010], a close correspondence between the universe of firms with an issuer credit rating and the universe of firms with public debt outstanding. Second, issuers with a rating are clearly selected as they correspond to a higher share of public and larger firms that have issued bonds for more than a decade.

Our approach of creating a panel data set that links bond issuance with firm's balance sheet is thus useful to go beyond credit ratings and achieve a more comprehensive analysis of issuer risk.

[12]While imperfect matching between data sets could lead us to underestimate this share, external sources confirm this low number of rated issuers. For instance, the ECB estimates that in 2004 only 11% of Euro Area firms with a turnover above €50M had an S&P rating, while 92% of corresponding U.S. firms were rated. Moreover, in 2017 the European Commission estimated the share of unrated bonds to be similar to HY bonds, around 14% of the total, an aggregate share that matches well the numbers in Table **??**.

Table 3 – Summary Statistics across Type of Issuers - Size

	Q1	Q2	Q3	Q4	Entire Sample
Total Assets (Mlns €)	16.78	81.37	702.4	45,743.6	5,572.1
	(8.297)	(39.85)	(777.6)	(1,392,864.1)	(1,085,894.3)
Bond Share (in %)	43.93	28.41	32.59	75.02	58.81
	(32.80)	(31.44)	(33.60)	(29.63)	(33.35)
Total Credit / Assets (in %)	50.65	35.91	28.60	3.669	12.52
	(549.6)	(122.7)	(69.69)	(13.39)	(167.3)
Book Leverage (in %)	24.36	31.61	26.84	17.90	21.78
	(45.56)	(21.50)	(18.56)	(15.39)	(20.95)
Profitability (EBITDA / Assets) (in %)	6.561	5.412	4.046	2.643	3.218
	(20.49)	(17.15)	(4.005)	(7.529)	(10.19)
Cash / Assets (in %)	2.369	4.498	4.375	3.792	3.934
	(7.346)	(8.457)	(5.701)	(4.386)	(5.685)
Fixed Assets / Assets (in %)	38.31	45.92	57.15	68.97	62.38
	(26.11)	(24.91)	(25.40)	(21.17)	(24.02)
Vol. Weighted Avg. Interest Rate (in %)	2.399	2.144	1.906	1.123	1.439
	(1.592)	(5.312)	(1.820)	(2.492)	(2.893)
Vol. Weighted Avg. Yield at Offering (in %)	4.299	4.300	3.350	0.899	1.884
	(2.172)	(2.645)	(21.85)	(1.473)	(10.70)
Observations	5,984				
Number of Groups	1,123				

The table reports median and standard deviation of the main variables of interests for issuers of our sample, broken down by quartiles of total assets. Quartiles are fixed and calculated only once with total assets values for the year 2019. The sample and summary statistics for this table are limited to EA non-financial bond issuers with positive bond outstanding in 2018-2019.

To this end, we focus on the characteristics of the firm that can be computed even for unrated firms. Table 3 compares the characteristics of issuers by different sizes. Smaller issuers have significantly higher levels of leverage measured as total credit over assets compared to

larger issuers, while their level of fixed assets is lower. Noticeably, the cost of debt that firms in different size categories face varies with the smallest issuers to have higher levels of both yield at offering and interest rate on their loans.

This evidence shows that the European bond market has not only expanded in size but also in the breadth of firms that it serves. On the flip side, bond issuers are increasingly riskier and potentially more vulnerable to shocks. A potential concern is that shifts of issuance or fund flows toward riskier firms have been shown to have strong predictive power for future macroeconomic fluctuations [Greenwood and Hanson, 2013, López-Salido et al., 2017, Ben-Rephael et al., 2021]. Jordà et al. [2020] further argue that Europe's higher frictions in corporate debt reorganization or liquidation amplify the macroeconomic fallout of corporate debt booms.

4 Bond Investor Composition

A key macroeconomic concern in credit markets is the risk of a sudden deterioration in lenders' supply of funds in bad times. Sources of financial fragility for banks have been studied extensively, including runs by short-term creditors and depositors, or a balance sheet channel amplifying negative shocks to asset values. An important question is whether bond financing is subject to the same type of concerns. This is in fact a debated issue. On the one hand, some institutional bond investors such as pension funds and insurance companies are long-term investors who are less prone to suffer from the balance-sheet channel [Becker and Benmelech, 2021]. Central banks also tend to hold bonds for the long-term in countries that have implemented bond purchases. However, not all bond investors are 'buy-and-hold' investors. For instance, recent work has pointed out the fragility of bond supply and market financing more generally. Bond funds have been growing extensively in recent decades and it is now well-understood that fund outflows can trigger fire sales and price dislocation [Goldstein et al., 2017, Falato et al., 2020, Ma et al., 2020]. In fact, fund outflows seem to have been the main source of "runs" in 2020: deposits flooded the bank sector, while funds

experienced historical outflows. These lead to rising spreads and drop in issuance [Zaghini, 2020]. In addition, there can also be other types of bond investors whose behavior in bad times might be hard to predict.

To shed light on this issue, we present some new facts on bond investor composition in Europe. In particular, we investigate how investor composition varies across different types of issuers. We use detailed micro-data from the Securities Holdings Statistics by Sector (SHSS) maintained by the Eurosystem that include the breakdown of holdings by investors' type at the security-by-security basis. We merge these data with our other datasets on firms' balance sheets, bonds, and credit ratings. This allows us to compare the investor base for specific type of issuers relative to aggregate holdings available in SDW Macroeconomic and sectoral statistics. Note that the micro-data only covers the last five years. This section focuses on 2018-2019, while the next section studies the 2020 crisis.

As a benchmark, we first look at aggregate data on investor composition. Figure 4 presents a time series of investor composition for all corporate bonds issued by Euro Area non-financial corporations. Prototypical long-term investors hold a large share of the aggregate. In particular, insurance companies and pension funds hold a quarter of the total. The ECB (and the Eurosystem) also holds as much as almost 10% of the total in 2019. These investors tend to be classified as 'buy-and-hold' and a source of stability for corporate bond supply. On the other hand, bond funds also represent a large share of the investor base: their 25% share makes them comparable in importance to insurance and pension funds investors. Interestingly, traditional banks hold as much as 10% of the aggregate. Finally, direct holdings by households or other non-banks financial institutions are limited, at less than 5% each, while the rest of the world, constructed as a residual category, covers the final 25%.

How does bond investor composition vary across issuing firms? In particular, are 'buy-and-hold' investors like insurance companies, pension funds or the ECB as likely to hold bonds from smaller and weaker issuers? One concrete concern is whether bond supply is more fragile for smaller and more opaque issuers because traditional 'buy-and-hold' investors typically have mandates that impose restrictions on what bonds they can hold. To address

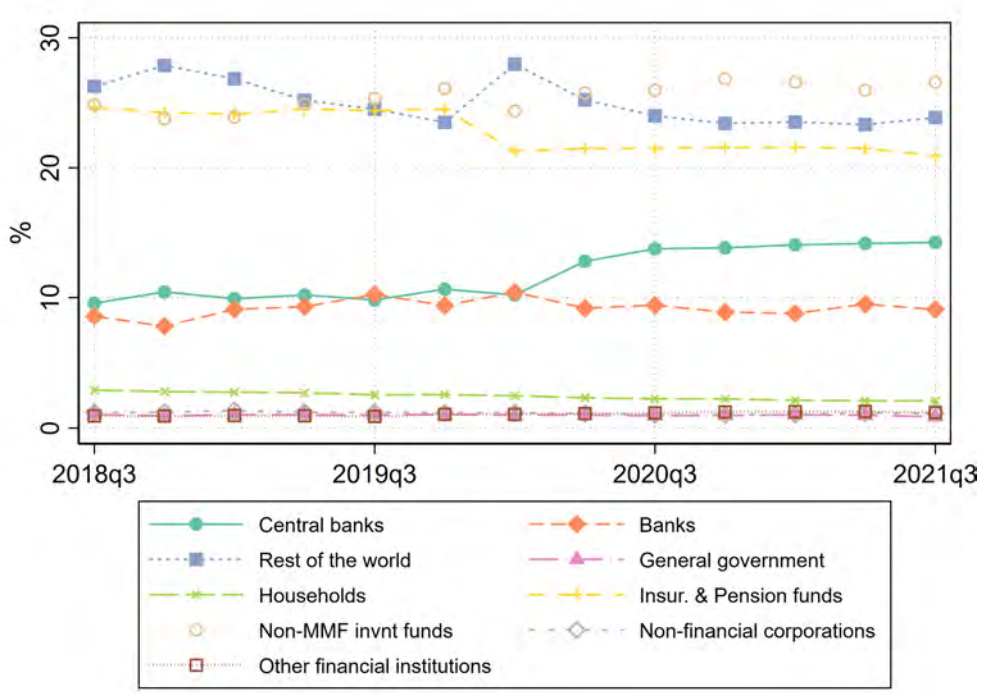

Figure 4 – Investors dynamics composition

The figure presents the investor composition of the debt securities issued by EA non-financial corporations in 2018-2021. The rest of the world is estimated as the residual amount from the total amount outstanding of debt securities and the amounts held by selected investors in the EA. The source of this data is ECB Securities Holding Statistics.

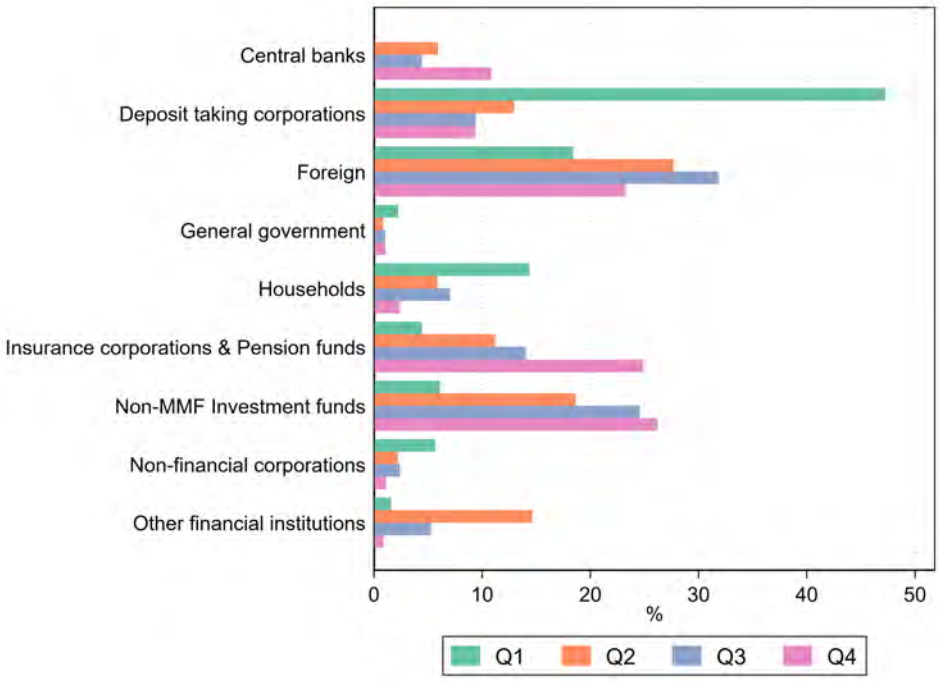

Figure 5 – Investor Composition by Size

This figure presents the investor composition of the debt securities issued by firms in our sample at the end of 2019, broken down by size. The rest of the world is estimated as the residual amounts held by selected investors in the EA. The source of this data is the ECB Securities Holdings Statistics per Sector and of the Eurosystem. The breakdown of size of issuers is obtained after collecting data on the asset size of all firms in the sample, from Orbis, Capital IQ and RIAD. Quartiles are fixed, i.e. they are computed for asset values of the year 2019. Investors' shares are expressed in %.

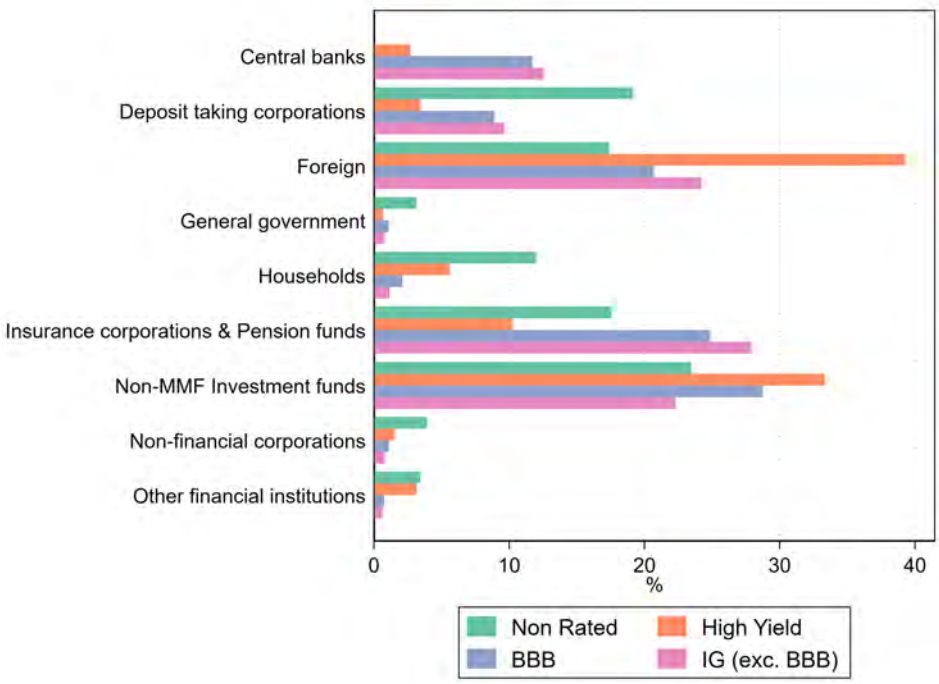

Figure 6 – Investor Composition by Rating

This figure presents the investor composition of the debt securities issued by firms in our sample at the end of 2019, broken down by levels of risk. The rest of the world is estimated as the residual amounts held by selected investors in the EA. The source of this data is the ECB Securities Holdings Statistics per Sector and of the Eurosystem. The breakdown of rating of issuers is obtained after collecting data on the rating of the firms and bond issued by each firm from either Standard & Poor's, Moody's or Fitch, from the CSDB Rating database. Ratings are dynamic over time, i.e. they are computed in each month. Investors' shares are expressed in %.

this question, we use the micro-data on holdings at the bond level to document the investor composition for corporate bonds issued by in the cross-section of issuers.

Figure 5 considers issuers of different size, dividing the sample using quartile of firms' assets, a plot investor composition at the end of 2019. The first fact is that for the largest issuers in the top quartile, investor composition is remarkably similar to the aggregate: for instance, insurance and pensions hold about a quarter and the ECB 10%. This is unsurprising: the largest firms are so much larger that they fully drive aggregate patterns.

However, investor composition for smaller issuers is strikingly different from the aggregate. For instance, the share of 'buy-and-hold' investors (ECB, insurance companies, pensions funds) is only 5% for the smallest issuers, or about 20 percentage points lower than in the aggregate. The ECB in particular holds virtually none of their bonds. Even more surprisingly, traditional banks hold almost 50% of the smallest issuers' bonds in our sample. This is remarkable in the sense that access to the bond market is often thought as a way to help firms reduce their dependence on banks. The massive holdings of corporate bonds by banks suggest that the bank-dependence of this segment of issuers is likely understated. This fact also raises a potential concern about the stability of credit supply to these firms: banks are often thought to be exposed to balance sheets effects in downturns [Becker and Benmelech, 2021].

Other issuer characteristics can matter for investor composition. Credit ratings is a well-known one. Figure 6 thus provides an alternative breakdown by rating. As expected, HY bonds are more rarely held by insurers, pensions, and central banks, being instead more commonly held by mutual funds and the rest of the world. Unrated bonds are noticeably more likely to be held by traditional banks and households relative to the aggregate. The large differences in investor holdings across small and large issuers cannot however be explained by rating only. Table 4 show the results of cross-sectional multivariate regressions that jointly include size, rating and private status indicators. It shows the effect of issuer characteristics on the holding share of different investor groups, relative to the omitted category of the largest, IG, and public issuers. Overall, a similar picture emerges. Insurers and pensions tilt

their holdings away from smaller and unrated issuers. They are replaced almost one for one by banks, which concentrated their holdings among these issuers. These effects are large in magnitudes, in line with the bar charts above.[13]

There thus appears to be a matching of firm and investors. There is heterogeneity on both sides, and this matching might reinforce fragility: bonds of smaller firms are substantially less likely to be held by traditional 'buy-and-hold' investors. A likely explanation is that these investors tend to limit the risks associated with their long-term horizon by having investment mandates, but on the flip side that can mechanically exclude new issuers because of their bond size or rating status. On the other hand, banks seem to matter disproportionately for the many smaller and unrated issuers that have multiplied in recent years. Understanding the origin of this striking fact is something thing we are actively exploring.[14] In any case, the management of banks' bond portfolios in bad times matters importantly for the smallest bond issuers. The next section studies directly the dynamics of investor holdings during the 2020 downturnn.

5 The 2020 Downturn

March 2020 has witnessed turmoil in corporate bond markets, raising concerns for the historically high number of firms relying on bond financing in Europe. Spreads and fund outflows experienced drastic spikes. Market functioning was severely disrupted until the European Central Bank stepped in and intervened massively to support the bond market. Ratings agencies and investment banks forecasted a substantial fall in credit quality among corporate issuers. For instance, by May 2020 S&P Global Ratings has cut the credit scores on over 150 European issuers. How were different issuers affected by this market turmoil?

[13] Interestingly, being private does not per se reduce the chances of being held by insurers and pensions.

[14] Potential explanation for this pattern include: (i) corporate bonds being pledged to access ECB liquidity; (ii) information asymmetries being lower for relationship banks relative to other bond investors; (iii) regulatory arbitrage, in the sense that these bonds have a high yield but have regulatory risk-weights below HY-rated bonds.

Table 4 – Investors Composition in 2019Q4: Cross-Sectional Regressions

	IC & PF	Non-Banks	Banks	Central Bank	Other	Rest of the world
Q1	-0.190***	-0.0603**	0.157***	-0.000395	0.112***	-0.00203
	(0.0289)	(0.0274)	(0.0352)	(0.00384)	(0.0222)	(0.0315)
Q2	-0.168***	-0.00348	0.189***	-0.000460	-0.0239	0.00328
	(0.0245)	(0.0233)	(0.0298)	(0.00325)	(0.0189)	(0.0267)
Q3	-0.0544***	-0.0312*	0.0450*	-0.000833	-0.000627	0.0329
	(0.0189)	(0.0180)	(0.0230)	(0.00252)	(0.0146)	(0.0207)
Private	0.0460***	-0.0512***	0.0803***	-0.000901	-0.0628***	0.0169
	(0.0137)	(0.0130)	(0.0167)	(0.00182)	(0.0105)	(0.0149)
HY	-0.109***	0.140***	-0.228***	-0.00560**	0.0960***	0.0610***
	(0.0166)	(0.0158)	(0.0202)	(0.00221)	(0.0128)	(0.0181)
NR	-0.0257*	0.0447***	0.0393**	-0.00489**	0.192***	-0.195***
	(0.0146)	(0.0139)	(0.0178)	(0.00194)	(0.0113)	(0.0160)
Observations	4591	4591	4591	4591	4591	4591
R^2	0.028	0.021	0.085	0.005	0.100	0.064

This table displays the results from estimating a cross-sectional regression of the investor holding shares on firms' characteristics. Specifically, size dummies, a variable equal to one if the firm is private, and rating categorical variables are included. The dependent variables are constructed as the share of each firm's total bonds outstanding held by each investor type. For this table data only from 2019Q4 are included. The source of this data is the Securities Holdings Statistics by Sector (SHSS) for debt securities issued by non-financial corporations. Standard errors, in parentheses, are corrected for clustering of the observations at the firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.1 Dynamics of Bond Investor Holdings

This section examines the dynamics of bond investors portfolio holdings around the Spring 2020 shock. Given the heterogeneity in bond investors across issuers documented in Section 4, this can shed light on the cross-sectional effect of the shock. In particular, the lower share of 'buy-and-hold' investors for smaller and unrated firms raised the concern that a firm-investor mismatch might exacerbate financial instability.

In fact, the micro-evidence paints a different picture: it seems that the pullback of bond investors was primarily aimed at the largest issuers. Table 5 presents an event study analysis of bond investors holdings around March 2020 using quarterly data from the SHSS. We consider the same investor groups as in the previous section and compare the three quarters post March 2020 holding with the previous three quarters. All columns include issuer (GUO) fixed effects to isolate within-firm changes in bond holdings around the crisis. We examine firms of different size by interacting the post March 2020 dummy with asset quartiles calculated in 2019.

It is immediately clear that the investor sell-off of 2020 was entirely concentrated among the largest issuers in the top quartile. The magnitudes are large: insurance and pensions reduced their holdings by 1 percentage points, nonbanks by 1.5 percentage points, and banks by 2 percentage points. The effect on the other three quartiles of issuers are drastically smaller and statistically insignificant. Virtually all bonds of large issuers sold were bought by the ECB.

Table 6 shows the results of similar regression, but breaking issuers down by rating instead of size. It confirms that the sell-off was concentrated among rated issuers. In the light of the previous evidence, this is unsurprising given the strong relationship between size and having a rating. There are nevertheless some differences across rating categories. Insurers, pensions, and banks sold BBB bonds, while non-banks sold HY and A-rated bonds. The central banks only purchased IG bonds, the HY bonds were sold to the rest of the world instead.

Interestingly, the evidence that the sell-off was focused on the largest issuers echoes some

Table 5 – Covid Shock: Investor Sell-Off, by Size of Issuers

	IC & PF	Non-Banks	Banks	Central Bank	Other	Rest of the world
Post*Q1	-0.000510	-0.00471	0.00259	0	-0.0148	0.0180
	(0.00289)	(0.00612)	(0.00422)	(1.85e-18)	(0.0118)	(0.0151)
Post*Q2	0.00376	0.00585	-0.00399	0	-0.00661	0.00339
	(0.00337)	(0.00776)	(0.00319)	(2.89e-18)	(0.00535)	(0.00813)
Post*Q3	-0.0101	-0.00352	0.00211	0	0.0175	-0.00253
	(0.00726)	(0.00647)	(0.0119)	(1.83e-18)	(0.0118)	(0.00901)
Post*Q4	-0.00976*	-0.0152***	-0.0238***	0.0361***	0.00498	0.00466
	(0.00519)	(0.00459)	(0.00867)	(0.00851)	(0.00320)	(0.00544)
Observations	37423	37423	37423	37423	37423	37423
R^2	0.000	0.001	0.001	0.019	0.001	0.000
Fixed Effects	GUO - Date	GUO - Date	GUO - Date	GUO - Date	GUO - Date	GUO - Date

This table displays the results from estimating the following specification: $y_{ijt} = \beta_j \times Post_t \times Q_j + \alpha_i + \epsilon_{ijt}$ for each firm i of size j and quarter t. The dependent variable y_{ijt} is constructed as the share of each firm's total bonds outstanding held by each investor type. The *Post* dummy is interacted with an asset quartile categorical variable as an approximation to firm's size based on the end of 2019 values. The frequency of the holdings data is quarterly. The *Post* dummy is equal to one for the period Q1 2020 until Q3 2020 and zero for the period Q2 2019 until Q4 2019. The source of this data is the Securities Holdings Statistics by Sector (SHSS) for debt securities issued by non-financial corporations. Standard errors, in parentheses, are corrected for clustering of the observations at the firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6 – Covid Shock: Investor Sell-Off, by Rating of Issuers

	IC & PF	Non-Banks	Banks	Central Bank	Other	Rest of the world
Post*NR	-0.00776	-0.00945	-0.00791	0.00826*	0.0172**	0.00501
	(0.00614)	(0.00617)	(0.00674)	(0.00467)	(0.00678)	(0.00420)
Post*HY	-0.00381	-0.0277***	-0.00123	0	0.00163	0.0220**
	(0.00413)	(0.00652)	(0.00303)	(4.14e-18)	(0.00482)	(0.00964)
Post*BBB	-0.0272***	-0.0108	-0.0463**	0.0724***	-0.00397	0.0154
	(0.00867)	(0.00957)	(0.0180)	(0.0140)	(0.00509)	(0.00953)
Post*IG	0.00526	-0.0116***	-0.0123	0.0224**	0.000740	-0.0135**
	(0.00509)	(0.00430)	(0.0121)	(0.0107)	(0.00270)	(0.00655)
Observations	37423	37423	37423	37423	37423	37423
R^2	0.001	0.001	0.002	0.028	0.001	0.001
Fixed Effects	GUO - Date	GUO - Date	GUO - Date	GUO - Date	GUO - Date	GUO - Date

This table displays the results from estimating the following specification: $y_{ijt} = \beta_j \times Post_t \times R_j + \alpha_i + \epsilon_{ijt}$ for each firm i of rating j and quarter t. The dependent variable y_{ijt} is constructed as the share of each firm's total bonds outstanding held by each investor type. The *Post* dummy is interacted with a categorical variable that indicates the firm's rating status at the end of 2019. The frequency of the holdings data is quarterly. The *Post* dummy is equal to one for the period Q1 2020 until Q3 2020 and zero for the period Q2 2019 until Q4 2019. The source of this data is the Securities Holdings Statistics by Sector (SHSS) for debt securities issued by non-financial corporations. Standard errors, in parentheses, are corrected for clustering of the observations at the firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

prior work on the bond market turmoil in the U.S. In particular, there is some evidence of a 'reverse flight to quality', with relatively safer and more liquid bonds being relatively more affected by the shock [Falato et al., 2020, Ma et al., 2020, Haddad et al., 2020]. The most common explanation is that investors looking for funds have incentives to sell these assets first. Indeed, it is plausible that the market for small, unrated bonds was especially illiquid during this time. The reluctance of the ECB to directly purchase small unrated bonds likely participated to this phenomenon.

This evidence implies that the impact of bond investor composition might vary in the cross-section of issuers in a way that is more complex than previously thought. For instance, it suggests that it might be too simplistic to assume that smaller, weaker issuers will face larger capital supply shocks because their bonds are less likely to be held by 'buy-and-hold' investors. In particular, banks' holdings are of small bonds were remarkably stable throughout the board. One possible explanation is that the banking sector received extraordinary support during the crisis as well.

5.2 Effects on Credit Markets

How did the shock in 2020 affect the cost and amount of credit in the cross-section of issuers? Figure 7 first documents the dynamics of interest rates and bond yields around Spring 2020 for our sample of bond issuers. Bond yields for larger issuers followed aggregate market dynamics: a sizeable increase in yield in March, followed by a reversal post-intervention. On the other hand, bond yields for the smaller issuers were in fact much more stable during this episode. This is consistent with the investor sell-off results above, indicating that smaller issuers were largely disconnected from broad bond market movements. Figure 8 breaks down the sample by rating and confirms that the effect is strongest for HY issuers. On the other hand, interest rates on loans were very stable for all issuers during this time. This is consistent with the initial turmoil being concentrated on capital markets rather than the banking sector. In fact, loan rates seem to have noticeably decreased in this period for smaller issuers, potentially due to the extensive policy support for bank lending.

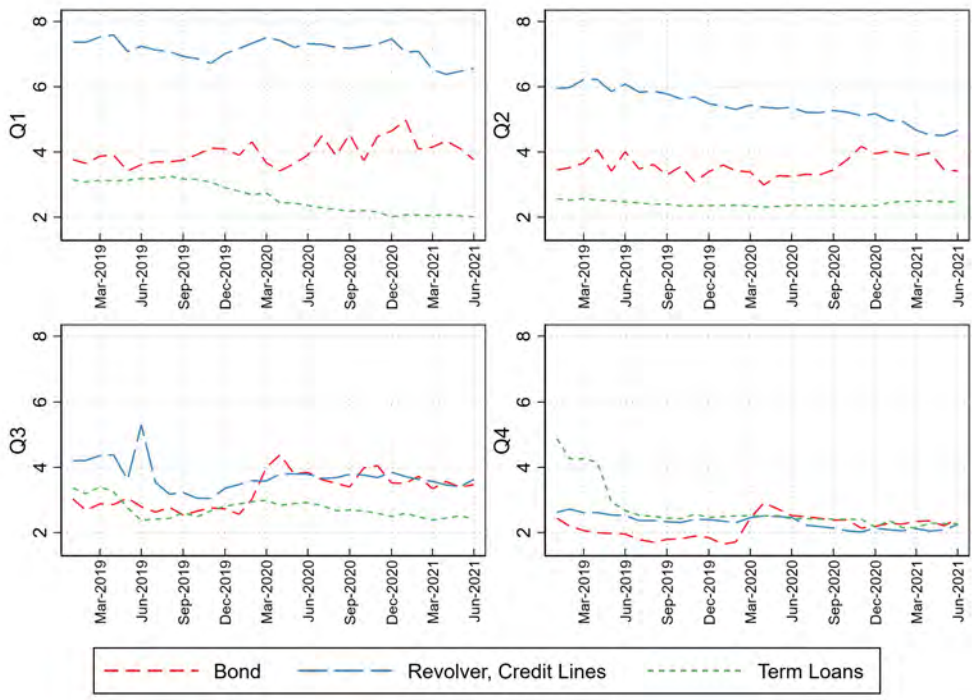

Figure 7 – Credit Prices by Size of Issuers

This figure shows the average interest rates of the stock of Bonds, Revolver & Credit Lines and Term Loans for Euro Area bond issuers in our sample, from January 2019 to June 2021. The sources are the Central Securities Database (CSDB) for Bonds and AnaCredit data for Loans. In CSDB, bonds correspond to debt instruments; in AnaCredit, Revolver and Credit Lines are computed as the sum of Revolving Credit, Credit Lines other than Revolving Credit, Overdrafts and Credit Card Debt; while Term Loans are computed as the sum of Loans, Trade receivables and Finance Leases. The breakdown of size of issuers is obtained after collecting data on the asset size of all firms in the sample, from Orbis, Capital IQ and RIAD. Quartiles are fixed, i.e. they are computed for asset values of the year 2019. Interest rates are expressed in %.

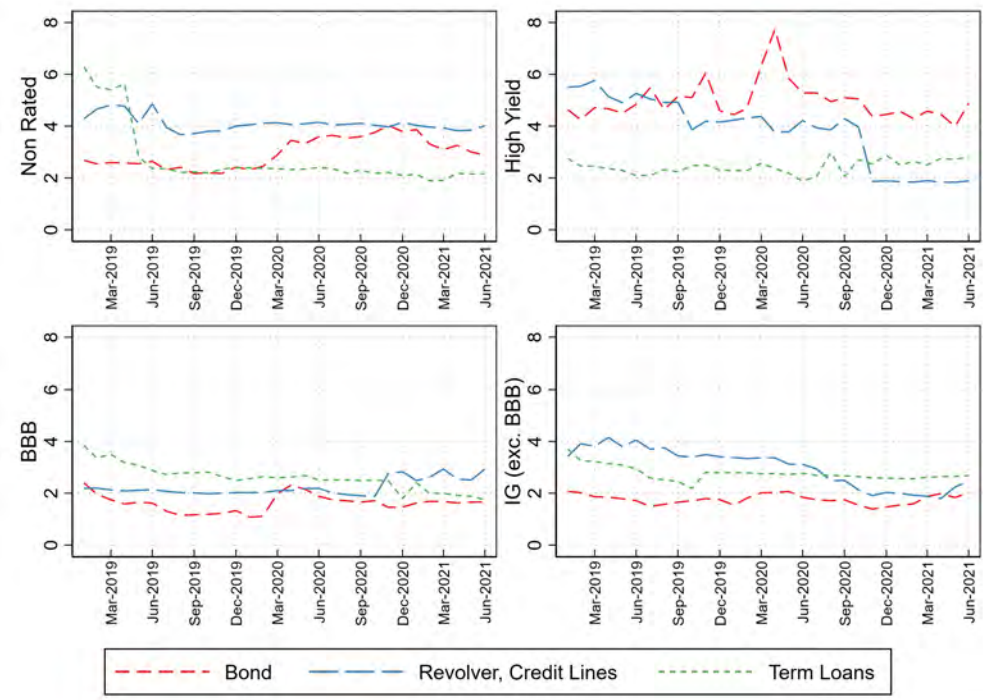

Figure 8 – Credit Prices by Rating of Issuers

This figure shows the average interest rates of the stock of Bonds, Revolver & Credit Lines and Term Loans for Euro Area bond issuers in our sample, from January 2019 to June 2021. The sources are the Central Securities Database (CSDB) for Bonds and AnaCredit data for Loans. In CSDB, bonds correspond to debt instruments; in AnaCredit, Revolver and Credit Lines are computed as the sum of Revolving Credit, Credit Lines other than Revolving Credit, Overdrafts and Credit Card Debt; while Term Loans are computed as the sum of Loans, Trade receivables and Finance Leases. The breakdown of rating of issuers is obtained after collecting data on the rating of the firms and bond issued by each firm from either Standard & Poor's, Moody's or Fitch, from the CSDB Rating database. Ratings are dynamic over time, i.e. they are computed in each month. Interest rates are expressed in %.

Figure 9 shows the dynamics of new issuance, separately for bonds and loans. It is apparent that the largest firms issued large amounts of bonds after the ECB intervention in April 2020. This is consistent with the bond issuance wave documented in the U.S. following the Federal Reserve announcement to start purchasing corporate bonds [Halling et al., 2020a, Darmouni and Siani, 2020]. On the other hand, there is no comparable issuance boom for smaller issuers. In fact, these issuers seemed to have relied more on bank loans during this episode. Figure 10 confirms that bond issuance was concentrated among rated issuers, which are extremely rare among smaller issuers. The issuance dynamics reinforce our previous two key findings: (i) smaller issuers are largely disconnected from the aggregate bond market; (ii) they are still heavily bank-dependent in spite of having entered the bond market.

6 Discussion and Implications

While a full analysis of welfare implications is beyond the scope of this paper, in this section we discuss how some of the facts of this paper relate to important policy questions. First, policy has played a central role in the growth of bond financing in Europe. In particular, it is now well established that accommodating conventional and unconventional monetary policy by the ECB have stimulated issuance and kept interest rates low. In addition, market integration across countries has made progress and national initiatives aimed at creating a bond market for SMEs were introduced. Overall, we observed a broadening firms' access to credit. Following a severe banking crisis, this can be seen as a welcomed development.

However, there are still some open questions related to the expansion. For instance, it seems important to pay close attention to bond investor composition and behavior. Our evidence that heterogeneous bond investors match with different type of issuers is a first step to build a more comprehensive framework of bond credit supply and its macroeconomic implications. In particular, it seems that banks in fact are key investors in the market for small issuers' bonds. This suggests that accessing the bond markets has not diversified these firms' source of funds nearly has much as previously thought.

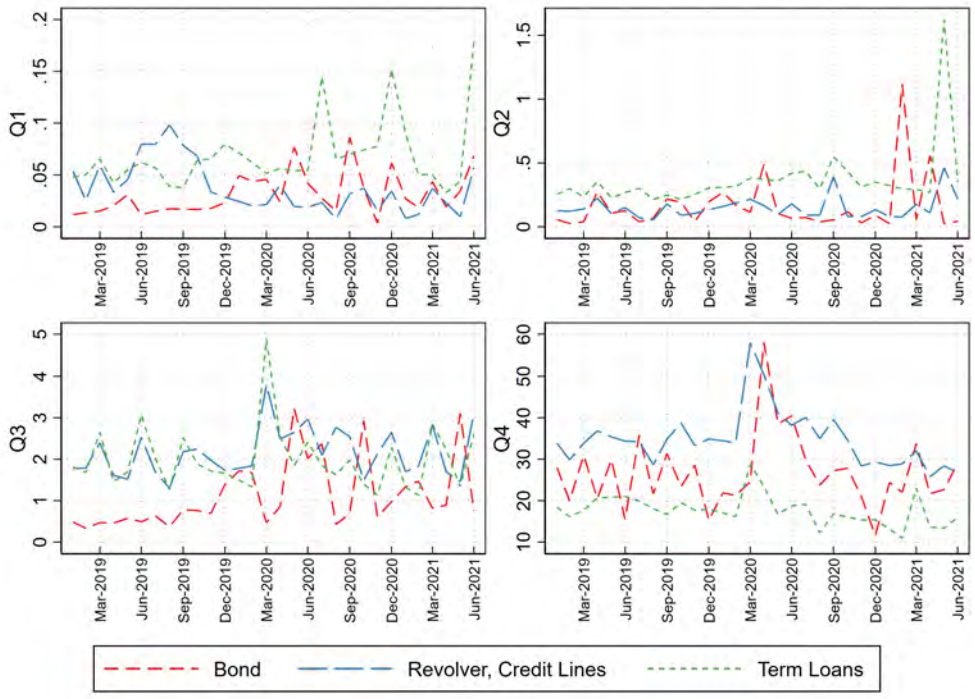

Figure 9 – New Credit Origination by Size of Issuers

This figure shows the aggregate level of volume outstanding for new origination of Bond, Revolver & Credit Lines and Term Loans for Euro Area bond issuers in our sample, from January 2019 to June 2021. The sources are the Central Securities Database (CSDB) for Bonds and AnaCredit data for Loans. In CSDB, bonds correspond to debt instruments; in AnaCredit, Revolver and Credit Lines are computed as the sum of Revolving Credit, Credit Lines other than Revolving Credit, Overdrafts and Credit Card Debt; while Term Loans are computed as the sum of Loans, Trade receivables and Finance Leases. The breakdown of size of issuers is obtained after collecting data on the asset size of all firms in the sample, from Orbis, Capital IQ and RIAD. Quartiles are fixed, i.e. they are computed for asset values of the year 2019. Volumes outstanding are expressed in Billions €.

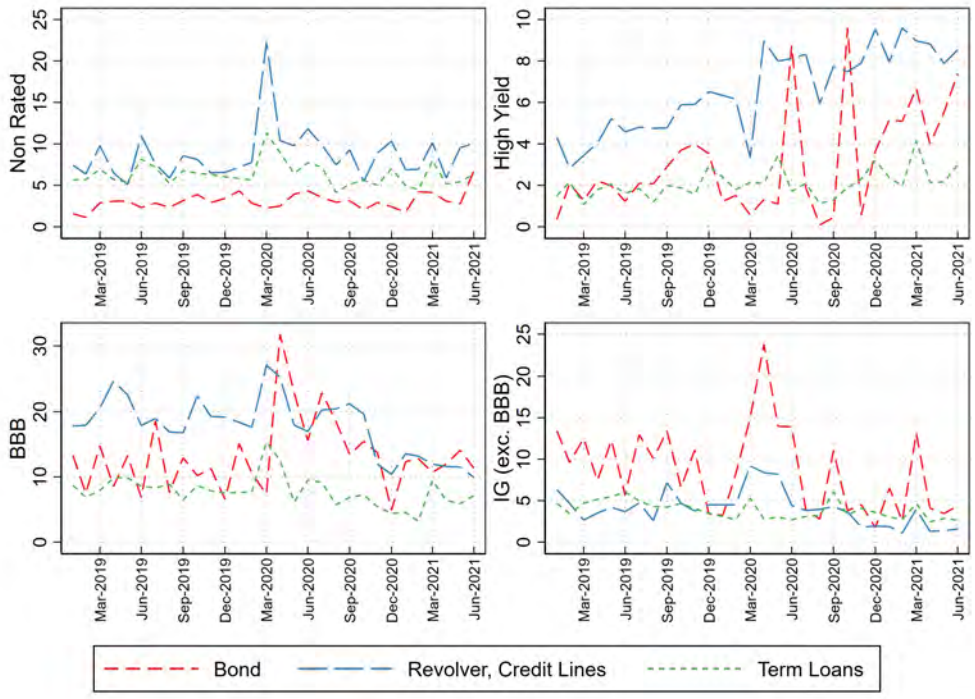

Figure 10 – New Credit Origination by Rating of Issuers

This figure shows the aggregate level of volume outstanding for new origination of Bond, Revolver & Credit Lines and Term Loans for Euro Area bond issuers in our sample, from January 2019 to June 2021. The sources are the Central Securities Database (CSDB) for Bonds and AnaCredit data for Loans. In CSDB, bonds correspond to debt instruments; in AnaCredit, Revolver and Credit Lines are computed as the sum of Revolving Credit, Credit Lines other than Revolving Credit, Overdrafts and Credit Card Debt; while Term Loans are computed as the sum of Loans, Trade receivables and Finance Leases. The breakdown of rating of issuers is obtained after collecting data on the rating of the firms and bond issued by each firm from either Standard & Poor's, Moody's or Fitch, from the CSDB Rating database. Ratings are dynamic over time, i.e. they are computed in each month. Volumes outstanding are expressed in Billions €.

Second, small issuers seem largely disconnected from aggregate bond market movements. There is a risk they might be "invisible" to policy makers, even if they track market indicators very closely. The 2020 episode suggests that there are both good and bad sides. On the one hand, smaller issuers were largely shielded from the investor sell-off. Interestingly, this suggests revisiting which bond investors constitute "safe hands" Coppola [2021]. However, it also seems that these issuers were not reached by the ECB support for corporate bonds. This is part driven by the eligibility conditions of the program, excluding much of the recent smaller issuers that have entered the market in recent years.

Nevertheless, drawing the correct policy conclusions is not straightforward. A clear cost of central bank support is the potential for excessive risk-taking. This effect has been studied extensively in the banking literature, and could lead to exacerbating reach for yield in financial markets [Becker and Ivashina, 2015, Bubeck et al., 2020, Di Maggio and Kacperczyk, 2017]. The traditional response of supervision, and in particular stress-testing, seems hard to transpose to the corporate bond market given the large number of actors involved. While how best to intervene in corporate bond markets is an open question we leave for future research, the facts we document in this paper can inform the trade-off behind the optimal intervention.

7 Conclusion

The rise in bond financing has significantly changed the landscape of corporate borrowing since the Great Recession, in particular in the euro area. We build a large panel of public and private firms over the past two decades to unpack this aggregate growth and examine the cross-section of European bond issuers. In particular, we focus on newer and smaller issuers. We document some important micro-facts related to the expansion and the recent downturn. First, the composition of bond issuers has shifted, with the entry of many smaller, private, and unrated issuers in recent years. While these firms are key to the capital markets transition, they are largely "invisible" when looking at aggregate data alone. Second,

their investor base is strikingly different: holdings of traditional 'buy-and-hold' investors are significantly smaller, while banks are strikingly large investors in that segment of the bond market. Third, the bond market sell-off and rebound in Spring 2020 were concentrated in bonds of larger issuers. This evidence suggests that smaller issuers are largely disconnected from the aggregate bond market, and still heavily bank-dependent. Understanding better the welfare and policy implications of this shift is an important avenue for future research.

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Internet Appendix

Illustrative Framework

This section presents an illustrative framework to understand cross-sectional patterns behind the aggregate growth in bond financing. The framework aims to capture both the bright side of the expansion as well as risks. The added-value is that it is a joint model of investment scale and debt structure that is both tractable and connects to the data.

Credit constraints: We adapt the canonical framework of Holmstrom and Tirole [1997] that models pledgeability frictions. The firm has assets/cash on hand of A and chooses investment level I, which yields RI in the high state and χI in the low state, with $\chi \in [0, R)$. Importantly, the payoff in the low state includes any indirect cost of financial distress, which amplifies fundamental cash-flow shocks and can take many forms. The high state realizes with probability p_H.[15] Because of a pledgeability friction (which can be micro-founded by moral hazard or cash-flow diversion), the maximum pledgeable income in the high state is only θRI, where $\theta < 1$ captures the agency friction that leads to inefficient credit rationing. The entrepreneur receives nothing in case of failure. The expected pledgeable income per unit of investment is given by $\mathcal{P} = p_H \theta R + (1 - p_H)\chi$. The firm can borrow $I - A$ from lenders with cost of funds ρ. Credit constraints arise because lenders must break-even on the debt while pledgeable income is limited: $\mathcal{P} I \geq (I - A)\rho$.

Debt structure: The firm jointly chooses how much to borrow using loans and bonds. Denoting the bond share by $\beta \in [0, 1]$, total bonds are $\beta(I - A)$ and loans are $(1 - \beta)(I - A)$. We model the trade-off between intermediated and bond financing in a simple way, following Crouzet [2019] and Darmouni et al. [2019].[16]

On the one hand, banks and bond investors have different cost of funds. Two macroeco-

[15] For simplicity, we follow Holmstrom and Tirole [1997] and assume no asymmetric information about p_H. For more on the reputational benefits of issuing bonds, see Nobili et al. [2020].

[16] Other recent qualitative models of debt structure with slightly different focus include Becker and Josephson [2016], Halling et al. [2020b], and Nobili et al. [2020]. Crouzet [2017], De Fiore and Uhlig [2011] and De Fiore and Uhlig [2015] embed a debt structure choice in a quantitative macro model. Schwert [2020] presents an asset pricing model to quantitative assess the relative pricing of loans and bonds.

nomic factors influence this difference: bank loan supply and investor risk appetite. Assume the cost of funds for banks is $r^L + c$. The term $c > 0$ captures intermediation costs born by banks, which shift loan supply. Because loans and bonds are (at least partially) substituable, a fall in loan supply induces firms to issue more bonds [Becker and Ivashina, 2014]. There is micro-evidence during the recent European sovereign debt crisis that loan supply was depressed due to banks' holdings of government bonds [Altavilla et al., 2017], and Becker and Ivashina [2018] shows that it induced firms to issue more bonds. Other rationales for this reduced-form parameter c include tighter post-crisis bank regulations, variable monitoring and screening costs, illiquidity of loans or bank market power (see Schwert [2020] for a discussion and empirical evidence). Second, the cost of funds for bond investors is given by $r^B = r^L - \gamma$, where γ indexes investors risk appetite that shifts the supply of bonds. One important driver of γ is the stance of monetary policy: loose monetary policy, including large asset purchases, tends to fuel risk appetite, portfolio re-balancing and reach for yield. Moreover, investors experience with European bonds might also grow over time as the market matures. The average cost of funds is linear $\rho(\beta) = r^B - \beta(c + \gamma)$ and we follow Crouzet [2019] in assuming that bond investors have in net a lower cost of funds ($c > -\gamma$). Bond market development thus has the benefit of relaxing financial constraints faced by firms.

On the other hand, a large body of work emphasizes that firms with more bonds have a larger downside risk in bad states of the world. In particular, bonds tend to be widely held by a dispersed base of investors, which makes them harder to renegotiate. This coordination (free-rider) problem across bond creditors means that market financing is typically seen as less flexible in bad times compared to relationship lending from banks [Bolton and Scharfstein, 1996, Crouzet, 2017]. There is considerable empirical evidence that dispersed financing is detrimental to borrowers in case of financial distress [Gilson et al., 1990, Asquith et al., 1994, Hoshi et al., 1990, Ivashina et al., 2016]. This is especially true in Europe where the bankruptcy system is substantially different from the United States, where Chapter 11 plays an important role: legal scholars have argued that national insolvency laws in Europe are still not prepared for the rising importance of bond debt [Becker and Josephson, 2016,

Ehmke, 2018].[17] Importantly, the value of bank flexibility is not restricted to liquidation and bankruptcy: it extends to debt renegotiation made possible by the dynamic nature of the relationship between creditors and debtors and is significantly harder to achieve with dispersed bond creditors [Denis and Mihov, 2003, Hoshi et al., 1991, Roberts and Sufi, 2009].[18]

Moreover, two additional channels have been documented. First, downgrades by rating agencies represent very public signals of deterioration in creditworthiness from which bank borrowers are largely insulated from. There is compelling evidence that a downgrade constitutes a financial distress event with negative firm-level effects [Acharya et al., 2018, Fracassi and Weitzner, 2020, Almeida et al., 2017, Kisgen, 2006]. Second, there is a potential fragility inherent to market financing. While traditional bond investors such as insurance companies and pensions funds tend be long-term 'buy-and-hold' investors, recent works have highlight the risk of "runs", panic and fire sales in bad times by the fast-growing investment funds sector [Goldstein et al., 2017, Falato et al., 2020, Ma et al., 2020]. Such market turmoil can spill-over on bond issuers, for instance by making roll-over more difficult.

We capture these ideas by assuming a reduced-form relationship between the payoff χ in the bad state and debt structure β: $\chi(\beta) = \chi_0 - \chi_1\beta - \frac{1}{2}\beta^2$. The channels above imply a positive parameter $\chi_1 > 0$, such that bond financing implies higher downside risk. There are of course countervailing forces: well-known advantages of bonds include longer maturity, less collateral and less restrictive covenants. Banks are also subject to frictions that affect borrowers in bad times. Nevertheless, for the purpose of illustration we follow the classical literature that assumes that *on net* there is an increase in downside risk. While this leads to some intuitive predictions (like safer firms issuing bonds), we recognize that this issue is not fully resolved and could be nuanced. For instance, bond financing might shift risk to

[17] "A change in the body of creditors' structure leads to new challenges, which put the law for restructuring and insolvency to the test. Particularly where the public ordering restructuring and insolvency law is designed for a concentrated lending structure, the question as to whether the law provides the suitable framework to deal with the problems associated with a cloudy body of creditors becomes pressing. [. . .] A law which produces an efficient outcome in times of pre-dominant relationship-lending does not necessarily promote successful bond restructurings" [Ehmke, 2018].

[18] More generally, this idea extends well beyond corporate bonds: there is ample evidence that dispersed market financing leads to renegotiation frictions in mortgage markets [Piskorski et al., 2010, Piskorski and Seru, 2018], as well as in sovereign debt markets [Hébert and Schreger, 2017].

different parts of the financial system rather than increasing it in absolute value.[19]

Equilibrium: In equilibrium, the firm's optimal bond share trades-off saving on intermediation costs with higher downside risk. The firm jointly chooses investment scale I and debt structure β to maximize profits subject to its credit constraints, taking the macroeconomic environment (c, γ, χ_1) as given. Given constant returns to scale, the credit constraint binds in equilibrium and investment is proportional to initial assets A: $I = m(\beta)A$, as in Holmstrom and Tirole [1997]. The multiplier is given by $m(\beta) := \frac{1}{1-\frac{\mathcal{P}(\beta)}{\rho(\beta)}}$. Importantly, the multiplier depends on the debt structure choice: a larger share of bonds reduces lenders' cost of funds ρ, but decrease pledgeable income $\mathcal{P}$ due to larger downside risk. The optimal share of bonds β^* maximizes debt capacity m by trading-off intermediation costs with pleagable income: $\frac{\partial m(\beta^*)}{\partial \beta} = 0$. To make the algebra more intuitive, assume that the multiplier m is proportional to $\mathcal{P}(\beta) - \rho(\beta)$. A quadratic $\chi(\beta)$ implies the following close-form expression for an interior solution $\beta^* \in [0, 1]$:

$$\beta^* = \frac{c + \gamma}{1 - p_H} - \chi_1$$

Note first that this equation can relate the aggregate growth in bond financing with the three macroeconomic factors discussed in the literature. The bond share is larger when bank loan supply is low (intermediation costs c are high) consistent with the European lending sector being weakened by the financial crisis, the Euro crisis and stricter regulations.

[19] A note on seniority of loans: It is well known that empirically loans tend to have lower interest rates relative to bonds. A key reason is that loans tend to be senior and secured while bonds are junior and unsecured. This implies that loans have lower expected losses given default, explaining a lower interest rate relative to bonds [Schwert, 2020]. To account for this interest rate differential in the data, we can extend the framework to incorporate seniority of loans in reduced-form. In the low state, bond investors receive cash-flow $\underline{\sigma}\chi I$, a lower share relative to their total lending $\underline{\sigma} < \beta$. In the high state, their share $\overline{\sigma}$ is proportionally larger, such that the participation constraint of each lender bind. This extension allows the model to match the higher interest rates on bonds relative to loans (with the difference depending on the equilibrium bank-bond share) even when bond investors have a lower cost of funds. Note however that seniority in this simple framework only affects the division of cash-flows among creditors in different states of the world and does not impact the firm's problem. The equilibrium choice of debt structure below thus does not depend on the seniority parameter, although the pricing of each debt instrument separately does. In a more sophisticated model, debt seniority and priority can matter for firm's decision, such as in Donaldson et al. [2020]. Note also that Schwert [2020] shows a significant loan premium after accounting for seniority. We do not take a stance on its potential explanations, and model them in reduced-form through the parameter c.

Moreover, the bond share is higher when investor risk appetite γ is high. Unconventional monetary, including zero and then negative target rate and asset purchases such as the Corporate Sector Purchase Program (CSPP), is one potential important driver and indeed ECB's actions have been shown to stimulate bond issuance. Finally, the bond share is larger when downside risk χ_1 associated with bond financing is lower. This is consistent with institutional changes that benefit bond financing, like bankruptcy reforms [Becker and Josephson, 2016] or the growth of long-term investors [Scharfstein, 2018].[20]

Firm-level prediction 1: The composition of firms entering the bond market shifts towards riskier firms Beyond aggregate growth, the model can be used to understand entry patterns (i.e. extensive margin of bond financing) and which firms select into the bond market. A firm stays out and uses only bank loans when $c + \gamma < (1 - p_H)\chi_1$. The three economic channels above apply also at the extensive margin. Entry into the bond market is higher when loan supply is low, when investor risk appetite is high, and when cash-flow risk or frictions in bond financing are low. We should therefore observe more new bond issuers over the years.

Moreover, the composition of bond issuers is also expected to change. Specifically, riskier firms enter the bond market for the first time as the macroeconomic environment becomes more conducive to bond issuance. To see this through the lens of the model, entry into the bond market ($\beta^* > 0$) follows a cutoff rule related to firm risk $1 - p_H$: a firm enters as long as it is not too risky $1 - p_H < (c + \gamma)/\chi_1$. The cutoff gives the risk of the marginal bond issuer and depends on the macroeconomic environment (c, γ, χ_1). While as a group bond issuers are always safer than non-issuers, as the macroeconomic environment changes new issuers become relatively riskier.

Firm-level prediction 2: Bond issuance leads to both growth and risk Second,

[20] A number of other institutional factors have been cited, including the creation of a currency union, the increased coverage of rating agencies, or improvement in secondary market liquidity. See for example the work of the Expert Group on European Corporate Bond Markets that started reporting to the European Commission in 2017: `https://ec.europa.eu/info/publications/171120-corporate-bonds-report_en`. Moreover, recent deregulation of bond markets have aimed to reduce the cost of bond issuance for smaller firms. For instance, Nobili et al. [2020] and Ongena et al. [2020] study the removal pre-existing limits to the issuance of corporate bonds by unlisted firms in Italy.

changes in debt composition have implication for firms' outcomes. Specifically, bond market access relaxes financial constraints and allow firms to borrow more [Faulkender and Petersen, 2006], increasing investment. However, it also increases downside risk: these are like two faces of the same coin. Figure 11 illustrates these effects through the lens of the model. The left panel shows how the bond share changes following entry in the bond market (depicted here due to a increase in investor risk appetite γ). The optimal share of bond financing jumps, and is associated with an increase in leverage and investment, which move one-to-one with the financial multiplier m.[21] At the same time, while firms optimally choose to enter the bond market in order to boost investment, new issuers are more exposed to negative shocks. The right panel of Figure 11 shows the change in the firm's resilience to shock, measured by the quantity χ. Firms that enter the bond market are more exposed to downside risk in case a negative cash-flow shock realizes. Admittedly, the framework is nevertheless too stylized to derive full welfare and policy implications, which we leave for future research.[22]

[21] A decrease in bond frictions χ_1 would have similar effect on leverage and investment, but a smaller effect on downside risk. A decrease in loan supply (increase in c) leads to a substitution from loans towards bonds, but has a more muted effect on leverage or investment. It is even possible that firms leave total debt unchanged and use all bond proceeds to repay loans one for one. That could leave investment unchanged, or even reduce it as in Crouzet [2017] that finds that a shift towards bond financing during the Great Recession was responsible for a third of the fall in investment for U.S. public firms.

[22] To study welfare, the model would have to be extended in at least two dimensions. First, are the cost of downside risk χ born only lenders and borrowers, or are there spillovers? Second, are shocks to bond supply γ driven by "excessive" risk-taking from the social point of view?

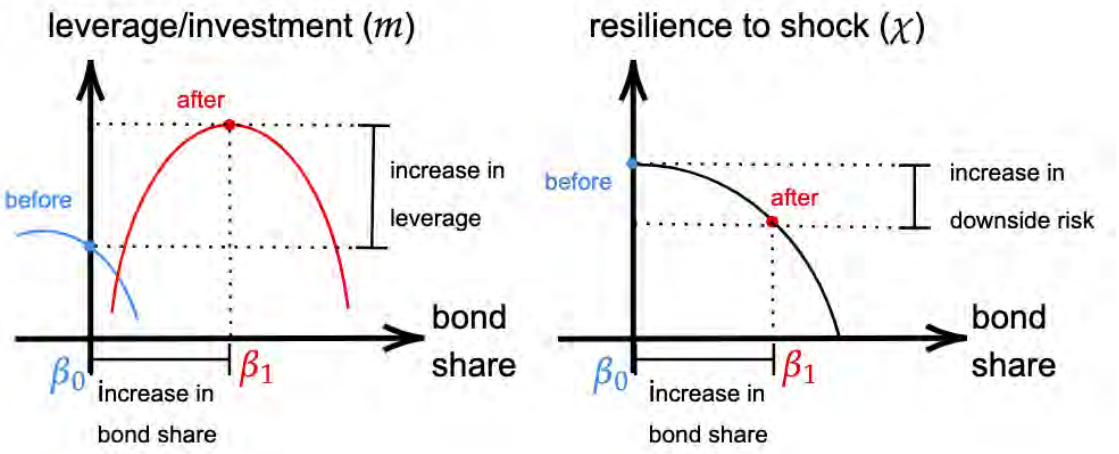

Figure 11 – Illustrative Framework: Effect of Bond Issuance

The figure shows the effects of entering the bond market after a change in the macroeconomic environment (here a change in investor risk appetite γ). The left panel shows the shift in the financial multiplier m, which varies one-to-one with leverage and investment in the framework, and the corresponding change in the optimal share of bond financing. The right panel shows the change in downside risk after entering the bond market, measured by χ, the payoff in the low cash-flow state of the world.