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 and riskier issuers. New issuers invest and grow, instead of simply repaying bank loans. Moreover, holdings of 'buy-and-hold' bond investors are large in aggregate but small for weaker issuers. Nevertheless, the bond investors' sell-off after March 2020 was largely directed at bonds of larger, safer issuers. This micro-evidence can shed light on the implications of corporate bonds market development for smaller firms and financial stability.

Keywords: Corporate bond market, debt structure, disintermediation, financial fragility, ECB, monetary policy, quantitative easing, bond investors
JEL codes: G21, G32, E44

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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. Is growth concentrated in historical issuers, or are new firms entering the bond market? What kind of issuers drive the extensive margin of growth? How are these new funds used, and which investors provide them?

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 drawing broader implications of bond markets 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

[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."

composition of bond issuers has shifted, with the entry of many smaller and riskier issuers in recent years. Second, new issuers invest and grow, instead of simply repaying bank loans. Moreover, holdings of 'buy-and-hold' bond investors are large in aggregate but small for weaker issuers. However, the bond investors' sell-off after March 2020 was largely directed at bonds of larger, safer issuers. In the last part of the paper, we discuss the implication of this micro-evidence for firms and financial stability.

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 2018. 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 implications through the lens of firm-level data over a long time frame.

Our focus on new issuers is justified by the fact that the growth of European bond markets has benefited many firms. Our analysis of the micro-data shows that the increase in firms' dependence on the bond market is not restricted to the largest, historical issuers, but is also driven by firms entering the bond market in recent years (the extensive margin of growth). While first-time issuers tend to issue smaller amounts, almost 20% of the 2018 total bonds outstanding comes from firms that entered the bond market after 2005. In count, these

[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].

recent issuers exceed historical issuers, and private issuers exceed public issuers.

Importantly, the entry of these firms has led to a shift in the composition of bond issuers towards smaller, riskier firms. Trends in credit ratings show that the volume of BBB securities, just above speculative-grade, has been rising fast and has outgrown the rest of the investment-grade category. However, looking at credit ratings alone understates the underlying shift in risk. Importantly, we show that there are many more unrated issuers in the Euro Area than in the United States, where bond market access has been equated to being rated [Faulkender and Petersen, 2006, Rauh and Sufi, 2010]. Our approach of creating a panel data set that links bond issuance with firm's balance sheet is thus necessary to go beyond credit ratings and achieve a more comprehensive analysis of issuer risk in the Euro Area. In particular, we find that, relative to historical issuers, new issuers are significantly smaller and less profitable, but have high levels of leverage. This trend is particularly pronounced for private issuers that have multiplied in recent years.

We then study how new issuers use funds. We document that new issuers borrow to invest and grow. In fact, first-time bond issuance tends to be very large at the firm-level: the median issuance represents about 40% of the previous year's total debt. The majority of funds raised is used for investment and to increase firms' long-term assets with only limited substitution away from bank loans. Bond issuance thus leads to an expansion, and not just a diversification, of debt.

We also present some new facts on bond investor composition in Europe to shed light on the potential fragility of credit supply. This 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], bond funds have been growing extensively in recent decades and, in bad times, fund outflows can trigger fire sales and price dislocation [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 weaker issuers (private, small, non-IG) is strikingly different from the aggregate. For instance, insurance companies and pensions funds hold only 15% of small private issuers'

bonds, relative to almost 30% of the aggregate. The ECB in particular holds virtually no bonds of private issuers that are outside of the top quartile of size. 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. There is a concern that this firm-investor matching might reinforce fragility in downturn.

The last part of the paper investigates some of the cross-sectional impact of the 2020 downturn. We first look it through the lens of rating downgrades by rating agencies. While only a minority of bond issuers are rated, a downgrade represents a financial distress event that has well-known negative firm-level effects [Acharya et al., 2018, Fracassi and Weitzner, 2020, Almeida et al., 2017, Kisgen, 2006]. An advantage of studying downgrades is that they are forward-looking and occurred rapidly, while balance sheet effects take more time to trace in the data. We find that the majority of firms that were downgraded in 2020 entered the bond market only recently, many of them private. This is consistent with the fact documented above of new issuers have weaker balance sheets. More generally, we also find that downgraded firms are not able to issue subordinated bonds, unlike the classical result of Rauh and Sufi [2010] in the United States.

Second, we document the dynamics of bond investors' portfolio holdings around the 2020 market turmoil. 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 by the shock. 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. Both mutual funds and insurers and pensions reduced their holdings of bonds issued by the largest firms but for different reasons. Mutual funds holdings suddenly drop and progressively revert, consistent with a need to sell assets to meet redemptions at the peak of the crisis [Falato et al., 2020, Ma et al., 2020]. Insurers and pensions holdings fell less suddenly but kept falling continuously into early 2021, consistent with a reach-for-yield portfolio adjustment [Becker and Ivashina, 2015]. Interestingly, these two channels could also potentially explain why holdings of smaller bonds were surprisingly stable during this

episode: bonds from the largest firms tend to be sold first, either because they are more liquid, safer and/or have a lower yield.

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 in the wake of a severe banking crisis. However, the impact on financial stability is still insufficiently understood. Our evidence of heterogenous bond investor composition across different types of issuers is a first step to build a more comprehensive framework of bond credit supply and its macroeconomic implications. Moreover, a more general issue is that many more firms are now exposed to market turmoil. In theory, whether intervening in bond markets is warranted depends on whether the possibility of non-fundamental market panics out-weights the risk of excessive risk-taking in financial markets. While how best to intervene in corporate bond markets is still an open question, the facts we document in this paper can inform the trade-off behind the optimal intervention.

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] European firms also do not tap market financing after a downgrade unlike in the classical U.S. study of Rauh and Sufi [2010].

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

[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.

decline in investment by firms with access to public debt markets. Moreoever, bond markets 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 weaker 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 Background and Data

2.1 Sample Construction

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 2018, although the last section of the paper uses data from 2020. We gather information about both public and private firms, and restrict attention to non-financial corporations. The public firms panel is constructed by merging two main data sources: Capital IQ and Compustat Global. Capital IQ provides micro level information on firms' debt structure in the Eurozone. In particular, it covers different types of debt that a firm may have such as credit lines, term loans, capital leases, senior bonds, subordinated bonds, and commercial paper. Additionally, information on the terms – interest rate and maturity – of each type of debt are also included for some companies. We merge Capital IQ with Compustat Global to have complete balance sheet information on the firm's assets, liabilities, and equity.

We also construct a private bond issuers panel by merging balance sheet data from Orbis with bond issuance from Centralized Securities Database (CSDB) maintained by the ECB. Because we only include firms that we could match to Orbis, and the data coverage is substantially worse prior to 2010, we likely underestimate the number of private issuers

[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].

in the Euro Area. Moreover, because Capital IQ does not cover private firms, we have substantially less information about the debt structure relative to public firms, such as maturity and pricing. The panel of private non-issuers includes firms in Orbis with assets above €2M.[6] The frequency of the final panel data is yearly and the match is unique using the LEI firm identifier. Finally, we also match these data with security-level information on holdings of selected categories of Euro area investors from the Securities Holdings Statistics by Sector (SHSS) collected by the Eurosystem. This allows to examine heterogeneity in investors composition across issuers.

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. For public firms, total market financing is the sum of three types of debt securities as reported in Capital IQ – senior bonds, subordinated bonds, and commercial paper.[7] For private firms, it is the sum of all outstanding bonds as reported in CSDB. Total debt is from Compustat Global/Orbis and comes from the firm's balance sheet. For public firms, we define total loans as the sum of credit lines, term loans, and capital leases that are also in Capital IQ. Table IA.2 in the Data Appendix defines all variables included in the analysis and provides more details on the sample construction.

Table 1 presents the summary statistics of the main variables for five sub-samples of firms: (a) public historical issuers; (b) public new issuers; (c) public non-issuers; (d) private issuers; (e) private non-issuers. Historical public issuers are firms that have issued bonds before 2004. Other public firms observations are classified as new issuer if the firm has a bond outstanding and it issued a bond for the first time in or after 2004, or non-issuer if it doesn't have a bond outstanding. The sample of public firms is composed of 3,336 firms, including 507 historical issuers, 1,028 firms that issue a bond at some point in or after 2004, and 1,801 firms that have never issued any bond. The sample of private firms contain 278,030 firms, 1,900 of which had a bond outstanding some time in 2010-2018. Note that not all

[6]The European Comission uses a cutoff of €2M in its definition of micro-enterprises.

[7]A potential concern is that grouping these together might mask some heterogeneity. For instance, Rauh and Sufi [2010] show that there are differences in how firms of different credit quality use senior and subordinated bonds using a sample of U.S. public borrowers. However, Table IA.3 shows that subordinated bonds are significantly smaller in the Euro Area relative to the United States, and make up less than 0.5% of total debt in Capital IQ. We have verified that all our main results hold using only senior bonds.

variables are available for the private issuers sample.

Based on the summary statistics, it becomes clear that there is a significant difference in size and leverage between these groups. Within public firms, historical issuers are the largest in size with a median of €2.3 B total assets, relative to €290 M for new issuers and €134 M for non-issuers. Private issuers are even smaller with a median of €135 M. Non-issuers also have significantly less leverage. Firms with bonds have a median debt-to-assets ratio of about 30%, while non-issuers have a median ratio below 20% (both public and private). Moreover, the median maturity of public non-issuers' debt is three years, relative to almost four years for public 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.

2.2 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. Since our main data source does not contain the universe of all Euro Area firms, we compare the micro-level data with comprehensive aggregate data 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.[8]

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 2002–2018. 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 2018. Both micro-level and aggregate data display similar magnitudes.[9]

[8]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.

[9]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.

Table 1 – Summary Statistics across Type of Issuers

	No.	Mean	p25	p50	p75
(a) Public Historical Issuers					
Total assets (M€))	5518	14643.24	343.30	2308.29	12927.70
Total debt (M€))	5518	4481.34	80.32	595.20	3261.84
Loans (M€)	5382	677.96	43.82	218.05	1096.07
Bond outstanding (M€)	4837	3021.16	3.71	265.64	1939.91
Equity (M€)	5518	3985.74	111.11	687.10	3485.33
Bond share (% of Debt)	4837	41.65	8.21	42.53	68.46
Cash (% of Assets)	5518	10.42	3.93	7.62	13.29
Net Property, Plant, Equipment (% of Assets)	5518	25.96	10.24	23.50	37.67
Goodwill (% of Assets)	5518	12.58	1.37	7.84	19.59
Debt over Assets (%)	5518	28.80	17.72	27.81	38.10
EBITDA (% of Assets)	5516	8.93	5.85	9.10	12.84
Average interest rate of debt (pp)	3973	4.33	3.15	4.38	5.33
Average maturity of debt (days)	4781	1599.55	760.68	1308.00	1990.25
(b) Public New Issuers					
Total assets (M€))	6090	3053.97	74.97	290.57	1538.70
Total debt (M€))	6090	941.20	18.43	87.38	455.39
Loans (M€)	5931	250.12	9.30	44.70	216.56
Bond outstanding (M€)	4641	631.44	5.39	34.62	219.11
Equity (M€)	6090	845.50	21.44	94.02	490.99
Bond share (% of Debt)	4641	42.78	16.77	39.71	67.48
Cash (% of Assets)	6090	11.24	3.73	7.97	15.04
Net Property, Plant, Equipment (% of Assets)	6090	25.43	6.88	20.57	38.91
Goodwill (% of Assets)	6090	11.41	0.00	5.54	18.04
Debt over Assets (%)	6090	32.56	19.25	30.29	43.41
EBITDA (% of Assets)	6079	5.89	3.48	7.45	11.24
Average interest rate of debt (pp)	4414	4.35	2.88	4.22	5.51
Average maturity of debt (days)	5500	1427.51	732.00	1241.91	1827.02
(c) Public Non-Issuers					
Total assets (M€))	14417	625.16	44.06	133.62	426.62
Total debt (M€))	14417	137.62	4.93	21.60	85.64
Loans (M€)	14416	94.15	4.04	18.42	73.84
Bond outstanding (M€)	14417	0.00	0.00	0.00	0.00
Equity (M€)	14417	238.12	16.20	52.24	170.59
Bond share (% of Debt)	14417	0.00	0.00	0.00	0.00
Cash (% of Assets)	14417	13.45	3.43	8.54	17.73
Net Property, Plant, Equipment (% of Assets)	14417	24.18	6.47	18.84	36.02
Goodwill (% of Assets)	14416	8.93	0.00	2.61	12.95
Debt over Assets (%)	14417	22.54	8.45	20.00	32.79
EBITDA (% of Assets)	14346	6.91	3.37	8.43	13.39
Average interest rate of debt (pp)	6373	4.16	2.63	3.88	5.18
Average maturity of debt (days)	9938	1343.79	730.00	1066.00	1826.00
(d) Private Issuers					
Total assets (M€))	7553	2306.19	35.65	134.68	792.84
Total debt (M€))	7032	843.23	11.01	44.76	272.63
Bond outstanding (M€)	7032	335.92	3.00	15.00	100.00
Equity (M€)	7406	180.70	1.02	6.43	43.15
Bond share (% of Debt)	7553	45.31	12.08	36.81	80.40
Cash (% of Assets)	7429	6.29	0.74	3.23	8.45
Net Property, Plant, Equipment (% of Assets)	7543	58.42	36.56	61.56	84.25
Debt over Assets (%)	7032	41.36	22.10	37.49	53.82
EBITDA (% of Assets)	6641	6.47	1.33	5.55	9.55
(e) Private Non-Issuers					
Total assets (M€))	1786469	139.31	3.79	7.96	23.95
Total debt (M€))	1297652	28.98	0.03	1.17	5.10
Bond outstanding (M€)	1786469	0.00	0.00	0.00	0.00
Equity (M€)	1721156	10.33	0.03	0.16	1.65
Bond share (% of Debt)	1786469	0.00	0.00	0.00	0.00
Cash (% of Assets)	1700245	13.01	1.04	5.07	17.04
Net Property, Plant, Equipment (% of Assets)	1775018	46.05	15.35	42.27	77.54
Debt over Assets (%)	1297652	24.17	0.35	15.38	38.10
EBITDA (% of Assets)	1273701	7.45	1.38	5.70	11.19

The table reports summary statistics of the main variables of interests for the following issuers' categories: (a) public firms with positive bond outstanding either in year 2002 or 2003, (b) public firms which issue bonds for the first time in the period 2004-2018, (c) public firms which never issue bond in the window 2002-2018 as well as new public issuers before their first issuance, (d) private firms with positive bond outstanding in some year in 2010-2018, (e) private firms which never issue bond in the window 2010-2018 as well as new private issuers before their first issuance. The sample is restricted to EA non-financial firms in 2002-2018.

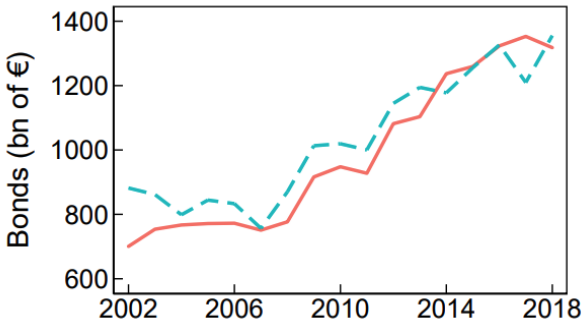


Figure 1 – Aggregate Bond Growth: SDW vs CapIQ

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 €.

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 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.

2.3 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 seemed to have benefited many firms, a fact that motivates the rest of our analysis.

Figure 2 (a) presents the time series of the average bond share of public firms in the Euro area. The average bond share has a steady and significant increase from 10% to 24% between 2002 and 2018.[10] Importantly, this increase in the firms' dependence on the bond market is not concentrated at the very top. Figure 2 (b) presents the dynamics of the bond share across four quartiles of the firms' size. While the largest firms have a significantly

[10] 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.

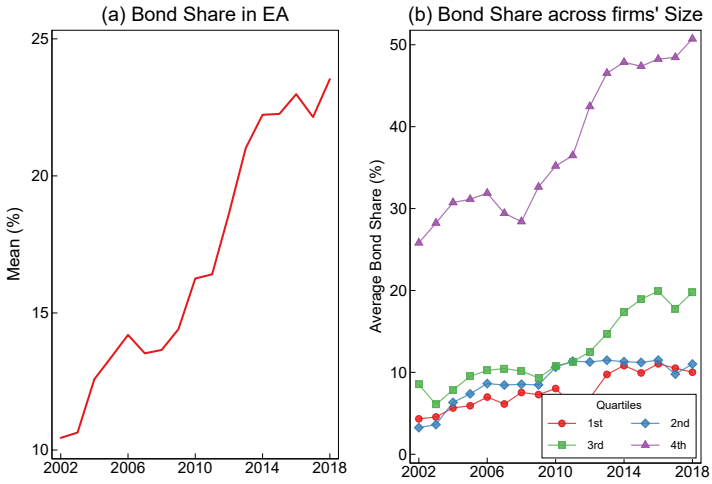


Figure 2 – Bond Share in EA

Panel (a) represents Euro Area annual average bond share, computed as the ratio of the total bond outstanding to the total debt. Panel (b) shows the evolution of bond share across quartiles of total assets in the period 2002-2018, 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 and cover Euro Area public non-financial firms in the period 2002-2018.

higher level of bond share and experienced the steepest growth, the bond share has roughly doubled across the size distribution.

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 first examine public firms. We define as new issuers firms that issued a bond for the first time in the period on or after 2004.[11] Figure 3 (a) shows that there is a constant entry of firms issuing bonds for the first time during our sample period. Approximately 30% of the public firms sample are issuers and we observe an upward trend in the number of issuers over the years. As shown in Figure 3 (b), every year approximately 10% of public issuers entered the bond market for the first time. Next, Figure 3 (c) shows the number of new private issuers over 2010-2018. We see that in count private new issuers exceed public new issuers and that entry accelerated in recent years. Note that

[11] Although our data starts in 2002, we choose 2004 as a cutoff to prevent an excessive number of false positive. The information in Capital IQ is patchy in the early years of the sample, and bonds are often reported as missing even for bond issuers.

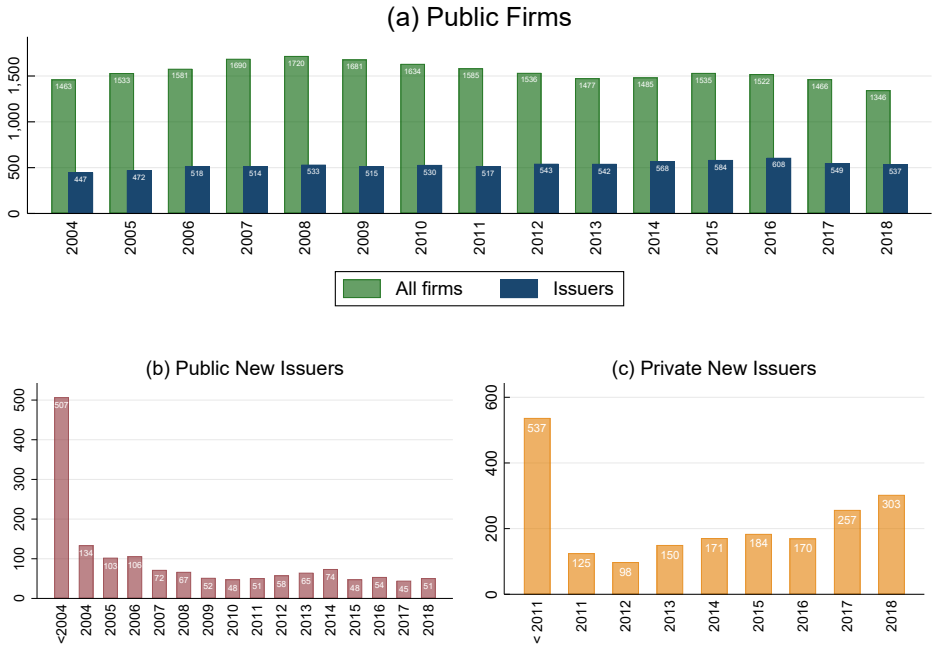


Figure 3 – Entry in the Bond Market

Panel (a) shows the total number of public firms and public issuers from 2004 to 2018. All firms represent the whole sample of public non-financial firms included in the analysis, while issuers are public non-financial firms with positive bond outstanding in a given year. Panels (b) and (c) represent the number of public and private new issuers, respectively. In each year, new issuers are defined as firms that issue bonds for the first time in that year.

the number of private issuers is likely even larger, since our sample is restricted to firms that we could match to Orbis. Overall, this represents a significant increase at the extensive margin in the bond market.

Finally, as a group, new entrants contributed significantly to the growth in aggregate bonds outstanding, even if the size of their individual issuance are smaller than historical issuers. Figure 4 shows the volume of bonds outstanding issued by recent issuers relative to the total volume of the bond market in each year. By the final years of the sample, firms that entered the bond market after 2006 account for almost 20% of the total volume of bonds outstanding. The share of private firms has been steadily increasing, reaching about a third of the total contribution of new issuers.

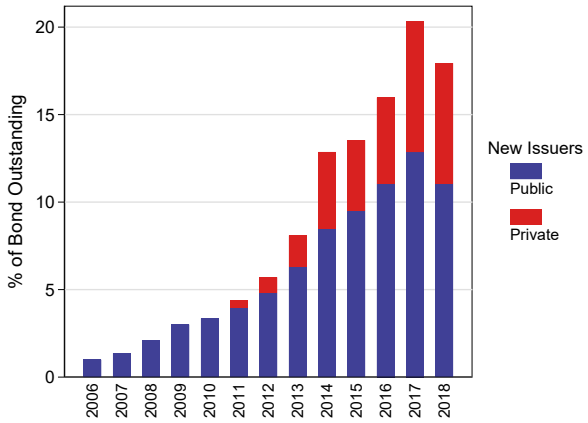


Figure 4 – Contribution of New Issuers to Total Bond Outstanding

The graph represents the bond outstanding for recent issuers in the period 2006-2018 relative to the total bond outstanding in each year. Recent issuers in year t are defined as firms that issued for the first time between 2006 and t. The private firms sample starts in 2010.

2.4 Illustrative Framework

The Internet Appendix presents an illustrative framework to understand cross-sectional patterns behind the aggregate growth in bond financing. It presents joint model of investment scale and debt composition that includes the trade-off between intermediated and bond financing highlighted in Crouzet [2017] and Darmouni et al. [2019]. On the one hand, bond market access relaxes financial constraints and allow firms to borrow more [Faulkender and Petersen, 2006], increasing investment. 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.[12]

The framework intuitively relates the aggregate growth in bond financing with the three

[12]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]. 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]. 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]. In fact, insolvency laws in Europe have been shown to explain part of why bond markets are less developed relative to the United States, where Chapter 11 plays an important role [Becker and Josephson, 2016].

macroeconomic factors discussed in the literature. The bond share is larger when bank loan supply is low consistent with the European lending sector being weakened by the financial crisis, the Euro crisis and stricter regulations [Becker and Ivashina, 2014, 2018, Altavilla et al., 2017]. Moreover, the bond share is higher when investor risk appetite is high. Monetary policy, 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 markets [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]. Finally, the bond share is larger when downside risk 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].[13] The framework can also be used to derive intuitive predictions on the cross-section of issuers. For instance, smaller and riskier firms should enter the bond market as the the macroeconomic environment becomes more conductive to bond issuance. The next section delves in the micro-data in more detail.

3 Dissecting the Rise of Bond Financing

3.1 The Changing Composition of New Issuers

We first 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

[13] 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.

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. [14] Figure 6 shows that the volume of BBB securities has been rising over the years and it has outgrown the rest of the investment grade category.[15] 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.[16] Moreover, the high yield market has more than doubled in the last decade, even though it still remains significantly smaller in size relative to the United States. For comparison, starting in 2010 this figure also shows that the aggregate amount issued by private issuers, which are presumable riskier, has been growing as well to reach over 10% of the total. Figure 5 presents average ratings over time. While the weighted average by volume outstanding has remained high, the unweighted average has fallen for all types of issuers. This suggests a shift in composition towards smaller riskier issuers.

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 compared to the United States. While the largest issuers are rated, Table IA.8 in the Internet Appendix shows that less than 15% of new issuers, both public and private, could be matched with a rating.[17] 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

[14] 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.

[15] In this plot, securities rated as BBB-, BBB, and BBB+ are included in the BBB category

[16] 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."

[17] 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 IA.8.

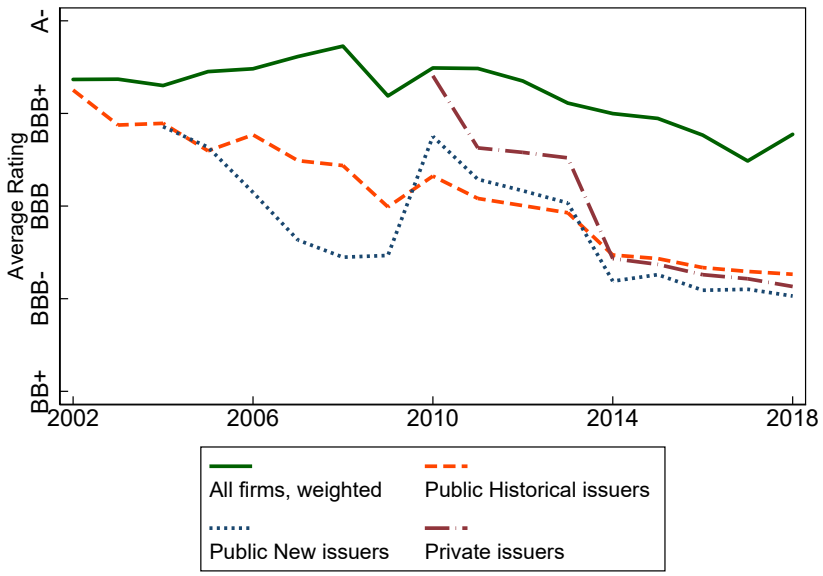


Figure 5 – Time Series of Ratings

The plot represents average rating weighted by bond outstanding for all issuers as well as average rating for public historical issuers, for public new issuers, and for private issuers. The sample includes EA non-financial firms over 2002-2018. The sample of private firms starts in 2010.

of firms with public debt outstanding. Second, new issuers with a rating are clearly selected. Table IA.9 also shows that they tend to be significantly larger and more profitable than new issuers without a rating. In addition, for public firms that are unrated we compute a predicted rating based on firm covariates in the spirit of Becker and Josephson [2016].[18] While this is only approximation, Table IA.9 column 3 shows that unrated firms predicted rating is significantly worse than for firms that did actually get a rating. These patterns are consistent with rating shopping on the part of issuers.[19] 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.

To this end, we focus on three characteristics of the firm (size, leverage, and profitability) that can be computed even for unrated firms. Figure 7 compares the characteristics of new

[18]While Becker and Josephson [2016] used a simple OLS model to approximate missing corporate ratings, we adopt a Lasso estimation that is better suited to avoid over-fitting. The R-squared of the predictive estimation is 0.64 for 2,402 observations. A detailed description of the method to approximate the missing ratings can be found at the Internet Appendix.

[19]An important body of work has focused on rating shopping, an in particular the role it played in the Financial Crisis [He et al., 2012, Efing and Hau, 2015, Bolton et al., 2012, Baghai and Becker, 2018].

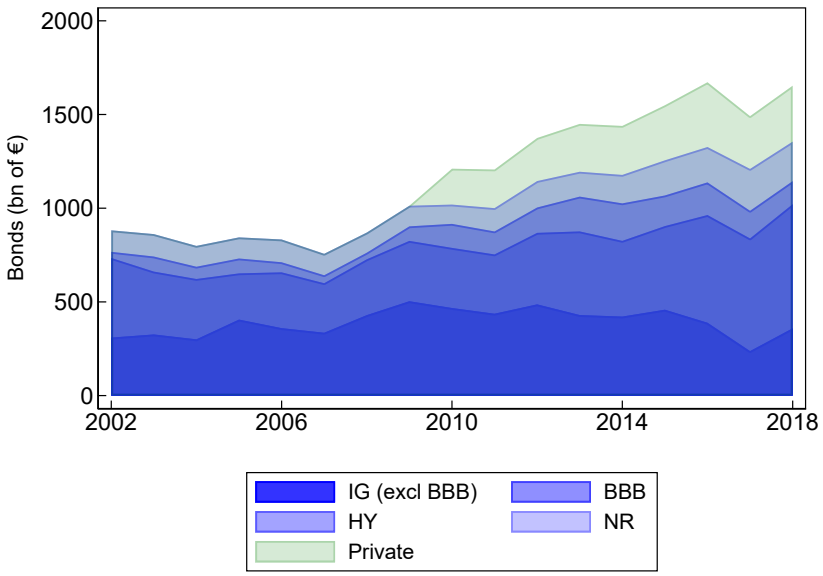


Figure 6 – Bond Outstanding by Rating Categories

The plot shows amount of bond outstanding in million € for public firms split into four rating categories: Investment Grade excluding BBB (i.e. firms rated between AAA and A- inclusive), BBB (from BBB+ to BBB- ratings inclusive), High Yield (from BB= to default ratings inclusive), and Non Rated (non-rated firms). The green area represents overall bond outstanding of private firms, independently of their rating.

bond issuers relative to historical issuers as well as non-issuers over our sample period. This figure also includes private firms. The top left shows that new issuers are substantially smaller than historical issuers. Nevertheless, the top right panel shows that new issuers have substantial amount of debt even before entering the bond market: in fact they tend to have more leverage than historical issuers. Interestingly, the bottom left panel analyzes profitability (earnings over assets) and it appears that new issuers are less profitable relative to historical issuers. These patterns are particularly striking for private issuers that tend to have much lower size and profitability and much higher leverage than public issuers. Finally, the bottom right panel shows that historical issuers have, on average, a higher rating (combining actual or predicted) compared to non-issuers and new issuers (public firms only). As a more formal test of this graphical analysis, Table IA.4 in the Internet Appendix confirms these patterns by running fixed-effects regressions of firm characteristics across three groups of issuers: public historical issuers (omitted category), public new issuers, and private issuers.

This evidence shows that the European bond market has not only expanded in size but

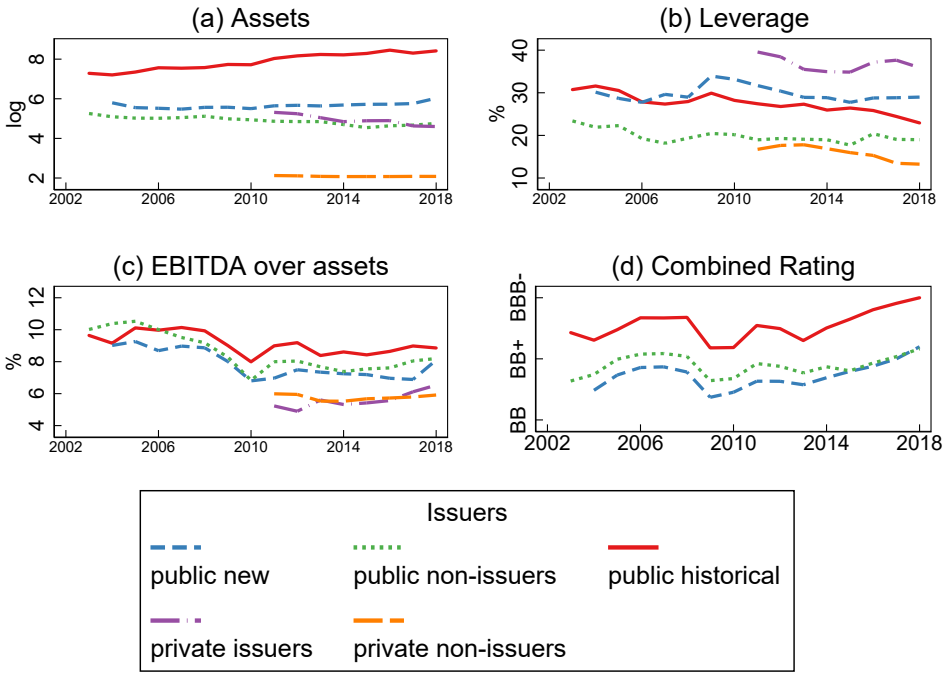


Figure 7 – Size, Leverage, Profitability, and Rating

The plot represents the median of (a) logarithm of lagged assets, (b) lagged percentage of debt over assets, (c) lagged percentage of EBITDA over assets, and (d) lagged combined ratings for public historical, new, and non-issuers from 2002 to 2018 as well as for private issuers and non-issuers from 2010 to 2018 (except in (d)). Lagged assets is used as an indicator of firm's size, while the ratio of debt to assets as a measure of leverage. EBITDA over assets measures profitability. The measure of rating employs actual ratings when available, and predicted ratings computed through lasso techniques otherwise. Public historical issuers consist of firms with positive bond outstanding either in 2002 or 2003. Public new issuers are public firms that issued bonds for the first time in the period 2004-2018. Public non-issuers' group is made up of public firms that never issued bonds in the period 2002-2018 as well as of public new issuers before their first issuance. Private issuers are firms with positive bond outstanding in the period 2010-2018.

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.

3.2 Bond Issuance and Firms' Balance Sheet

How do new issuers use the funds? An important question is whether bonds simply replace loans in a pattern of pure debt substitution, and we thus investigate changes in new issuers' balance sheets.

Note first that first-time bond issuance is massive at the firm level. Figure IA.1 in the Internet Appendix shows that newly issued bonds are extremely high relative to existing debt for the median new issuer. Newly issued bonds constitute about 35% of total debt, and sometimes considerably more. If anything, this level has been trending upward over the past two decades. In addition, the raw data suggests that only a small share of bonds funds are used to repay bank loans, as shown in Figure IA.2 in the Internet Appendix. This is in line with some of the results in Becker and Josephson [2016] although their data stops in 2010 and include only public firms, many outside the Euro Area.

To understand the evolution of the debt and assets more precisely, we run a dynamic regression analysis. For this analysis, we use only the new issuers and the time window of [-3, +5] years from the first issuance. We use D_t time dummies and run the following specification:

$$y_{i,t} = \sum_{t=-3}^{5} \beta_t \left(D_t\right) + \alpha_i + \alpha_t \tag{1}$$

We chose the year before issuance as reference date. The specification includes firm and year fixed effects to capture any firm- or year-specific characteristics. The dynamic evolution of

debt for new issuers is presented in Figure 8.

Panel (A) shows that for public new issuers total debt increases up to 50% after issuance compared to its pre-issuance level and remains significantly higher for the years after issuance. Bank loans decreases by approximately 10% compared to pre-issuance level, suggesting that new issuers substitute only partially bank loans with bonds. The level of bonds remains high and stable for the five years after the issuance, consistent with the fact that firms do not dramatically adjust their bonds in a short time period. Panel (B) shows very similar dynamics for private issuers, with an even larger drop in non-bond debt.

Figure 9 presents the dynamic evolution of firms' assets that follows a bond issuance. Panel (A) shows that public new issuers grow in size by expanding their assets by 15% on average, consistent with limited loan substitution. We also observe that cash rises significantly the year after the issuance but drops in the later years. On the other hand, investment in long-term assets appears to be consistent over the years as firms grow. Panel (B) shows a similar pattern for private firms, with two differences. First, investment is significantly larger: long-term assets grow by about 30%. Second, cash levels grows relatively more and does not revert nearly as fast. Lastly, we investigate shareholder payouts. In the U.S., there is evidence that seasoned issuers often use the bond market to finance share buybacks [Acharya and Plantin, 2019, Farre-Mensa et al., 2020, Mota, 2020]. Figure IA.10 in the Internet Appendix shows that this does not appear to be the case for new issuers, consistent with bond proceeds being largely used to fund growth.[20]

A question about the interpretation is whether the bond market helps firms grow or whether only growing firms join the bond market. While perfectly distinguishing between the two is difficult without quasi-random variation, we can nevertheless look at some empirical patterns on growth rates to shed light on this issue. Figure IA.9 in the Internet Appendix first looks across firms, prior to issuance, to show that issuers do not have a strikingly higher growth rate than non-issuers, whether it is computed using sales or assets. Furthermore, Figure IA.8 looks at within-firm variation and shows a notable increase in sales growth

[20]For public firms for which we have detailed debt structure information from Capital IQ, we also see that bond issuance helps firms extend debt maturity. See Figure IA.3 in the Internet Appendix.

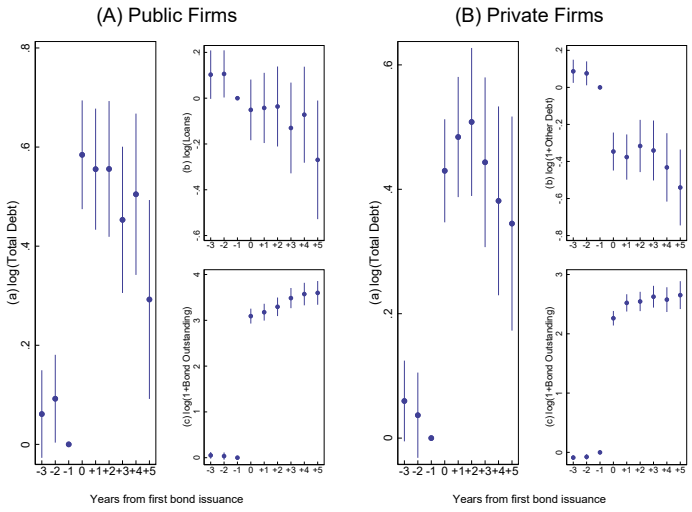


Figure 8 – Debts' Dynamics

The figures show the coefficients and the 95% confidence intervals obtained through fixed-effects regressions. Panel (A) and (B) include only public new issuers and private new issuers, respectively. The points are the coefficients resulting from regressing the (A-a, B-a) logarithm of total debt, (A-b) logarithm of loans, (B-b) logarithm of 1 plus other debt, calculated as difference between total debt and bonds, and (A-c, B-c) logarithm of 1 plus bond outstanding, on time dummies for a window of [-3, +5] years from the first issuance. Year and firm fixed effects are included. Standard errors are clustered at the firm level. Each line crossing a point represents the confidence interval for that coefficient.

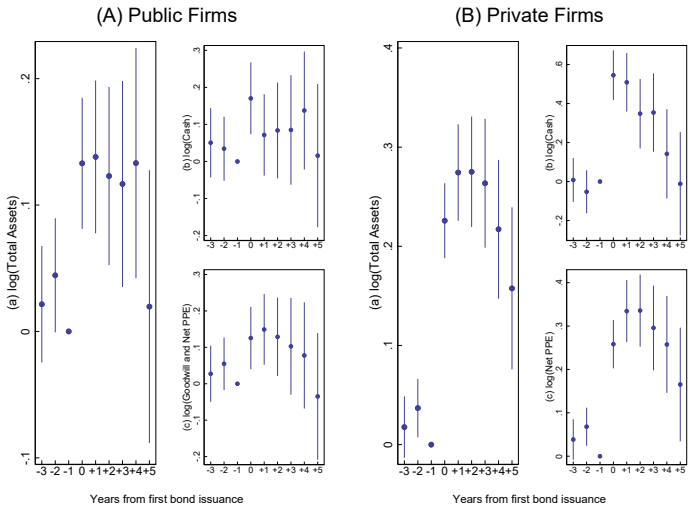


Figure 9 – Assets' Dynamics

The figures show the coefficients and the 95% confidence intervals obtained through the fixed-effects regressions. Panel (A) and (B) include only public new issuers and private new issuers, respectively. The points are the coefficients resulting from regressing the (A-a, B-a) logarithm of total assets, (A-b, B-b) logarithm of cash, (A-c) logarithm of the sum of goodwill and net ppe, and (B-c) logarithm of net ppe, on time dummies for a window of [-3, +5] years from the first issuance. Year and firm fixed effects are included. Standard errors are clustered at the firm level. Each line crossing a point represents the confidence interval for that coefficient.

after issuance. The lack of clear presence of pre-trends is in line with the evidence on asset dynamics discussed above. Overall, it suggests that, even though issuers are a selected set of firms, the growth after entering the bond market is unlikely to be entirely driven by different growth trajectories that predate issuance.

3.3 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. Because the micro-data only starts in 2016, we focus on a recent snapshot. Investor composition has been relatively stable over our sample period, except for the significant increase of the ECB holdings following the start of corporate bond purchases in 2016 with the introduction of the CSPP.[21]

Figure 10 first presents investor composition at the end of 2019 for all corporate bonds issued by Euro Area non-financial corporations, using aggregate data only. Prototypical long-term investors hold a large share of the aggregate. In particular, insurance companies and pension funds hold over a quarter of the total. The ECB (and the Eurosystem) also holds as much as almost 10% of the total in that year. 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. However, direct holdings by households or other non-banks financial institutions are limited, at less than 5% each. Finally, banks make up another 10%, other financial institutions 5%, and the rest of the world, constructed as a residual category, covers the final 20%.

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 this question, we use the micro-data on holdings at the bond level to document the investor composition for corporate bonds issued by *private* issuers only.

Figure 11a considers private issuers of different size, dividing the sample using quartile of firms' assets. The first fact is that for the largest issuers in the top quartile, investor composition is remarkably similar to the aggregate. However, investor composition for smaller

[21] Figure IA.4 in the Internet Appendix shows investor composition for the aggregate bonds outstanding in 2015-2020.

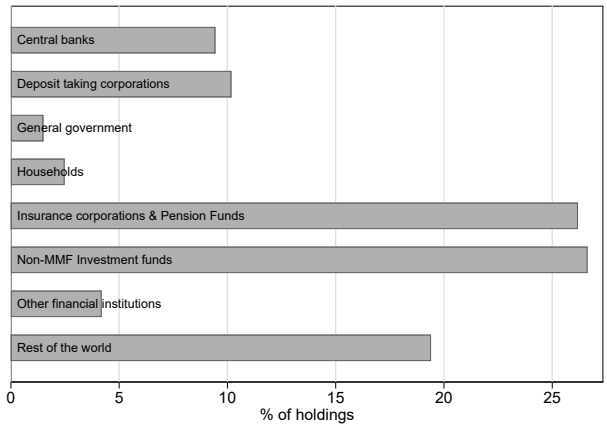


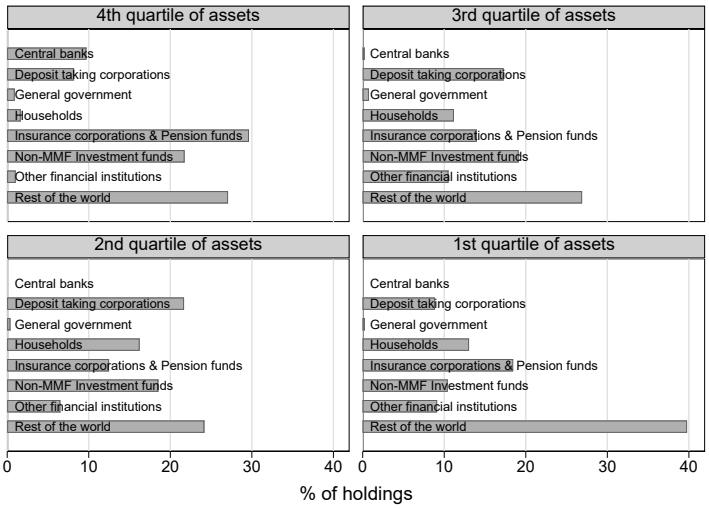
Figure 10 – Investor composition: All non-financial issuers in 2019

The figure presents the investor composition of the debt securities issued by EA non-financial corporations at the end of 2019. 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. Holdings by non-financial corporations are excluded, and the shares by construction sum up to one. The source of this data is the SDW Macroeconomic and sectoral statistics, Financial accounts, Who-to-whom detail for debt securities issued by non-financial corporations.

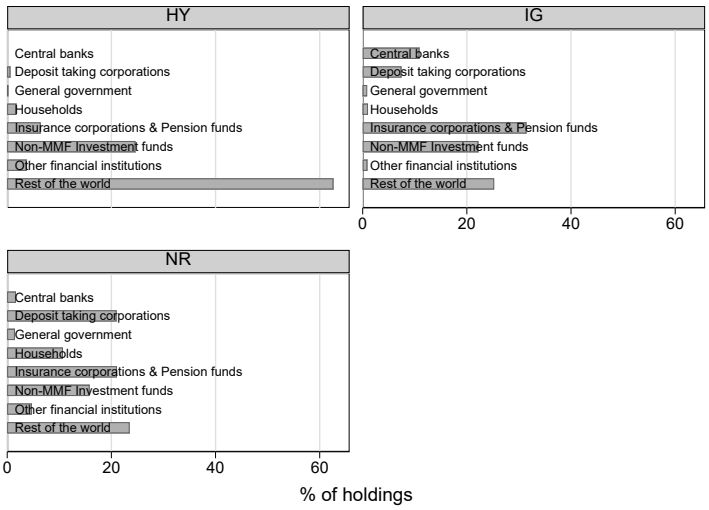
private issuers is strikingly different from the aggregate. In particular, the share of 'buy-and-hold' investors (ECB, insurance companies, pensions funds) is only 15%, or about 20 percentage points lower than in the aggregate. The ECB in particular holds virtually no bonds of private issuers outside of the top quartile of size. On the other hand, we see higher shares of holding by households (15% vs. 4%) and "Other financial institutions" (8% vs 3%), while the share of bond funds is relatively comparable (around 20%).

Figure 11b provides an alternative breakdown by rating. Once again, while the safest private issuers (IG) look similar to the aggregate, investor composition is very different for other issuers. Insurance and pensions hold only 6% of private HY issuers' bonds, and the ECB none. An extremely large share is held by the 'rest of the world' residual category, over 60%. Moreover, bond funds make up the vast majority of domestic HY bond holdings. For unrated bonds, banks are surprisingly large, holding over 21%, while they hold only 7% of IG bonds and virtually no HY bonds. Direct holdings of households also account for as much as 10%, while they do not exceed 1% of rated bonds.

There thus appears to be a matching of firm and investors. There is heterogeneity



(a) By firm size



(b) By credit rating

Figure 11 – Investor composition: Private non-financial issuers in 2019

The figures present the investor composition of the debt securities issued by EA private non-financial corporations at the end of 2019. In panel (a) the sample is divided using the quartiles of private firm's assets as an approximation for the firm's size. In panel (b) the sample is divided based on the firm's rating in three categories: (i) High Yield (HY); (ii) Investment Grade (IG), and (iii) unrated (NR). 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. Holdings by non-financial corporations are excluded, and the shares by construction sum up to one. The source of this data is the Securities Holdings Statistics by Sector (SHSS) for debt securities issued by non-financial corporations.

on both sides, and this matching might reinforce fragility: bonds of smaller and riskier firms are substantially less likely to be held by traditional 'buy-and-hold' investors. 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. Moreover, it seems important to better understand the behavior of less-studied investor groups, such as households, other financial institutions or foreign investors: they matter disproportionately for the many smaller and riskier issuers that have multiplied in recent years. The next section thus studies directly the dynamics of investor holdings during the 2020 downturn across different issuers.

4 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. While disruptions in credit markets eased, the crisis was leading to a deep recession. 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. The next subsection looks at the composition of downgraded firms. Since only a minority of firms are rated, the following subsection looks more broadly at the dynamics of bond investor holdings across different types of issuers.

4.1 Rating Downgrades

The risk of being downgraded by rating agencies is an important concern for bond issuers. A deterioration in credit rating affects firms' operations and represents a much more frequent instance of financial distress relative to liquidation and bankruptcy. An advantage of studying recent downgrades is that they are forward-looking and occurred rapidly, while

balance sheet effects will take time to trace in the data. Prior work has used clever empirical strategies to address the challenge of separating the effect of a downgrade from underlying fundamental difficulties.[22] On the other hand, bank-financed firms are largely insulated from such clear negative public signals about their creditworthiness.

We collect data of the firms that were downgraded during 2020. We gather the list of firms downgrades by the three major rating agencies (Standard and Poor's, Fitch, Moody's) and match them to firm-level data from Orbis and Capital IQ. In total, our matched sample contains 112 non-financial firms, although some variables are missing for some observations. We find that the majority of the firms that were downgraded in 2020 entered the bond market recently, many of them private. Table 2 shows that most of these firms are indeed new issuers, and, in particular, only 31% of these firms were historical public issuers. Moreover, approximately half of the downgraded firms are private. Public historical issuers make up only 60% of total outstanding of downgraded firms. Figure 12 presents graphically this observation: it depicts the number of firms that were downgraded in 2020 based on their year of entry in the bond market as well as the split between private and public firms. From this plot, it becomes evident that the majority of the 2020 downgraded firms entered the bond market only recently, while at the same time the share of private firms is large.[23] This is consistent with the fact documented earlier that new issuers tend to have weaker balance sheets.

Event study with 2004-2018 data One limitation of the analysis of the 2020 crisis is that not enough time has elapsed to estimate the impact of rating downgrades on firms. We thus conduct an event study around a firm's downgrade using our public firms panel

[22]For instance, Acharya et al. [2018] show that the unexpected downgrades of GM and Ford in 2005 lead to a liquidity shock to bond-financed firms which adjusted their balance sheet in response. Using a surprise change in Moody's rating methodology, Fracassi and Weitzner [2020] show that ratings have a significant causal impact on firms' financing, investment, and security design decisions, while Almeida et al. [2017] exploit rating agencies' sovereign ceiling policies. For more on the effects of ratings on firm financing decisions, see Graham and Harvey [2001] or Kisgen [2006] among others. Darmouni et al. [2019] also document that a downgrade is in general associated with a larger stock reaction in Europe relative to the United States.

[23]Tables IA.5 and IA.6 in the Internet Appendix provide more details on the share of the downgraded firms across countries and industries.

Table 2 – 2020 Downgrades: New issuers and Private firms

	Historical issuers	New issuers		Private firms
		2004-2011	2012-2020	2010-2020
	(1)	(2)	(3)	(4)
% of firms downgraded in 2020	31.25	8.93	6.25	53.57
% of bonds downgraded in 2020	62.34	2.57	1.55	33.54
% of fallen angels	50	20	0	30

The table reports public firms that issued for the first time (1) before 2004, (2) between 2004 and 2011, (3) between 2012 and 2020 as well as (4) private firms between 2010 and 2020, as ratios of number of firms downgraded in 2020, bond outstanding of the firms downgraded in 2020, and number of fallen angels in 2020.

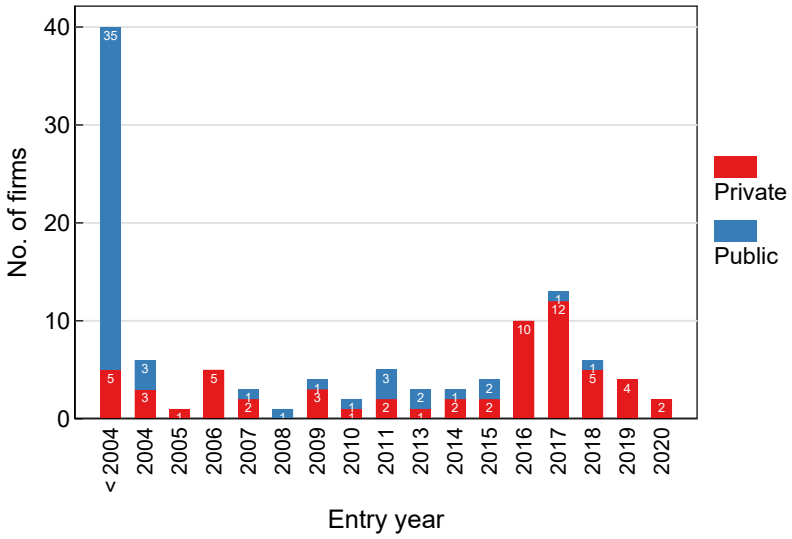


Figure 12 – 2020 Downgrades: Entry Year to Bond Market

The plot presents the number of public and private firms downgraded in 2020, split across their year of entry to the bond market. The sample is restricted to EA issuers between 2002 and 2018.

for previous years in order to understand its impact on debt structure.[24] These results suggest that firms change their long-term choice of debt following a downgrade in a way that contrasts with the classical result of Rauh and Sufi [2010]. Following a downgrade, firms appear to turn to bank financing with loans increasing steadily for at least five years after the downgrade. However, subordinated bonds do not significantly increase. A potential explanation is that subordinated bond markets are less developed in Europe relative to the United States. Consistent with this, Table IA.3 in the Internet Appendix shows that subordinated bonds are significantly smaller in the Euro Area relative to the United States, and make up less than 0.5% of total debt in Capital IQ. It thus seems that a rating downgrade reduces European firms' access to market financing in more drastic fashion than previously thought.

4.2 Dynamics of Bond Investor Holdings in 2020

This section examines the dynamics of bond investors portfolio holdings around the 2020 market turmoil. In this section, we consider all private issuers, not only rated ones. Given the heterogeneity in bond investors across issuers documented in Section 3.3, 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 3 presents an event study analysis of bond investors holdings around March 2020 using quarterly data from private issuers from

[24] We use a dynamic regression analysis and focus on the annual changes in a time window of [-3, +5] years from the first downgrade. We use D_t time dummies and run the following specification:

$$y_{i,t} = \sum_{t=-3}^{5} \beta_t \left(D_t\right) + \alpha_i + \alpha_t \tag{2}$$

We chose the year before the downgrade as reference date $t = 0$. The specification includes firm and year fixed effects to capture any firm- or year-specific characteristics as well as two year lagged values of firm characteristics. Note that while we are able to check whether the effect of downgrades is explained by pre-trends, we admittedly do not have a quasi-random variation in downgrades.

the SHSS. We consider four investor categories separately and compare the three quarters post March 2020 holding with the previous three quarters. All columns include issuer (LEI) fixed effects to isolate within-firm changes in bond holdings around the crisis. The first panel shows the average effect across all issuers. On average, we see that *both* non-banks (including mutual funds) and insurance companies and pension funds ('buy-and-hold') decrease their holdings of corporate bonds after March 2020. Note first that the average magnitude is small: these investors reduce their holding of the average bond by 30 to 40 basis points. However, the amount of heterogeneity across issuing firms is striking.

Indeed, the next panel examines firms of different size by interacting the post March 2020 dummy with asset quartiles calculated in 2019. It is immediately clear that the effect is entirely driven by the largest firms in the top quartile as well as being much larger for these firms: insurance and pensions reduced their holdings by 1 percentage points and nonbanks by 1.5 percentage points. The effect on the other three quartiles of issuers are drastically smaller and statistically insignificant.

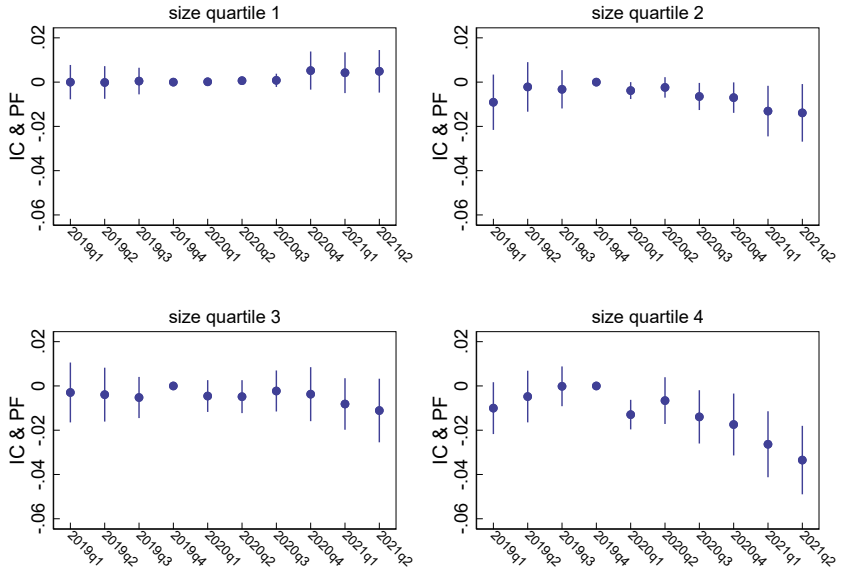
There are nevertheless some differences between the behavior of these two sectors. To make this clear, Figure 13 shows dynamic coefficient plots of running the same type of regressions but with a longer event window and separate estimates for each quarter. These plots confirm that the pull back was focused on the largest firms, but the exact timing is revealing. For nonbanks, the effect is sudden: March 2020 sees the largest decline of about 3 percentage points. However, the effect reversed rather quickly and had disappeared by the end of the year. For insurance companies and pension funds, the effect on impact is smaller, about 1 percentage points. However, we observe a continuous subsequent decline, and by mid 2021 holdings are about 4 percentage points lower.

These strikingly different dynamics suggest distinct underlying economic mechanisms. The sudden drop and quick reversal for nonbanks is consistent with a need to sell assets to meet redemptions. Aggregate evidence suggests that redemptions and fund outflows peaked in March before reverting in the following months. The slower but continuous drop for insurance and pensions could potentially be explained by reach for yield: a portfolio

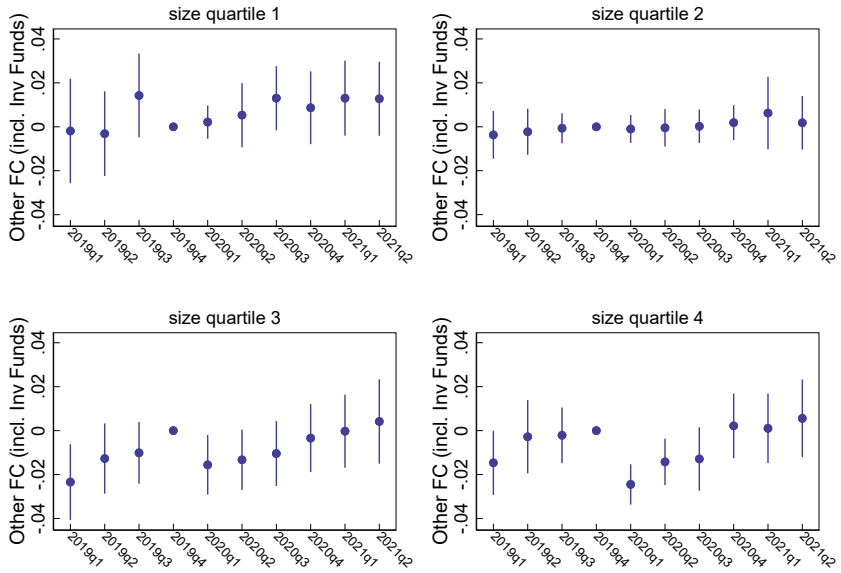
Table 3 – Changes in Investor Composition around March 2020

	Insurers & Pensions	Nonbanks	Banks	Households	Central Bank	RoW
Panel 1: Average effect	(1)	(2)	(3)	(4)	(5)	(6)
Post March 2020	-0.00392**	-0.00587**	0.00134	-0.00807***	0.00276***	0.0138***
	(0.00190)	(0.00234)	(0.00242)	(0.00238)	(0.000932)	(0.00366)
Observations	6950	6950	6950	6950	6950	6950
R-squared	0.002	0.002	0.000	0.004	0.004	0.005
Fixed Effects	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer
Panel 2: Heterogeneous effects -Issuer size						
Post March 2020 × 1st Assets Quartile	0.000241	0.000600	-0.00611	-0.00895	-0.00244	0.0167*
	(0.00217)	(0.00516)	(0.00429)	(0.00739)	(0.00235)	(0.00977)
Post March 2020 × 2nd Assets Quartile	-0.00264	0.000188	0.00561	-0.0175***	-0.0000568	0.0137*
	(0.00377)	(0.00341)	(0.00408)	(0.00479)	(0.000650)	(0.00726)
Post March 2020 × 3rd Assets Quartile	-0.00185	-0.00648	0.00354	-0.00842**	0.00240	0.0106
	(0.00410)	(0.00501)	(0.00605)	(0.00362)	(0.00148)	(0.00756)
Post March 2020 × 4th Assets Quartile	-0.00957**	-0.0146***	0.00130	0.000266	0.00889***	0.0145***
	(0.00411)	(0.00473)	(0.00439)	(0.00350)	(0.00223)	(0.00538)
Observations	6950	6950	6950	6950	6950	6950
R-squared	0.003	0.004	0.001	0.006	0.013	0.005
Fixed Effects	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer
Panel 3: Heterogeneous effects -Issuer rating						
Post March 2020 × HY	-0.00943**	-0.0650***	0.0000375	-0.00995**	-0.000836**	0.0850***
	(0.00371)	(0.0158)	(0.00182)	(0.00506)	(0.000368)	(0.0167)
Post March 2020 × IG	-0.0143**	-0.0102*	-0.00491	-0.00424**	0.0151***	0.0191***
	(0.00602)	(0.00522)	(0.00653)	(0.00199)	(0.00387)	(0.00410)
Post March 2020 × Unrated	-0.00196	-0.00168	0.00241	-0.00856***	0.00102	0.00869**
	(0.00209)	(0.00251)	(0.00275)	(0.00286)	(0.000938)	(0.00425)
Observations	6950	6950	6950	6950	6950	6950
R-squared	0.003	0.012	0.000	0.004	0.015	0.011
Fixed Effects	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

This table displays the results from estimating the following specification: $y_{it} = \beta \times Post_t + \alpha_i + \epsilon_{it}$ for each firm i and quarter t. The dependent variable y_{it} is constructed as the share of each firm's total bonds outstanding held by each investor type. 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. In panel (2) 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. In panel (3) the *Post* dummy is interacted with a categorical variable that indicates the firm's rating status at the end of 2019. The source of this data is the Securities Holdings Statistics by Sector (SHSS) for debt securities issued by non-financial corporations. This sample includes only private issuers. Standard errors, in parentheses, are corrected for clustering of the observations at the firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$



(a) Insurers and Pensions



(b) Nonbanks

Figure 13 – Change in Investor Holdings: Dynamic Coefficient Plots, by Issuer Size

This figure displays the results from estimating the following specification: $y_{it} = \Sigma_\tau \beta_\tau \times \mathbf{1}[t = \tau] + \alpha_i + \epsilon_{it}$ for each firm i and quarter t. The dependent variable y_{it} is constructed as the share of each firm's total bonds outstanding held by each investor type. The frequency of the holdings data is quarterly. We estimate a coefficient for each date τ between 2019Q1 and 2021Q2. Four size categories are constructed based on the firm's asset value in 2019. Panel (a) presents the results for insurance companies and pension funds and Panel (b) for nonbanks financial investors. The figures show the coefficients and the 95% confidence intervals obtained through the fixed-effects regressions using as a base level the Q4 2019 value. The frequency of the data is quarterly and the time period presented is from Q1 2019 until Q2 2021. Firm fixed effects are included and standard errors are clustered at the firm level. The source of this data is the Securities Holdings Statistics by Sector (SHSS) for debt securities issued by non-financial corporations. This sample include only private issuers.

adjustment towards riskier assets as safe yields fall.[25] Testing these channels directly is difficult however, since we cannot trace holdings at the ultimate investor level. Nevertheless, direct evidence has been documented in other settings, such as the United States, for both outflow-driven corporate bond sales [Falato et al., 2020, Ma et al., 2020] and reach for yield by insurers [Becker and Ivashina, 2015]. These mechanisms might also be able to explain why the effect is concentrated among the largest firms. When funds need to meet redemptions, it is well understood that they tend to sell more liquid assets first (a 'reverse flight to liquidity'). Moreover, reaching for yield implies a tilt away from the safest bonds. Since bonds from the largest firms tend to be more liquid and safer, that could explain the observed cross-sectional difference.

Another dimension of issuer heterogeneity is rating. Figure IA.6 in the Internet Appendix repeats the dynamic coefficient plots, but separating issuers into three categories: IG, HY, and unrated. This reveals that the effect is concentrated among rated issuers. In the light of the previous evidence, this is unsurprising given the strong relationship between size and having a rating. The observed difference between IG and HY are nevertheless enlightening. For nonbanks, the effect is stronger for HY bonds, consistent with HY funds facing the largest outflows in March. Furthermore, the decline of insurers and pensions' holdings is significantly larger for IG bonds, in line with a reach for yield hypothesis.

We can also look at the behavior of other investor types, that have received less attention in prior work due to their smaller aggregate market share. Specifically, Section 3.3 showed that banks and households hold a disproportionate share of bonds issued by smaller, unrated firms. Less is known about how these investors behave in a downturn: in fact there is a potential concern that banks might suffer from a negative balance sheet channel amplification, or that retail investors might succumb to a market panic. The last two columns of Table 3 show that the behavior of these two types of investors was very different in 2020. Banks' holdings are stable throughout the board. On the other hand, households seemed to have sold across the board (with the exception of very large issuers, for which they hold minimal

[25]"Insurers walk tightrope of risky corporate credit" Reuters, July 29th, 2020 (`https://www.reuters.com/article/us-insurance-investment-credit-analysis-idUSKCN24U1OB`).

amounts to begin with).

Who purchased bonds that were sold off? Table 3 column 5 shows that the ECB increased its holdings of bonds issued by the largest firms. However, they were concentrated in IG issuers, in line with its main program mandate. The ECB purchases were not broad and large enough to make up for other investors selling, leading to an increase in the residual category "Rest of the World" (column 6). This is true for virtually all types of issuers, but is particularly salient for the HY bonds, for which they hold the lion's share to begin with. It is a particularly unfortunate data limitation that we cannot see more precisely who holds HY bonds, given how fragile this segment was in 2020.

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. Understanding better the mechanisms behind these cross-sectional differences would nevertheless require further work. Are holdings of smaller issuers more stable because their investors are different and did not adjust their portfolio? Or is it because these investors chose to sell bonds from larger issuers first? The fact that we cannot observe end investors' identity in our data makes answering these questions difficult. Finally, it remains the important question of how these changes in investor composition impact firms' financing and balance sheets. We are actively working on extending the analysis in this direction.

5 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 and reducing their reliance on the European banking sector. Following a severe banking crisis, this can be seen as a welcomed development.

However, there are still some open questions related to the expansion, in particular given the recent entry of smaller, riskier issuers. 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. A more general issue is that many more firms are now exposed to market turmoil, even if the shock originates outside the corporate sector. In theory, if market turmoil was purely driven by non-fundamental runs and panics, broadening lender-of-last resort policies to include corporate bonds in order to protect smaller issuers would be beneficial. The 2020 shock highlights the fact that policy-makers were eager to intervene to backstop the corporate bond market: the ECB expanded the range of eligible bonds for purchases and collateral.[26] Nevertheless, the ECB's mandate still excluded much of the recent smaller issuers that have entered the market in recent years.

However, 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.

[26]Pelizzon et al. [2019] provide evidence that the inclusion of an asset in the Eurosystem's list for eligible collateral directly affects its secondary market liquidity and yield. In the United States the Federal Reserve has also started to conduct direct corporate bond purchases for the first time in its history.

6 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 and riskier issuers in recent years. Second, new issuers invest and grow, instead of simply repaying bank loans. Moreover, holdings of 'buy-and-hold' bond investors are large in aggregate but small for weaker issuers. Nevertheless, the bond investors' sell-off after March 2020 was largely directed at bonds of larger, safer issuers. Understanding better the welfare and policy implications of this shift is an important avenue for future research.

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Internet Appendix

Sample description

The main filters applied for the final sample construction are the following. We exclude observations with: (a) total assets or total debt either missing or zero; (b) book leverage smaller than 0 or greater than 1; (c) sum of total debt greater than total debt; (d) sum of loans and bonds greater than total debt; (e) debt over assets bigger than 300%; (f) equity over assets bigger than 300% or smaller than 300%. Furthermore, we winsorise term loans at the 5th and 95th percentile, and impose bond share to be at maximum equal to 100%. The following table presents the number of firms per country included in the final dataset.

Table IA.1 – Number of Firms, cross country

Country	No. of Public Firms	No. of Private Firms	Country	No. of Public Firms	No. of Private Firms
AUT	87	10651	ITA	384	58171
BEL	134	13205	LTU	30	518
CYP	51	567	LUX	32	8879
DEU	793	43927	LVA	21	499
ESP	174	51505	MLT	16	1112
EST	13	1271	NLD	172	37474
FIN	176	6814	PRT	59	3642
FRA	858	29832	SVK	9	1751
GRC	236	1728	SVN	25	1242
IRL	64	5231			

The table shows the number of public and private firms across countries. The sample is restricted to EA non-financial firms in the period 2002-2018.

Table IA.2 – Variables Definition

Variable Name	Definition
Compustat	
Total assets	AT
Cash	CHE
Dividends	DV
Equity	CEQ
Goodwill	GDWL
Total liabilities	LT
Property, Plant and Equipments (Net)	PPENT
Repurchases (Net)	Purchase (PRSTKC) - Sale (SSTK) of common and preferred stocks
Capital IQ	
Total debt	Total Principal Due (TP) + Overall Adjustments (OA)
Bonds	Senior Bonds and notes (SBN) + Subordinated bonds and noted (SUB) + Commercial Paper (CP)
Loans	Capital Leases (CL) + Term Loans (TL) + Drawn Credit Lines (DC)
Compustat and Capital IQ	
Bond share	Bonds/ AT
Leverage	TD/AT
Other debt	TD - Bonds - Loans
Other liabilities	LT- TD
Orbis	
Total assets	TOAS
Cash	CASH
Total debt	Long Term Debt (LTDB) + Short Term Debt (LOAN)
Dividends	Cash dividends paid - total
Equity	CAPI
Property, Plant and Equipments (Net)	FIAS
Statistical Data Warehouse	
Bonds	Liabilities, Debt
Equity	Liabilities, Equity and investment fund shares
Loans	Liabilities, Loans - Loans to NFCs by MFIs
Other	Liabilities, Other accounts

This table provides the definition for all variables from three different sources: Capital IQ, Compustat, Orbis, and Statistical Data Warehouse Macroeconomic and sectoral statistics. All financial ratios are winsorized at 1% tails.

Debt structure of firms in EA and in the US

Table IA.3 breaks down the debt composition for three years. It shows that the growth in the bond share in the EA is driven by firms replacing term loans by senior bonds. Based on the comparison between EA and the US, it appears that the rise in bond financing is a European phenomenon: while the U.S. bond share is significantly higher at 35-45%, it does not show the same striking growth. Moreover, the level difference across regions is virtually fully explained by the relative importance of term loans versus bonds. For instance, in 2009 senior and subordinated bonds constituted 35% of debt in the U.S. but only 12% in the Euro Area, a 23pp gap. On the other hand, term loans were only 29% in the U.S. as opposed to a full 55% in Europe, a 26pp gap.

Table IA.3 – Euro Area vs US debt structure

Variables	2004		2009		2015	
	EA	US	EA	US	EA	US
Bonds	12.24	46.69	13.08	35.83	19.70	34.66
Commercial Papers	.83	.70	.68	.39	1.43	.63
Senior Bonds	10.92	38.54	12.07	31.40	17.93	32.38
Subordinated Bonds	.49	7.45	.33	4.04	.35	1.65
Loans	76.17	48.44	75.56	58.99	72.46	61.35
Capital Leases	7.01	9.02	6.86	9.34	5.46	8.04
Drawn Credit Lines	7.81	17.13	13.57	20.24	12.98	21.42
Term Loans	61.34	22.29	55.12	29.40	54.01	31.89
Other	11.59	4.86	11.36	5.18	7.83	3.99

The table shows the composition of the debt for Euro Area and United States' firms in the years 2004, 2009, and 2015. Each debt category is presented as percentage of the total debt. Bonds is the sum of commercial paper, senior bonds, and subordinated bonds. Loans comprise capital leases, drawn credit lines, and term loans.

Additional Figures and Tables

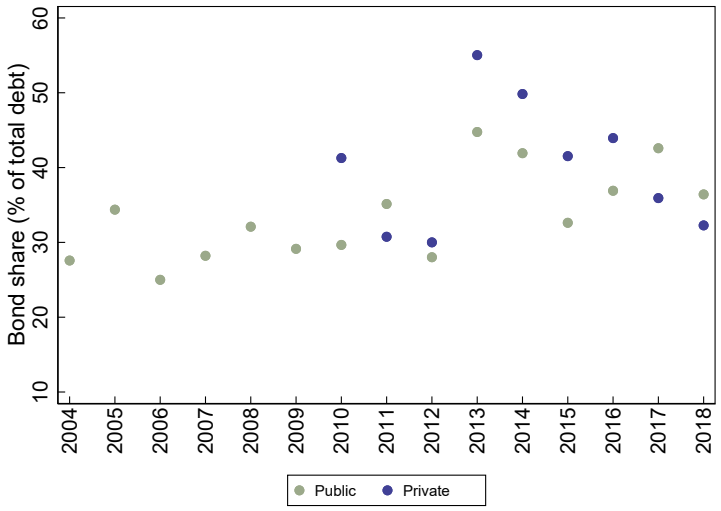


Figure IA.1 – Bond Share At First Issuance

The plot presents the median bond share of private new issuers in 2010-2018 as well as public new issuers in 2004-2018. The bond share is computed as ratio of bond outstanding to total debt. The ratios are reported in percentages. The sample includes Euro Area non-financial firms over 2004-2018.

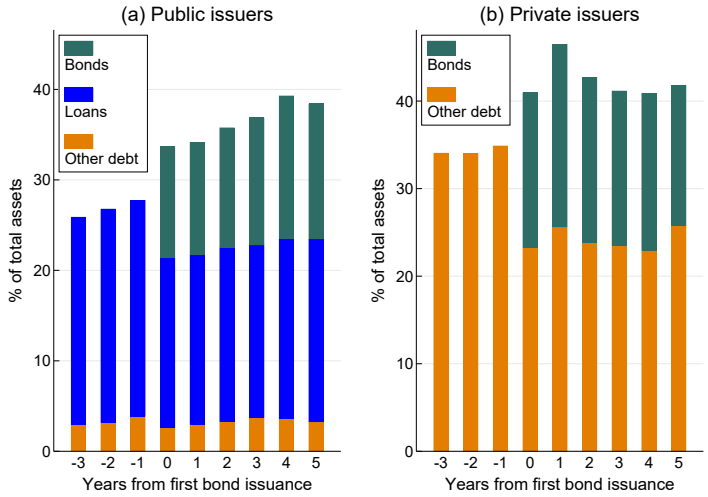


Figure IA.2 – Debt Structure At First Issuance

The plots show the dynamics of new issuers' debt structure before and after the first bond issuance, for (a) public issuers, and (b) private issuers. For public issuers, other debt is computed as difference between total debt and the sum of loans and bonds. In the case of private issuers, other debt is the difference between total debt and bonds. Each debt category is normalised by total assets.

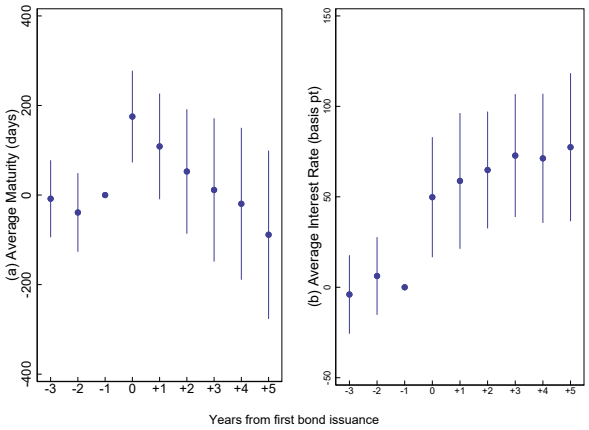


Figure IA.3 – Maturity and Interest Rate's Dynamics

The figure plots the coefficients and the 95% confidence intervals obtained through the fixed-effects regressions. Only new issuers are considered. The points are the coefficients resulting from regressing (a) average maturity remaining - measured in days - and (b) average interest rate - measured in basis points -, on time dummies for a window of [-3, +5] years from the first issuance. In the interest rate's specification, we control for quartiles of leverage and quartiles of maturity. Year and firm fixed effects are included. Standard errors are clustered at the firm level. Each line crossing a point represents the confidence interval for that coefficient.

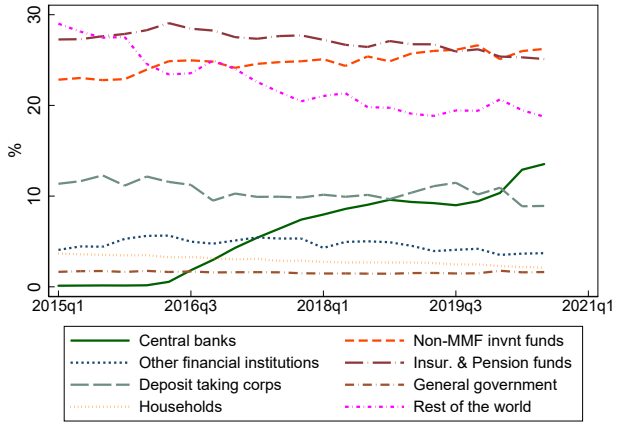


Figure IA.4 – Dynamics of investor composition: All non-financial issuers

The figure presents the evolution of the investor composition of the debt securities issued by EA non-financial corporations. 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. Holdings by non-financial corporations are excluded, and the shares by construction sum up to one. The source of this data is the SDW Macroeconomic and sectoral statistics, Financial accoutns, Who-to-whom detail for debt securities issued by non-financial corporations. Data are quarterly and the time period covered is from 2015 Q1 until 2020 Q4.

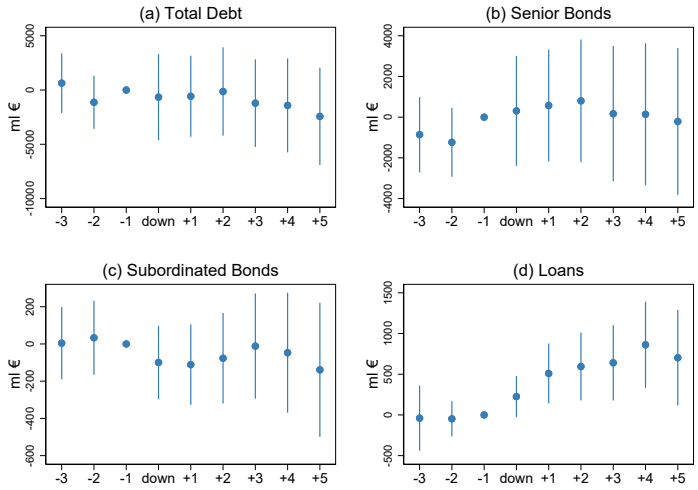
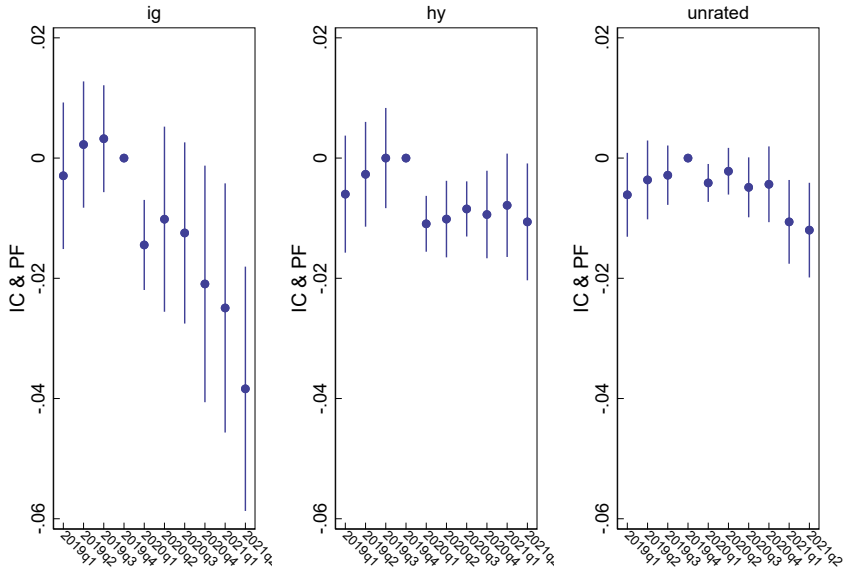
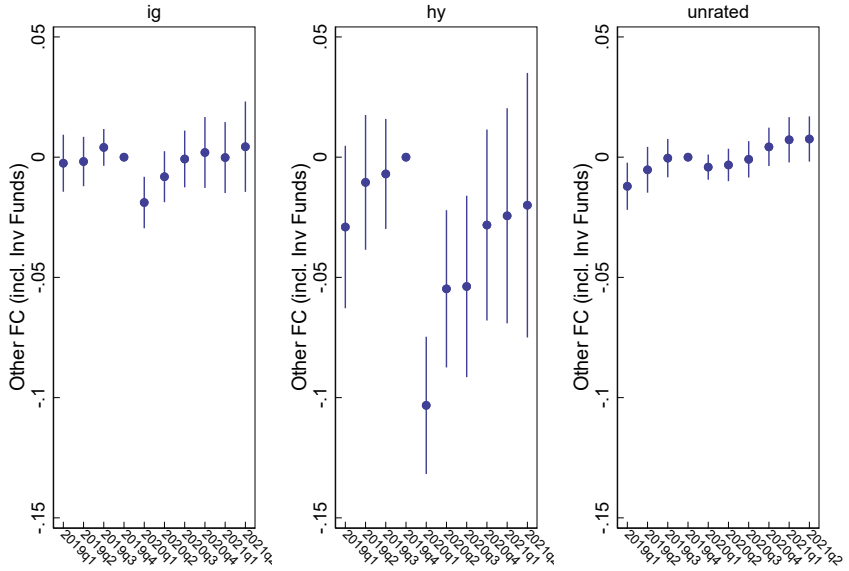


Figure IA.5 – Downgrades: Debt Outstanding

The figure plots the coefficients and the 95% confidence intervals analysing the downgrade event on debt's size for public firms. The points are the coefficients resulting from regressing (a) total debt, (b) senior bonds, (c) subordinated bonds, and (d) loans -in million € - on identifiers of the years elapsed since the downgrade. The base year is the year preceding the downgrade. All the regressions include controls for firm fixed effects (FE), year FE, four-digit standard industrial classification industry-by-year FE as well as controls for two-years lagged values of: assets, bond over debt, common equity, EBITDA over assets, leverage, and combined ratings. Standard errors are clustered at the firm level.



(a) Insurers and Pensions



(b) Nonbanks

Figure IA.6 – Change in Investor Holdings: Dynamic Coefficient Plots, by Issuer Rating

This figure displays the results from estimating the following specification: $y_{it} = \Sigma_\tau \beta_\tau \times \mathbf{1}[t = \tau] + \alpha_i + \epsilon_{it}$ for each firm i and quarter t. The dependent variable y_{it} is constructed as the share of each firm's total bonds outstanding held by each investor type. The frequency of the holdings data is quarterly. We estimate a coefficient for each date τ between 2019Q1 and 2021Q2. Three rating categories are constructed based on the firm's rating status in 2019. Panel (a) presents the results for insurance companies and pension funds and Panel (b) for nonbanks financial investors. The figures show the coefficients and the 95% confidence intervals obtained through the fixed-effects regressions using as a base level the Q4 2019 value. The frequency of the data is quarterly and the time period presented is from Q1 2019 until Q2 2021. Firm fixed effects are included and standard errors are clustered at the firm level. The source of this data is the Securities Holdings Statistics by Sector (SHSS) for debt securities issued by non-financial corporations. This sample include only private issuers.

Table IA.4 – Differences across Historical Public Issuers, Public New Issuers and Private Issuers

	Size $_{t-1}$	Leverage $_{t-1}$	Profitability $_{t-1}$	Combined Rating $_{t-1}$
	(1)	(2)	(3)	(4)
Public new issuers	-1.904***	4.318***	-2.746***	-0.760***
	(0.147)	(0.935)	(0.490)	(0.141)
Private issuers	-2.814***	9.201***	-1.073***	
	(0.143)	(0.987)	(0.390)	
Observations	12666	12247	11934	5770
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes

Fixed effect regressions covering the period 2011-2018. Each column is a separate regression. The table reports coefficients of regression firms' characteristics on a categorical variable which takes value 0 if the firm is public and has issued bonds before 2004 (public historical issuer), value 1 if the firm is public and has issued for the first time in or after 2004 (public new issuer), and value 2 if the firm is private and has issued in year t or after (private issuers). Public historical issuer is the omitted category. Column (1) reports lagged size, (2) lagged leverage, (3) lagged profitability, and (4) non-lagged combined rating (only for public new issuers). Size is computed as logarithm of lagged assets, leverage is the lagged ratio of total debt to total assets, profitability is the lagged ratio of EBITDA to total assets, and combined rating is computed through ML (lasso) techniques. Year and sector fixed effects are included. 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 IA.5 – 2020 Downgrades across Countries

Country	Downgrades (%)
AT	1
BE	1
CY	0
DE	25
ES	15
FI	3
FR	26
GB	0
GR	2
IE	4
IT	13
LU	1
LV	1
NL	5
PT	1
SK	1

The table reports the percentage of firms downgraded in 2020, across countries. The sample is constrained to Euro Area non-financial firms.

Table IA.6 – 2020 Downgrades across Sectors

Sector	Downgrades (%)
Construction	3.42
Finance	5.51
Manufacturing	30.69
Mining	2.09
Other	.44
Real estate	2.75
Retail Trade	1.71
Services	16.80
Transportation	27.11
Wholesale Trade	1.65

The table reports the percentage of firms downgraded in 2020, across sectors. The sample is constrained Euro Area non-financial firms.

Table IA.7 – Effect of a Downgrade on the firm's Debt

	Total Debt (1)	All Bonds (2)	Senior Bonds (3)	Sub Bonds (4)	Loans (5)	Assets (6)
Downgrade	0.164	0.0306	0.241	0.263	0.360***	0.0737
	(0.110)	(0.162)	(0.217)	(0.366)	(0.136)	(0.0602)
Observations	1387	1344	1387	1387	1366	1387
Adjusted R^2	0.921	0.860	0.726	0.381	0.732	0.972

Fixed effect regressions. Each column is a separate regression. The table reports coefficients from firm-panel regressions of debt characteristics on an indicator for whether a firm has experienced at least one downgrade in the current year. The sample is restricted to EA rated public firms in the period 2002-2018. The dependent variables are computed as logarithm of 1 plus: (1) total debt, (2) all bond outstanding, (3) senior bonds, (4) subordinated bonds, (5) loans, and (6) assets. All the regressions include controls for firm fixed effects (FE), country-by-year FE, four-digit standard industrial classification industry-by-year FE, and for a series of 1-year lagged firm's characteristics: assets, book equity, EBITDA/assets, bonds/debt, debt/asset, combined ratings. Standard errors are adjusted for clustering at firm level, and are reported in parentheses. ** denotes significance at 5% level.

Firms' rating prediction

A firm's rating is a key variable in our analysis. First, 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 use the average rating of the firm's instruments. In addition to that, for the firms that are unrated we use a machine learning technique to approximate their rating. Becker and Josephson [2016] used a simple OLS model to approximated missing corporate ratings. In line with their model, we adopt a machine learning approach by using the rlasso function. The set of variables included in the model specification are: categorical variables for years, countries, and sectors as well as cash over assets, interest payments over total debt, return on assets, log of market cap, book-to-market ratio, stock price volatility, logarithm of book assets, share trading volume, debt over book assets, interest coverage, percentage of net PPE over assets, external payouts, operating profit, and their interactions. Missing observations of external payouts are replaced with zero. The following selected regressors are obtained: market cap x market cap, market cap x external payouts, market cap x operating profit, interest payment over debt x debt over assets, roa x tangibility, roa x operating profit. The R-squared is 0.64 (for 2,402 observations). Standard errors are clustered at the firm level. Predicted ratings are defined on a scale from 1 to 20. When predicted ratings were lower than 1 or greater than 20, they were replaced with 1 or 20 respectively. A comparison between the predicted rating and the combined rating is shown in the figure IA.7. The plot provides evidence that the model predicts the average rating quite accurately. Note that 20 companies had an actual rating even before their first bond issuance; we replace these actual ratings observations by missing values.

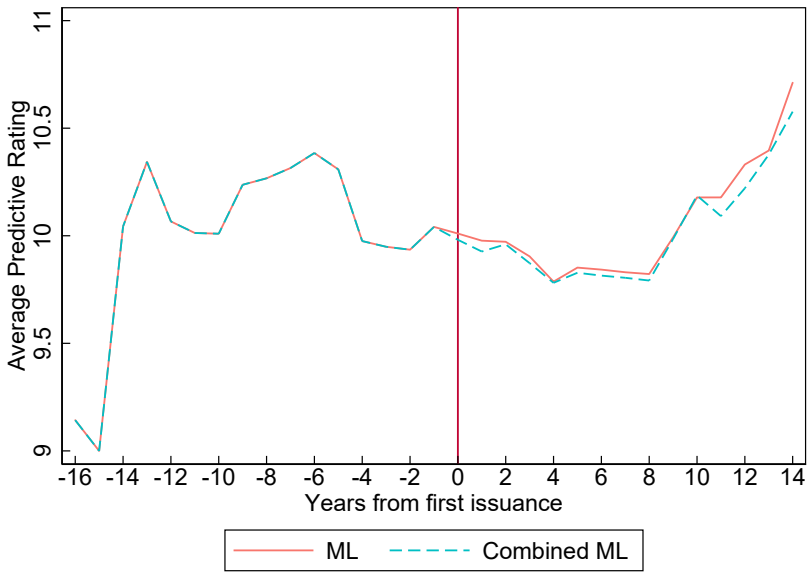


Figure IA.7 – Combined versus Predicted Ratings: Event Study

The figure plots predicted rating as well as combined rating obtained by using actual ratings when available and predictive ratings otherwise. The two variables are considered in a window of 16 years priors and 14 years after the first issuance.

Table IA.8 – Rated firms and bonds

Year	Rated Issuers (%)			Rated Bonds (%)		
	Public Historical	Public New	Private	Public Historical	Public New	Private
	(1)	(2)	(3)	(4)	(5)	(6)
2002	23	NA	NA	87	NA	NA
2003	24	NA	NA	86	NA	NA
2004	26	10	NA	86	84	NA
2005	28	11	NA	87	83	NA
2006	29	9	NA	86	80	NA
2007	29	9	NA	86	76	NA
2008	31	8	NA	90	75	NA
2009	32	8	NA	91	77	NA
2010	33	10	18	92	79	77
2011	36	10	19	90	75	82
2012	37	10	18	90	77	80
2013	40	11	15	91	78	78
2014	41	12	15	89	80	81
2015	41	12	14	88	76	77
2016	41	11	14	89	77	81
2017	40	13	12	84	76	77
2018	44	15	12	88	74	83
Average	34	11	15	88	77	80

The plot reports the percentage of: (1) rated public historical issuers over all historical issuers, (2) rated public new issuers over all new issuers, (3) rated private issuers over all private issuers, (4) public historical issuers' rated bonds over public historical issuers' bond outstanding, (5) public new issuers' rated bonds over public new issuers' bond outstanding, (6) private issuers' rated bonds over private issuers' bond outstanding.

Table IA.9 – Characteristics of Rated issuers

	Public			Private	
	Asset $_{t-1}$	Profitability $_{t-1}$	Comb Rating $_{t}$	Asset $_{t-1}$	Profitability $_{t-1}$
	(1)	(2)	(3)	(4)	(5)
Rated firms (dummy=1)	1.644***	7.819***	2.129***	1.874***	0.359
	(0.587)	(2.827)	(0.366)	(0.240)	(0.640)
Observations	391	390	963	831	753
Adjusted R^2	0.313	0.336	0.225	0.271	0.047

Fixed effect regressions. Each column is a separate regression. The table reports coefficients of firm-panel regressions of issuer's characteristics on whether the firm is rated. Columns 1-3 estimate lagged size, lagged leverage, and non-lagged combined rating for public issuers. Columns 4-5 estimate lagged size, and lagged profitability for private issuers. Size is computed as logarithm of lagged assets, profitability is the lagged ratio of EBITDA to assets, and computed combined rating is obtained through ML (lasso) techniques. All the regressions control for four-digit standard industrial classification industry-year fixed effects. Standard errors, in parentheses, are corrected for clustering of the observations at the firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

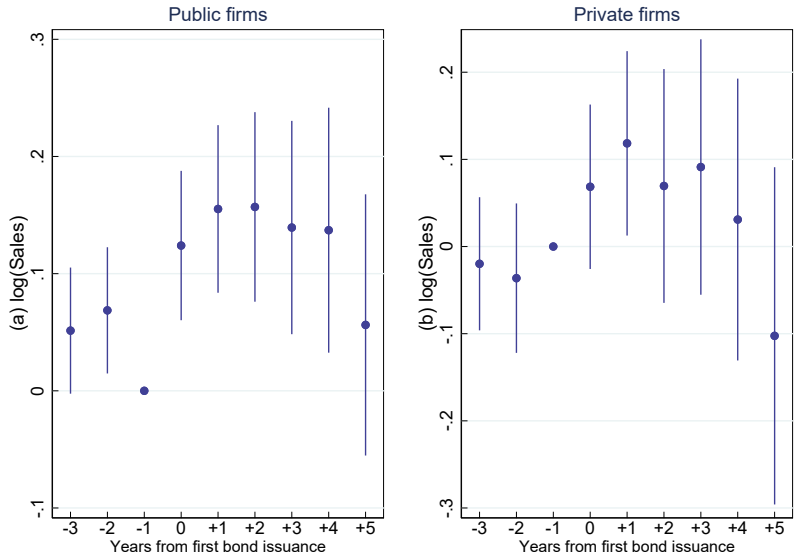


Figure IA.8 – Dynamics of Sales

The figures show the coefficients and the 95% confidence intervals obtained through the fixed-effects regressions. Panel (a) considers public new issuers, while panel (b) private new issuers. The points are the coefficients resulting from regressing the logarithm of sales, on time dummies for a window of [-3, +5] years from the first issuance. Year and firm fixed effects are included. Standard errors are clustered at the firm level. Each line crossing a point represents the confidence interval for that coefficient.

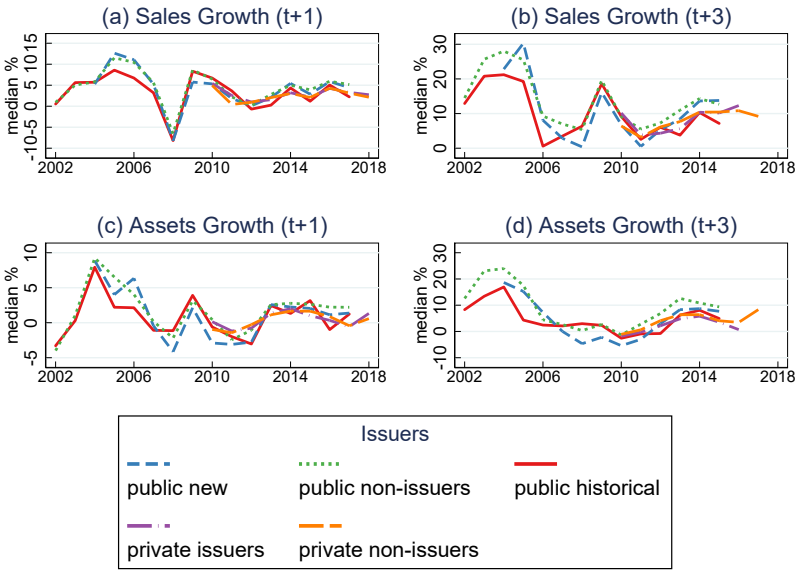


Figure IA.9 – Growth of Sales

The plot represents the time series of growth of sales, and assets across type of issuers. Growth is computed with respect to (a) sales at time t+1, (b) sales at time t+3, (c) assets at time t+1, and (d) assets at time t+3.

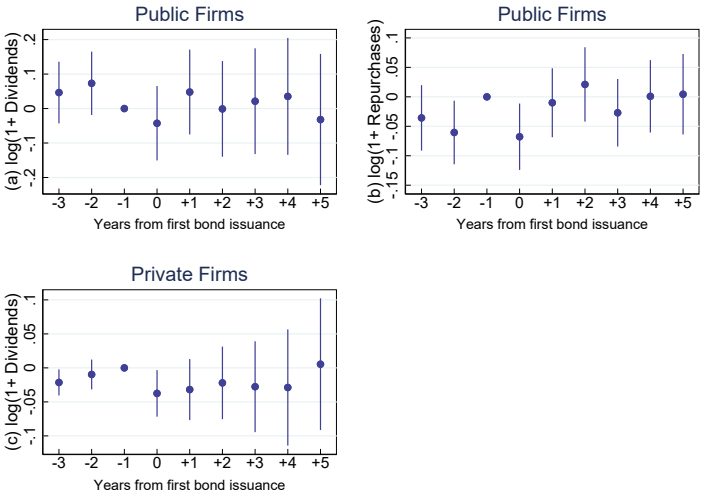


Figure IA.10 – Dividends and Repurchases' Dynamics

The figures show the coefficients and the 95% confidence intervals obtained through the fixed-effects regressions. Panel (a) and (b) employ public firms, while panel (c) focuses on private firms. The points are the coefficients resulting from regressing (a, c) logarithm of 1 plus dividends, (b) net repurchases - computed as difference of purchase and sell of common and preferred stocks, on time dummies for a window of [-3, +5] years from the first issuance. Year and firm fixed effects are included. Standard errors are clustered at the firm level. Each line crossing a point represents the confidence interval for that coefficient.

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.[27] 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].[28]

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

[27] 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].

[28] Other recent qualitative models of debt structure with slightly different focus include Becker and Josephson [2016], Halling et al. [2020], 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.

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].[29] Importantly, the value of bank flexibility is not restricted to liquidation and

[29] "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

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].[30]

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 different parts of the financial system rather than increasing it in absolute value.[31]

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].

[30]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].

[31]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

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. 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

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.

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].[32]

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, 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,

[32] 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.

2006], increasing investment. However, it also increases downside risk: these are like two faces of the same coin. Figure IA.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.[33] 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 IA.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.[34]

[33] 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.

[34] 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?

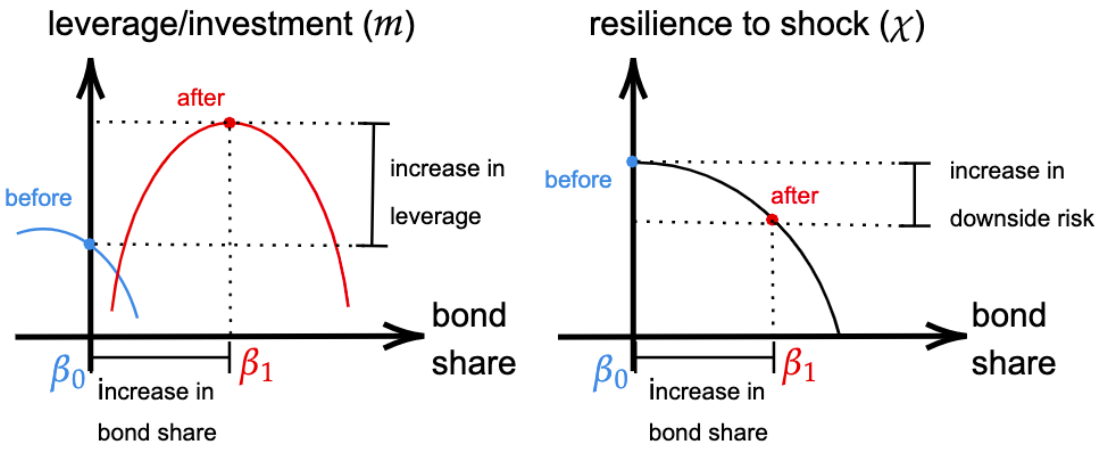


Figure IA.11 – Illustrative Framework: Effect of Bond Issuance

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.