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How Does Access to the Unsecured Debt Market Affect Investment?☆

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ABSTRACT

I analyze the relevance of debt composition (secured versus unsecured) for the association between collateral and investment. I study a negative shock to the cost and availability of unsecured debt. A decrease in the share of unsecured debt leads to a reduction in investment. The substitution toward secured debt results in asset encumbrance, higher interest rates, and the presence of covenants. The minimization of financing costs is one mechanism through which the priority composition of debt impacts investment. The results complement evidence on the collateral channel with a novel focus on debt structure.

1. Introduction

Does debt structure matter for investment? Previous research reports substantial heterogeneity in debt structure (Rauh and Sufi, 2010; Colla et al., 2013; Colla et al., 2020).[1] However, the real implications of these heterogeneous debt composition choices remain largely unexplored. This paper fills this gap in the literature.

I analyze the relevance of debt composition (secured versus unsecured) for the association between collateral and investment.[2] I define debt structure as the share of unsecured debt. Distinguishing between secured and unsecured debt is important because it introduces a priority hierarchy to cashflow claims and control rights upon default. Priority can be obtained through granting or excluding access to a set of assets and by incorporating other contractual devices that may achieve the same ends as the pledge of collateral. A recent body of work focuses on heterogeneous creditors, collateral's right of exclusion, and the costs of collateralized

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[1] See Diamond (1991); Diamond (1993); Park (2000); Bolton and Freixas (2000); DeMarzo and Fishman (2007); Rauh and Sufi (2010); Vig (2013); or Badoer et al. (2020) for references on the relevance of debt structure.

[2] Earlier studies, instead, tend to focus on homogeneous creditors and the level of debt or debt capacity. Seminal studies on the role of collateral include Bester (1985), Chan and Thakor (1987), Boot et al. (1991), and Boot and Thakor (1994). See Stiglitz and Weiss (1981) and Holmstrom and Tirole (1997) for details on how financial frictions can limit access to external financing and impact investment. Gan (2007) and Chaney et al. (2012) show that higher collateral availability increases firm investment and reduces costs of financing (Cerqueiro et al., 2016). See Kiyotaki and Moore (1997) and Bernanke et al. (1999) for aggregate consequences.

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borrowing to show that under some conditions secured debt can erode investment (Donaldson et al., 2020a).[3]

This paper provides the first empirical evidence on how the priority composition of debt affects investment. Debt structure matters for investment, but disentangling composition effects from level effects in leverage is an empirical challenge. In this study, I use a negative shock to unsecured debt to show that a decrease in the share of unsecured debt leads to a reduction in investment. Substituting toward secured debt reduces the operational flexibility of the firm and induces higher interest rates as well as a greater likelihood of covenants. My novel finding is that priority spreading may lead to underinvestment even when firms are solvent. I shed light on the costs of collateralization and provide the microfoundations for incorporating the hierarchy of creditor priority on real outcomes to macro-finance models. Finally, I contribute to the policy debate on the absolute priority rule of secured debt.

My main empirical analysis focuses on a shock to the cost and availability of unsecured debt that occurred during the downturn in the asset-backed commercial paper (ABCP) market in July 2007. The ABCP market collapse had the strongest impact on financial institutions with large portfolios of ABCP who were affected by subprime mortgage losses. Some of the exposed financial institutions supply unsecured commercial paper to nonfinancial firms. Therefore, firms that issue commercial paper are indirectly affected by the unwillingness of exposed financial institutions to roll over commercial paper.

To avoid confounding effects from changes in credit demand, I only focus on the pure liquidity shock period throughout the analysis (before September 2008). That is, exogenous variation in unsecured debt is presumably independent of changes in credit quality or the investment opportunity set. I sort firms according to whether they use commercial paper before the shock. I conjecture that firms with commercial paper financing ex-ante (treatment group) face refinancing problems when the ABCP market collapses. The crucial characteristic of commercial paper is that it has no secured counterpart; thus, it is difficult to replace when it becomes temporarily unavailable.

I use a difference-in-differences (DID) analysis to compare treated firms to a group of similar firms that do not rely on commercial paper (control group). I specifically look at how the share of unsecured debt changes after the ABCP shock. I then focus on whether and how changes in the composition of debt affect the level of investment by combining DID with an instrumental variable (IV) estimation. I exploit treatment-induced exogenous variation in debt structure from the ABCP shock (DID) as an instrument to analyze how the debt structure affects investment (IV).

I also explore substitution patterns among debt types to rule out the lack of unused debt capacity (or level effects) as the driver of changes in investment after the ABCP shock. Moreover, I analyze the mechanisms behind my results by examining whether the average interest rate, average maturity, or covenants on debt contracts change after the ABCP shock. Finally, I explore alternative explanations for changes in investment (unrelated to debt structure).

The main findings are as follows. I first document that firms in the treatment group experience an average reduction of 8.2% in the share of unsecured debt compared to the control group. When looking at how different types of debt standardized by total assets respond to the ABCP shock, I find that the reduction in unsecured debt is mainly driven by an average 2.5% reduction in commercial paper over total assets. This result is consistent with the origin of the shock, a temporary shortage in the supply of unsecured commercial paper. I also find that the shortage forces firms in the treatment group to substitute with other funding sources. More precisely, I observe a 1.9% increase in the treatment group's reliance on unsecured credit lines and an increase in senior secured term loans of 1.3% over that of the control group.

I then examine how the composition of debt affects investment. A one-standard-deviation decrease in the share of unsecured debt causes investment to decline by 0.04 standard deviation units, representing around 4% of the sample average investment. The economic significance of debt structure is equivalent to that of size, book leverage, and cashflow volatility. For completeness, I focus on how contract terms respond when firms substitute toward secured debt. I find that firms in the treatment group experience a statistically and economically significant increase in interest rates, which accounts for 26% of the sample average interest rate on debt and an increase in the maturity of financial debt. I also observe that firms in the treatment group face a higher likelihood of investment and financial covenants when taking on new secured bank debt.

When interpreting the results, note that the credit supply shock to commercial paper forces firms to substitute toward secured credit. How much investment declines depends on the extent to which secured debt contract terms are adjusted to reflect the presence of different frictions. Overall, the shock forces firms to encumber assets and leads to an increase in financing costs and the presence of new covenants, which I interpret as a reduction in firms' operational flexibility.

My results have an important implication. They show that debt level and (priority) composition are essential for investment. Firms trade off the benefits of pledging collateral with its associated costs. The pledge of collateral allows firms with profitable investment opportunities to finance investment projects through secured debt (level effect). However, at the same time, priority spreading makes creditor conflicts more likely. Collateralization reduces the operational flexibility of the firm by ring-fencing the assets and providing creditors with liens. Thus, collateralized borrowing also has associated costs, which eventually may dampen investment (composition effect).

This paper is related to the finance literature on the relevance of debt structure. Colla et al. (2013) and Colla et al. (2020) provide large sample evidence showing that 75–85% of their firms borrow predominantly with one type of debt, and the degree of debt specialization varies widely across different subsamples. While large rated firms tend to diversify across multiple debt types, small unrated firms specialize in fewer types. Moreover, Rauh and Sufi (2010) demonstrate that traditional capital structure studies that ignore differences in the priority structure of corporate liabilities miss substantial capital structure variation. My results take these conclusions one step further by showing that studies which do not consider the role of debt structure may also miss changes in investment. Additionally, Giambona et al. (2021) look at the relation between firms' investment opportunities and the priority structure of corporate liabilities. They conclude that a higher share of unsecured debt contributes to more flexibility in the capital structure because it leaves assets unemcumbered, which can then support more future leverage.[4] My results suggest that this flexibility may contribute to increased firm investment. Overall, I fill the gap in the literature by, to the best of my knowledge, being the first to show that debt structure, defined as secured versus unsecured debt, has real effects on investment.

[3] Non-exclusivity friction refers to the potential for dilution from other creditors. Collateralization provides protection from dilution. As a result, unsecured creditors are generally diluted with the pledge of collateral, which reduces their recovery rates upon default (Badoer et al., 2020).

[4] An important difference between my paper and Giambona et al. (2021) is that they study how firms adjust their capital structure when facing a positive investment opportunity shock. They show that the shock reduces the constraints of firms' capital structures by decreasing leverage, shortening debt maturity, increasing unsecured debt, and reducing convertible debt. By contrast, my paper links the priority structure of corporate liabilities on actual investment in property, plant, and equipment undertaken by firms.

Additionally, a recent body of work builds on the law literature and attemps to reveal a role for collateral largely unexplored in the literature: collateral serves to mitigate enforcement frictions between creditors. My main result is consistent with predictions in Donaldson et al. (2020a) and Badoer et al. (2020). My results help illustrate both the *collateral rat race* and the *collateral overhang*. In anticipation of future dilution, substitution toward secured debt and asset encumbrance reduces the operational flexibility of the firm and may affect further borrowing and investment. One crucial difference is that while the implications of Donaldson et al. (2020a) are most applicable to firms near distress, I find that underinvestment arises even if firms are solvent.

This study is also related to a long line of macro-finance research on the collateral channel and the transmission, propagation, and amplification of exogenous shocks to the real economy. I add to this literature by showing that the hierarchy of creditor priority seems important for firm investment, which could have implications for macroeconomic fluctuations. Existing models with financial frictions inadequately incorporate this real-world debt and capital structure feature. Thus, the aggregate implications of my results may be relevant to understanding cyclical variations in the presence of financial constraints.

The rest of the paper is structured as follows. In Section 2, I present a conceptual framework that guides the empirical strategy. I describe the relevant variables, the main prior research supporting the relation between debt priority structure and investment, and possible identification threats. Section 3 describes the data and the variables constructed with textual analysis. I also provide the first suggestive evidence on the positive association between the share of unsecured debt and a firm's investment using ordinary least squares (OLS) estimation. Section 4 discusses the identification strategy and the treatment and control group choice. I also present the main empirical analysis, including the test for the mechanism. In Section 5, I carry out a robustness check. Section 6 concludes.

2. Conceptual Framework and Empirical Strategy

Collateral helps mitigate market imperfections caused by asymmetric information (Stiglitz and Weiss, 1981; Holmstrom and Tirole, 1997) or limited contract enforceability (Kiyotaki and Moore, 1997; Hennessy and Whited, 2005; Livdan et al., 2009). A long line of studies shows that alleviating these frictions enhances firms' debt capacity, enabling them to invest more (Gan, 2007; Chaney et al., 2012). This strand of the literature, however, generally relies on the implicit assumption that all debt is homogeneous and secured. Secured debt is, by definition, backed by the firm's assets. But in practice, firms also have access to unsecured debt, which is not explicitly backed by assets and depends crucially on credit quality (Rauh and Sufi, 2010; Colla et al., 2013; Colla et al., 2020; Badoer et al., 2020) and the investment opportunity set (Giambona et al., 2021).

Using data on U.S. public manufacturing firms from Compustat, I define debt structure ($ShareUnsecured_{it}$) as unsecured debt standardized by total debt. Total debt secured is defined using item #241, "Mortgages and Other Secured Debt," which allows me to define unsecured debt as the difference between total debt minus mortgages and other secured debt:

$$ShareUnsecured_{it} = \frac{\text{Total Debt}_{it} - \text{Mortgages and Other Secured Debt}_{it}}{\text{Total Debt}_{it}}.$$ [5]

[5] I only focus on the role of financial debt, and thus, this definition excludes short-term debt with suppliers.

Table 1
Summary Statistics from 1993 to 2019. This table reports summary statistics for all manufacturing firms (SIC codes 2000–3999) in Compustat from 1993 to 2019. All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). I report the mean, standard deviation, 25^{th} percentile, median and 75^{th} percentile for each variable. Table A1 in the Appendix shows how Compustat variables have been constructed.

	Mean	Std Dev	p25	Median	p75
Investment	0.052	0.058	0.017	0.033	0.062
Share Unsecured	0.762	0.355	0.526	1.000	1.000
Book Leverage	0.248	0.326	0.007	0.157	0.332
Debt-to-Equity	0.437	0.980	0.003	0.170	0.465
Size	5.626	2.290	3.938	5.420	7.139
Profitability	-0.013	0.421	-0.019	0.108	0.174
Tangibility	0.223	0.193	0.077	0.169	0.312
M/B	3.451	4.193	0.972	1.584	3.302
CF Volatility	0.247	0.412	0.008	0.021	0.143
Cash	0.291	0.305	0.043	0.166	0.462
R&D Expenses	0.169	1.796	0.005	0.038	0.135
Dividend Payer	0.347	0.476	0.000	0.000	1.000
Unrated	0.805	0.396	1.000	1.000	1.000
# Observations	48,542				

This definition of debt composition maps with the priority structure of corporate liabilities.[6] The critical distinction between secured and unsecured debt is that the former introduces a priority hierarchy to cashflow claims and control rights. Priority can be obtained through granting (Tirole, 2006) or excluding (Kronman and Jackson, 1979) access to a set of assets and by incorporating other contractual devices that may achieve the same ends as the pledge of collateral. For instance, negative-pledge covenants avoid diluting unsecured creditors by limiting new secured debt issues.[7]

Once we allow debt heterogeneity to play a role for the association between collateral and investment, the access and usage of this pool of instruments may significantly affect firms' policies in the presence of financial constraints. I build on the investment literature to define investment ($Investment_{it}$) as the share of capital expenditures to total assets:

$$Investment_{it} = \frac{\text{Capital Expenditures}_{it}}{\text{Total Assets}_{it}}.$$

I plot the relation between investment and the level and composition of debt for U.S. public manufacturing firms from 1993 to 2019 in Fig. 1.[8] While the level of debt is negatively related to investment, the opposite is true for the relation between the share of unsecured debt and investment. In other words, more secured financing implies a lower level of investment. What is the mechanism behind the positive relation between the share of unsecured debt and investment?

Under the perfect capital markets assumption, a firm's debt and capital structure decisions are irrelevant (Modigliani and Miller, 1958). In the presence of frictions, secured debt has traditionally been associated with alleviating the underinvestment problem (Stulz and Johnson, 1985). Two main papers provide the grounds for a positive relation between the share of unsecured debt and investment. On the empirical side, Giambona et al. (2021) show that when hit by an unexpected investment opportunity shock, firms increase the share of unsecured

[6] Barclay and Smith (1995), Rauh and Sufi (2010), Vig (2013), and Giambona et al. (2021), among others, have used this definition.

[7] See Badoer et al. (2020) for a detailed explanation of the mechanisms to establish priority in the context of this debt composition definition.

[8] The vast majority of the investment literature defines investment as item #128 in Compustat when using data on U.S. public firms. See, e.g., Kaplan and Zingales (1997) and Chaney et al. (2012), among others.

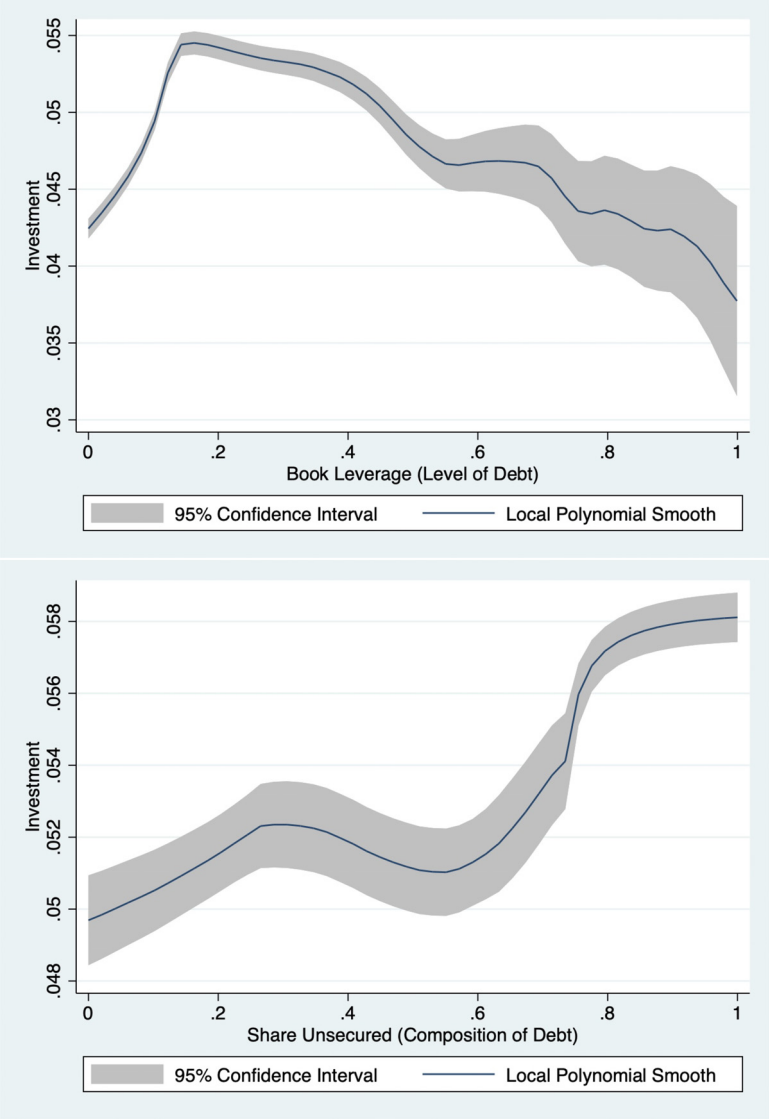

Fig. 1. Relation between leverage and investment for U.S. public manufacturing firms (SIC codes 2000–3999), 1993–2019 (Compustat data). The upper panel shows a kernel-weighted local polynomial regression of investment on book leverage, displaying the smoothed values with confidence bands (level of debt). The bottom panel shows a regression of investment on the share of unsecured debt (composition of debt). Investment is the share of capital expenditures to total assets.

debt and new debt covenants become less restrictive. Their results support the idea that firms make their capital structures less constraining and try to bolster financial flexibility.

At the theoretical level, Donaldson et al. (2020a) develop a model with multiple creditors by focusing on collateral's right of exclusion. In their model, by encumbering assets, secured debt can limit a borrower's flexibility and thus worsen, rather than alleviate, the underinvestment problem. This collateral overhang problem also suggests a positive relation between the share of unsecured debt and investment.[9] In other words, more secured debt may imply underinvestment as it limits the firm's operational flexibility.[10]

Fig. 2 summarizes the identification strategy to guide my empirical analysis. Analyzing the relation between debt composition ($ShareUnsecured_{it}$) and investment ($Investment_{it}$) with a simple OLS setup is an empirical challenge as the link is subject to clear endogeneity concerns. To alleviate these concerns, I use a negative shock to the cost and availability of unsecured debt for identification purposes.

I analyze three extreme examples to shed light on how changes in debt composition caused by the shock affect investment. Case 1 evaluates the effects when firms decide not to substitute missing unsecured commercial paper with new debt issuance (level effect). Cases 2 and 3 look at scenarios where firms choose to *fully* replace missing unsecured commercial paper with either *only* unsecured or *only* secured debt, respectively (composition effects).

[9] Donaldson et al. (2020b) extend the setup in Donaldson et al. (2020a) by incorporating a role for covenants and get similar results. They conclude that the optimal debt structure is a mix of secured debt, unsecured senior debt, and unsecured debt without negative pledge covenants.

[10] Although Badoer et al. (2020) do not focus on the effect of the priority structure of corporate liabilities on investment, their paper shows that ring-fencing the assets by providing creditors with liens is costly, potentially impacting investment. See also the discussion in Hennessy et al. (2007) regarding the costs of collateralized borrowing as well as the empirical exercise in Vig (2013), who concludes that a reform strengthening creditor rights leads to a reduction in secured debt and total debt. Firms alter their debt structure because the reform introduces a liquidation bias.

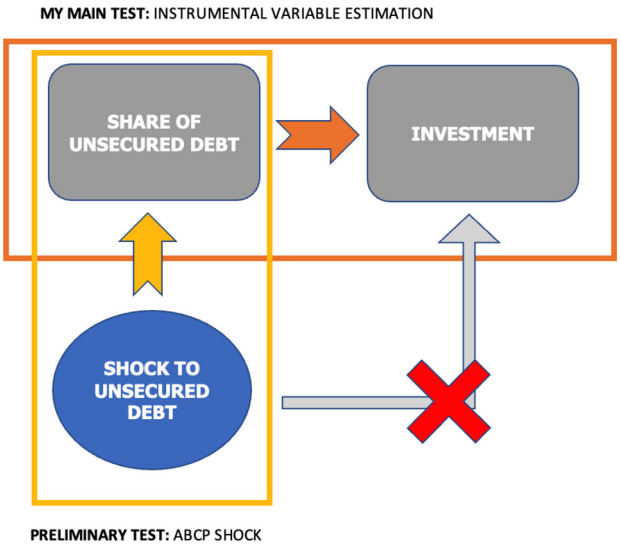

Fig. 2. Empirical Strategy and Threats to Identification. This figure summarizes the relation between the priority structure of corporate liabilities and firms' investment (orange arrow). It also provides the intuition behind my identification strategy, using a shock to unsecured debt to evaluate how treatment-induced variation in debt structure (yellow arrow) affects investments. Finally, the grey arrow highlights the identification threats coming from the shock and directly affecting investment (not through debt structure) or through other channels or variables that could generate the investment reaction.

With no substitution of missing unsecured debt (*Case 1, Level Effect*), total leverage goes down, and firms may be unable to finance existing investment opportunities even if the net present value of the investment projects is positive. The share of unsecured debt and investment decrease, but there is no dilution, as the firm now has lower leverage for the same amount of assets to liquidate upon default. Similarly, when firms decide to *fully* substitute missing unsecured commercial paper with new unsecured debt issuance (*Case 2, Composition Effect-Unsecured*), total leverage, debt structure, and investment stay the same. However, dilution of existing junior unsecured creditors (if any) may occur.[11] Therefore, for Cases 1 and 2, variation in debt composition does not cause changes in investment.

The interesting case arises when firms decide to *fully* substitute missing unsecured commercial paper with new secured debt issuance (*Case 3, Composition Effect-Secured*). As a result, total leverage stays the same but the share of unsecured debt decreases. I note three important implications. First, existing junior secured creditors and unsecured creditors (if any) face dilution when asset encumbrance occurs.[12] This situation is consistent with the *collateral rat race* in Donaldson et al. (2020a). Moreover, asset encumbrance also has associated costs. Administrative and monitoring costs are relevant, but asset encumbrance reduces the firm's operational and financial flexibility, which may limit future borrowing and investment. This scenario is consistent with *collateral overhang* in Donaldson et al. (2020a). In this case, variation in debt composition may drive the change in investment.

The use of exogenous variation in debt structure helps me clarify three effects. First, I evaluate the effects in terms of investment (orange arrow in Fig. 2). Second, to rule out the possibility that level effects are driving the observed reaction in investment (e.g., insufficient financing for existing investment opportunities), I examine debt substitution patterns when firms try to replace missing unsecured debt with new debt issuance. Third, I analyze the effect of the shock on contract terms. For those firms that substitute toward secured debt in response to the shock, it must be the case that asset encumbrance is consistent with the observed reaction of interest rates, maturity, and covenants for each of the debt types involved in the substitution patterns of firms.

Finally, I also need to rule out potential threats to my identification of the relation between debt priority structure and investment, and to account for alternative variables or channels that could drive the results in my empirical setup (grey arrow in Fig. 2). I explore these identification threats in detail in Section 5.1.

3. Sample Overview and Suggestive Evidence

I begin by describing how I construct my main Compustat sample as well as the textual analysis strategy I use to generate the additional data needed for my analysis. Then, I present descriptive evidence and OLS results on the relation between debt priority structure and investment.

3.1. Data and Textual Analysis

To construct the sample, I start with U.S. firms traded on AMEX, NASDAQ, and NYSE that are covered by Standard&Poor's (S&P) database Compustat. My sample period is 1993 to 2019. I remove all firm-year observations that are not from the manufacturing sector (SIC codes 2000–3999). I further remove firm-year observations with missing, negative, or zero total assets and property, plant, and equipment. Finally, I winsorize all key firm characteristics at the first and 99^{th} percentiles. The manufacturing sample contains 48,542 firm-year observations from 4,159 distinct firms.

In selecting firm characteristics, I follow some of the most relevant papers in the debt structure (Rauh and Sufi, 2010; Colla et al., 2013; Colla et al., 2020), capital structure (Rajan and Zingales, 1995; Barclay and Smith, 1995; Titman and Wessels, 1998; Lemmon et al., 2008), and investment (Kaplan and Zingales, 1997; Gan, 2007; Chaney et al., 2012) literature. All firm characteristics employed in the analysis are defined in Table A1 in the Appendix.

To generate data needed for the analysis but not available in Compustat or Capital IQ, I use a text-search algorithm. All publicly listed firms in the U.S. are required by law to file material information electronically with the Securities and Exchange Commission (SEC). The SEC handles the electronic filing through the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR). The primary purpose of EDGAR is to allow investors timely access to price-relevant corporate information. My algorithm searches for specific keywords in all available 10-K, 10-KT, 10-K405, 10KSB, and 10KSB40 forms filed in the SEC's EDGAR system. More precisely, I use the algorithm to generate the following variables:[13]

- *Affirmative and Negative Covenants:* I generate dummy variables identifying firm-year observations with a covenant limiting dividend payments, capital expenditures, or including financial covenants in secured and unsecured debt contracts.
- *Secured versus Unsecured Credit Lines:* Capital IQ only provides data on total revolving credit. To analyze debt substitution patterns, I generate two dummy variables that identify whether a credit line is secured or unsecured.

3.2. Descriptive Evidence

Table 1 presents descriptive statistics for all U.S. public manufacturing firms from 1993 to 2019. The average manufacturing firm in Compustat has 24.8% book leverage, and 76.2% of its total debt is

[11] For this case, I assume the new unsecured debt issued is senior.
[12] For this case, I assume the new secured debt issued is senior.
[13] Table A2 in the Appendix provides detailed information on the construction of these text-search variables.

Table 2
Summary Statistics for Different Debt Composition Thresholds. This table reports the summary statistics (mean and standard deviation) of firm characteristics for the following debt composition thresholds of secured and unsecured debt for all manufacturing firms (SIC codes 2000–3999) in Compustat from 1993 to 2019: less than 25% in unsecured debt, 25% to 50% in unsecured debt, 50% to 75% in unsecured debt, and 75% to less than 100% in unsecured debt as well as the 0% and 100% full specialization cases. All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). Table A1 in the Appendix describes the variables used in the analysis.

	0%		Up to 25%		25%–50%		50%–75%		75%–99%		100%	
	Unsecured		Unsecured		Unsecured		Unsecured		Unsecured		Unsecured	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Investment	0.046	0.048	0.048	0.050	0.050	0.051	0.049	0.047	0.051	0.046	0.055	0.066
Book Leverage	0.238	0.249	0.259	0.235	0.238	0.264	0.268	0.258	0.282	0.225	0.233	0.387
Debt-to-Equity	0.349	0.772	0.410	0.756	0.387	0.860	0.455	0.843	0.440	0.742	0.451	1.129
Size	4.947	1.600	5.104	1.643	4.867	1.900	5.251	1.949	6.328	2.162	5.743	2.508
Profitability	-0.027	0.344	0.012	0.319	-0.060	0.395	-0.007	0.368	0.045	0.305	-0.030	0.484
Tangibility	0.214	0.172	0.236	0.170	0.212	0.166	0.229	0.164	0.251	0.176	0.212	0.211
M/B	2.995	3.733	2.760	3.633	3.492	4.206	2.982	3.893	2.373	3.150	4.048	4.552
CF Volatility	0.219	0.384	0.204	0.379	0.273	0.422	0.230	0.401	0.178	0.366	0.279	0.430
Cash	0.260	0.275	0.208	0.247	0.291	0.297	0.212	0.257	0.164	0.212	0.364	0.329
R&D Expenses	0.133	0.373	0.104	0.423	0.160	0.303	0.126	0.293	0.087	0.319	0.216	2.501
Dividend Payer	0.181	0.385	0.197	0.398	0.159	0.365	0.205	0.404	0.449	0.497	0.410	0.492
Unrated	0.923	0.267	0.897	0.304	0.876	0.330	0.800	0.400	0.644	0.479	0.816	0.387
% Observations	4%		19%		13%		13%		29%		22%	

unsecured, while tangibility accounts for 22.3% of total assets. The average firm invests 5.2% of total assets and holds 29.1% of its total assets in cash and marketable securities, and 34.7% of the firm-year observations pay dividends.

To understand how firm characteristics vary along the debt structure distribution, Table 2 shows summary statistics for the thresholds of secured and unsecured debt in 25% unsecured debt increments, including the two full specialization cases (100% secured and 100% unsecured debt cases). The results suggest that firms show a preference for unsecured debt, which is consistent with recent evidence reported by Benmelech, Kumar, Rajan, 2020 on the decline of secured debt over time in the U.S. In more than 50% of the firm-year observations, firms hold more than 50% of their debt structure in unsecured sources of financial debt. This preference does not seem to be driven by a lack of available collateral, proxied by tangible assets of the firm (e.g., pledgeability).[14] For instance, firm-year observations fully financed through secured debt have the same average pledgeability as those firm-year observations fully financed through unsecured debt (21%). However, pledgeability peaks for those firms with the highest share of unsecured debt (25%), suggesting that firms rely on unsecured debt even if they have collateral to pledge.[15]

The descriptive evidence shows that a higher share of unsecured debt is associated with higher investment in fixed assets, greater tangibility, larger size, greater profitability, a higher debt-to-equity ratio, the existence of a credit rating and dividend payments, a lower market-to-book ratio, and lower R&D investment. But these relations are generally non-monotonic and nonlinearities are present in all variables excluding size.[16]

When comparing firms that have no unsecured debt in their debt structure to those that finance fully through unsecured debt, I conclude that firms that do not rely on unsecured debt financing can be considered financially constrained based on definitions in Almeida et al. (2004) in terms of size and the existence of a credit rating for long-term debt. Rampini and Viswanathan (2020) recently reached the same conclusion. More secured debt is associated with firms being financially constrained and does not necessarily imply higher investment. Moreover, firms fully financed through unsecured debt invest 10% more, although they do not exhibit significant differences in pledgeability.

3.3. OLS Estimation

To shed further light on the relation between debt priority structure and investment, I implement the following specification for investment ($Investment_{it}$) in an OLS estimation setup:

$$Investment_{it} = \gamma_t + \theta_i + \rho ShareUnsecured_{it} + X_{it}'\beta + \varphi_{it}, \quad (1)$$

where $ShareUnsecured_{it}$ is the share of unsecured debt. X_{it} contains all observable firm characteristics relevant for investment, including book leverage, size, profitability, tangibility, the market-to-book ratio, volatility of quarterly cashflows, and dummy variables identifying dividend-paying and unrated firms. I also control for level effects using the debt-to-equity ratio based on Rajan and Zingales (1995).[17] Finally, θ_i and γ_t capture firm and year fixed effects, respectively. Errors are clustered at the firm-level, at the source of variation as in Petersen (2009).

Table 3 presents the estimation results for Eq. (1). Column (1) reports the regression results without observable firms characteristics. In Columns (2) and (3), I add the baseline firm-level controls (e.g., book leverage, size, profitability, tangibility and the market-to-book ratio). Columns (4) and (5) report the regression results additionally including a control for the volatility of cashflows, which captures the distance to default. Finally, Columns (6) and (7) show the regression results controlling for a dividend payer

[14] Donaldson et al. (2020a) distinguish between pledgeability and collateralizability by highlighting that the property rights that can be assigned ex-ante may not coincide with the assets that can be liquidated ex-post. For example, the collateralizable part of projects would include fixed assets (e.g., real estate) but not necessarily movable assets (e.g., inventories). The pledgeable part of projects could represent the tangible assets deployed, not all of which need be collateralizable.

[15] This differs from Proposition 1 in Donaldson et al. (2020a), which concludes that high pledgeability undermines unsecured credit. My suggestive evidence shows that high pledgeability is compatible with a large share of unsecured debt.

[16] In unreported analysis, I run debt structure determinant regressions for U.S. public manufacturing firms in an OLS setup. Size, market-to-book, and the dividend-payer dummy are all positively associated with the share of unsecured debt. Book leverage, profitability, tangibility, and cashflow volatility are all negatively associated with the share of unsecured debt. All variables are statistically significant at the 1% confidence level.

[17] The exact set of controls is determined by the IV estimation empirical strategy in Section 4. To the extent that I instrument the share of unsecured debt with exogenous variation from the ABCP shock, the set of controls in the first- and second-stage of the IV need to coincide. This is why the controls in equation (1) slightly differ from those used in the investment literature (Kaplan and Zingales, 1997; Chaney et al., 2012). I explain this in depth in subsection 4.1.

Table 3
OLS Estimation. How Variation in the Share of Unsecured Debt Affects Investment, 1993–2019. The table reports OLS estimation results for the effect of the share of unsecured debt on investment. Investment is defined as the share of capital expenditures to total assets, and the share of unsecured debt is total unsecured debt divided by total debt. All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). Investment is multiplied by 100. Data are for U.S. public manufacturing firms (SIC codes 2000–3999), and the sample period is from 1993 to 2019. Standard errors are clustered at the source of variation, at the firm level as in Petersen (2009), and all specifications include firm and year fixed effects. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Table A1 in the Appendix describes the variables used in the analysis.

	Dependent Variable: Investment						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share Unsecured	1.650***	0.482***	0.474***	0.485***	0.477***	0.421***	0.415***
	(0.137)	(0.098)	(0.098)	(0.098)	(0.097)	(0.098)	(0.098)
Book Leverage		0.286*		0.278		0.230	
		(0.172)		(0.172)		(0.170)	
Size		0.406***	0.358***	0.413***	0.365***	0.345***	0.296***
		(0.049)	(0.046)	(0.049)	(0.046)	(0.050)	(0.047)
Profitability		0.959***	0.908***	0.938***	0.889***	0.905***	0.865***
		(0.145)	(0.139)	(0.146)	(0.140)	(0.144)	(0.139)
Tangibility		21.438***	21.187***	21.437***	21.189***	21.083***	20.827***
		(0.492)	(0.497)	(0.491)	(0.496)	(0.496)	(0.500)
M/B		0.209***	0.206***	0.194***	0.192***	0.186***	0.183***
		(0.012)	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)
Debt-to-Equity			0.244***		0.240***		0.228***
			(0.045)		(0.045)		(0.045)
CF Volatility				0.346***	0.328***	0.273**	0.256**
				(0.113)	(0.113)	(0.113)	(0.113)
Dividend Payer						1.038***	1.026***
						(0.124)	(0.124)
Unrated						0.409***	0.408***
						(0.130)	(0.130)
Crisis						1.147***	1.101***
						(0.221)	(0.220)
Unrated*Crisis						0.142	0.159
						(0.127)	(0.127)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Observations	48,542	48,542	48,542	48,542	48,542	48,542	48,542

dummy, an indicator variable for whether the firm-year observation is for an unrated firm, a dummy variable identifying fiscal years in which the National Bureau of Economic Research (NBER) dates a recession, and the interaction term for the unrated and crisis variables. All the odd columns (excluding Column (1)), contain the regression results controlling for the debt-to-equity ratio instead of book leverage.

Overall, this analysis shows a positive association between the share of unsecured debt and investment. After controlling for changes in capital structure and firm characteristics likely to impact firms' investment decisions, I find that the composition of debt still has an impact on investment. A 1% increase in the share of unsecured debt leads to a 0.421% increase in investment (Column (6)). To appreciate the economic significance of the coefficients in this table, recall from Table 1 that the mean of the share of unsecured debt is 76.2% and that the standard deviation of the ratio is 35.5%, while the mean of investment is 5.2% and the standard deviation is 5.8%. Thus, a one-standard-deviation increase in the share of unsecured debt implies an increase in investment of 0.03 (=0.355*0.421/(100*0.058)) standard deviation units. This result corresponds to approximately 2.9% (=0.355*0.421/0.052) of the average value of investment.[18] The evidence reported in Table 3 indicates that when firms increase their share of secured debt, their investment goes down. The results suggest that, on average, the costs of secured debt seem to offset the benefits of pledging collateral.

4. Evidence from the ABCP Shock

The main limitation of the results in Table 3 is that they are subject to clear endogeneity issues. Disentangling changes in the level of debt from changes in the composition of debt is an empirical challenge. Moreover, while variation in debt structure may affect firm investment, the opposite can also be the case for specific investment projects. That is, some investments may be more easily financed with certain types of debt, which may affect debt structure. Simultaneity and reverse-causality concerns are important in the context of this paper.

To overcome these issues, I search for a plausibly exogenous source of variation in debt structure (or one type of debt) that will allow me to study whether investment decisions of firms are altered. For this purpose, I use the ABCP market collapse of 2007, which was an unexpected shock to the cost and availability of unsecured debt.[19]

Asset-backed commercial paper is an off-balance-sheet securitization instrument used mainly by financial institutions to finance long-term assets in the short term. In the summer of 2007, as the subprime mortgage crisis was taking hold, two German banks and BNP Paribas suspended net asset value calculations, which overnight sharply increased the cost of ABCP relative to the federal

[18] The economic significance of the results may seem low, but the quantative relevance of debt structure in affecting investment is equivalent to that of profitability, book leverage or the volatility of cashflows.

[19] See, e.g., Brunnermeier (2009), Acharya and Schnabl (2010), and Acharya et al. (2013) for a discussion of the overall effects of the ABCP collapse.

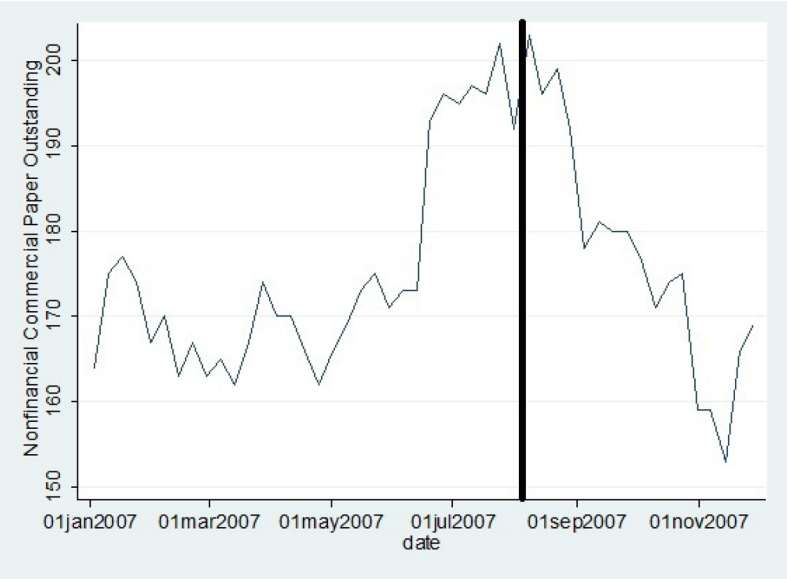

Fig. 3. Evolution of nonfinancial corporate commercial paper in 2007. This graph shows the evolution of nonfinancial corporate commercial paper in 2007. The black vertical line signals the collapse of the ABCP market in July 2007. Data are from the Federal Reserve Bank of St. Louis, FRED Economic Data.

funds rate. Financial institutions exposed to ABCP are only connected to nonfinancial firms through these firms' use of unsecured commercial paper (linking specific institutions to specific firms exogenously). These institutions pass on the effects of the liquidity shock to their set of linked firms. This shock transmission is as a function of how affected these financial institutions are by the ABCP shock and how much they reduce the availability of commercial paper to each specific firm. As a result, the ABCP shock caused a temporary shortage in the supply of unsecured commercial paper.

Although the magnitude of the effect on the unsecured commercial paper market was significantly lower than the effect on the ABCP market, the drop in outstanding commercial paper was sizable. Fig. 3 plots the evolution of nonfinancial corporate commercial paper in 2007. The graph shows that as soon as the ABCP market collapses in July 2007, the nonfinancial corporate commercial paper market experiences a temporary shortage. This is precisely what I exploit for identification.

I sort firms according to whether they use commercial paper before the shock. I conjecture that firms exposed to commercial paper financing ex-ante (treatment group) face refinancing problems when the ABCP market collapsed than similar firms not exposed (control group). Note that commercial paper is a short-term unsecured financing instrument used by both rated and unrated firms. As the evidence in Colla et al. (2013) suggests, rated firms with a commercial paper program tend to rely only on (unsecured) senior bonds and notes. In contrast, unrated firms with a commercial paper program opt for mixed debt structures. They use credit lines and (secured) term loans, in addition to senior bonds and notes and commercial paper.[20] More importantly, the crucial characteristic of commercial paper is that it does not have a secured debt counterpart; thus, it is difficult to substitute.

The ABCP shock occurs in fiscal year 2007. As a result, I define the pre-treatment period as the two fiscal years prior to the shock, 2005–06. Then, I define two alternative post-treatment periods: fiscal year 2007 and the cumulative 2007–08. I restrict the latter to include only the period before Lehman Brothers' bankruptcy filing in September 2008 to avoid confounding effects related to changes in the set of investment opportunities or in the valuation of firms' collateral (demand effects). Finally, I require at least one observation per firm in the pre- and post-treatment periods to avoid attrition.

Table 4 shows summary statistics for all relevant firm characteristics from Compustat and a comparison of the characteristics for the treatment and control groups during the pre-treatment period. The final sample for the ABCP identification strategy comprises 2,264 firm-year observations, which include 939 unique firms. The analysis shows that 66.2% of the average U.S. public manufacturing firm's total debt is unsecured, while investment represents 4.4% of total assets.

4.1. Empirical Design: Effect of Debt Structure on Investment

The identification strategy combines difference-in differences (DID) estimation with instrumental variables (IV) estimation to address simultaneity and reverse causality concerns in the relation between debt priority structure and investment. More precisely, I first perform DID estimation to quantify the effect of the ABCP shock on the share of unsecured debt for firms in the treatment group compared to the control group. Then, I use treatment-induced exogenous variation in the share of unsecured debt from ABCP as an instrument in an IV setup to establish a relation with investment. Note that a simple DID on investment would not suffice to show that the effect on investment is being channeled through the composition of debt. The empirical specification for investment ($Investment_{it}$) is as follows:

$$Investment_{it} = \gamma_t + \theta_i + \rho ShareUnsecured_{it} + X'_{it}\beta_c + \varphi_{it} \quad (2)$$

$$ShareUnsecured_{it} = \gamma_t + \theta_i + \psi Z_{it} + X'_{it}\beta_s + \eta_{it}, \quad (3)$$

where $ShareUnsecured_{it}$ is the share of unsecured debt (the variable that I want to instrument), and $Z_{it} = (D_i * Post_t)$ is the source of exogenous variation in the identification strategy (the instrument). D_i is a dummy variable that takes a value of 1 for firms in the treatment group, that is, firms with a commercial paper program in the pre-treatment period. $Post_t$ takes a value of 1 in the post-treatment period. All other terms in the specification are the same as in Eq. (1).

[20] See Panels A and B in Table 5 and Panels A-D in Table IA.2 in the Appendix in Colla et al. (2013).

Table 4
Summary Statistics for ABCP Sample. This table reports key firm characteristics for the full ABCP sample and for the pre-treatment period. I define the treatment group as firm-year observations with a commercial paper program in the pre-treatment period, while the control group is comprised of firm-year observations not relying on commercial paper. All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). For each firm characteristic, I compute the difference between the means of the treatment and control groups and the associated p-values. The pre-treatment period considers fiscal years 2005–06, while the post-treatment period comprises fiscal year 2007. Table A1 in the Appendix describes the variables used in the analysis.

	ABCP Sample		Treatment Group (TG)		Control Group (CG)		
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	$p(\bar{x}^{TG} - \bar{x}^{CG}) \neq 0$
Investment	0.044	0.036	0.052	0.041	0.041	0.033	0.000
Share Unsecured	0.662	0.370	0.754	0.336	0.636	0.372	0.000
Book Leverage	0.210	0.147	0.234	0.136	0.201	0.148	0.000
Debt-to-Equity	0.321	0.302	0.353	0.274	0.306	0.306	0.007
Size	6.116	1.938	6.593	2.341	5.895	1.697	0.000
Profitability	0.067	0.161	0.064	0.162	0.075	0.151	0.199
Tangibility	0.235	0.157	0.281	0.174	0.223	0.148	0.000
M/B	1.629	1.015	1.587	1.054	1.674	1.006	0.144
CF Volatility	0.024	0.026	0.024	0.024	0.024	0.026	0.399
Cash	0.185	0.214	0.161	0.184	0.190	0.222	0.016
R&D Expenses	0.064	0.115	0.053	0.102	0.063	0.111	0.061
Dividend Payer	0.374	0.484	0.460	0.499	0.345	0.476	0.000
Unrated	0.676	0.468	0.584	0.494	0.703	0.457	0.000
Int Rate	0.099	0.150	0.088	0.123	0.090	0.112	0.383
Maturity	0.757	0.268	0.686	0.283	0.792	0.248	0.000
Cov Sec Div	0.227	0.419	0.105	0.306	0.279	0.449	0.000
Cov Sec Inv	0.053	0.223	0.017	0.130	0.064	0.245	0.000
Cov Sec Fin	0.221	0.415	0.148	0.356	0.261	0.440	0.000
Cov Sec Intensity	0.500	0.852	0.270	0.642	0.605	0.911	0.000
Cov Unsec Div	0.094	0.292	0.046	0.210	0.110	0.312	0.000
Cov Unsec Inv	0.029	0.168	0.029	0.169	0.027	0.163	0.391
Cov Unsec Fin	0.130	0.337	0.117	0.322	0.132	0.338	0.294
Cov Unsec Intensity	0.254	0.645	0.192	0.541	0.268	0.669	0.033
# Observations	2,264		411		995		

An important remark is in line regarding the choice of controls in X_{it}. The investment literature generally uses cashflows, Tobin's Q/market-to-book, book leverage, and size as the main observable firms characteristics (Kaplan and Zingales, 1997; Chaney et al., 2012). The debt structure literature additionally typically includes tangibility, cashflow volatility, and dummy variables identifying unrated firms and dividend-paying firms (Rauh and Sufi, 2010Colla et al., 2013; Colla et al., 2020).[21] In my analysis, the set of controls in Eqs. (2) and (3) need to match for the IV to be correctly identified. As the share of unsecured debt in Eq. (3) requires that tangibility, cashflow volatility, and unrated and dividend-paying firms in addition to cashflows, market-to-book, book leverage, and size I therefore include the complete set of controls in both equations. This is also the rationale for my choice of controls in Eq. (1).

I am interested in the sign and statistical and quantitative significance of ρ. I expect $\rho > 0$, which would imply that as firms increase their share of unsecured debt, they are able to sustain larger investment projects. Because I control for the level of debt in the empirical specification through X_{it}, ρ solely captures the effect of the composition of debt on investment, clean from the effects of changes in total leverage. Moreover, ψ should be highly statistically significant to satisfy instrument relevance.

Note that ψ is capturing the net effect from the shock, that is, the effect from the shortage in the supply of unsecured commercial paper and the subsequent attempts (if any) to replace unsecured debt with new debt. I further analyze the substitution patterns that emerge in the wake of the ABCP shock to guarantee that the response in the share of unsecured debt is not contaminated by level effects. Analyzing the substitution patterns of both groups is important as different types of debt instruments have different maturities (Diamond, 1993; Brunnermeier and Oehmke, 2013), priorities (Stulz and Johnson, 1985; Barclay and Smith, 1995), sensitivity to information (Denis and Mihov, 2003), and claims over the assets of the firm (LoPucki, 2003; LoPucki, 2004). I implement the following specification for the different debt types standardized by total assets ($DebtType_{it}$):

$$DebtType_{it} = \gamma_t + \theta_i + \chi_d(D_i * Post_t) + X'_{it}\beta_d + \eta_{it}, \quad (4)$$

where $DebtType_{it}$ is total secured debt, senior secured bonds and notes, senior secured loans, secured drawn credit, total unsecured debt, senior unsecured bonds and notes, senior unsecured loans, unsecured drawn credit, and commercial paper standardized by total assets. The remaining specification terms are the same as those described in Eqs. (1), (2) and (3). I expect $\chi_d < 0$ for the unsecured commercial paper regression and statistically significant.

4.2. Results: Effect of ABCP Collapse on Debt Structure

Table 5 reports the results from the first stage of the IV estimation, the average treatment effect (ATE) from a DID estimation of the share of unsecured debt for the post-treatment periods of 2007 and 2007–08. Columns (1) and (2) report results for fiscal year 2007, and columns (3) and (4) report results for fiscal years 2007 to 2008 using the two alternative proxies to control for level effects (book leverage in the odd columns and the debt-to-equity ratio in the even columns). The results are negative and statistically and economically significant. The temporary shortage in the supply of unsecured commercial paper stemming from the collapse of the ABCP market causes firms in the treatment group to decrease the share of unsecured debt by around 8.2% more than the control group in 2007 and by 7.3% in the longer 2007–08 period. In

[21] The debt structure literature uses profitability instead of cashflows.

Table 5
DID Estimation. How the Share of Unsecured Debt Changes in Response to the ABCP Shock. The table reports DID estimation results for the ATE on the share of unsecured debt in the wake of the ABCP shock as in Eq. (3). All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). The share of unsecured debt is multiplied by 100. Two different variables are used to control for level effects on debt: book leverage and the debt-to-equity ratio. Data are from U.S. public manufacturing firms (SIC codes 2000–3999) in Compustat. The *p*-value for the instrument relevance test for the first-stage of 2SLS is reported after the estimated coefficients in each column. Standard errors are clustered at the source of variation, at the firm-level as in Petersen (2009), and regressions include firm and year fixed effects. The pre-treatment period considers fiscal years 2005–06. Columns (1)–(2) and (3)–(4) show results for the post-treatment periods of fiscal year 2007 and fiscal years 2007–08, respectively. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Table A1 in the Appendix describes the variables used in the analysis.

	Dependent Variable: Share Unsecured			
Post-treatment:	2007		2007–08	
	(1)	(2)	(3)	(4)
ATE 2007	-8.212***	-8.439***		
	(2.199)	(2.176)		
ATE 2007–08			-7.275***	-7.551***
			(2.084)	(2.051)
Book Leverage	16.152		12.889	
	(12.135)		(11.051)	
Size	-4.553	-4.329	-1.072	-0.826
	(3.810)	(3.793)	(3.605)	(3.608)
Profitability	4.728	3.614	12.714	11.048
	(11.210)	(11.238)	(10.097)	(10.171)
Tangibility	-29.589*	-28.863*	-14.702	-13.952
	(16.837)	(16.820)	(18.700)	(18.597)
M/B	0.273	0.194	0.839	0.775
	(1.320)	(1.325)	(1.298)	(1.300)
CF Volatility	-18.949	-18.750	-16.477	-13.175
	(19.751)	(19.804)	(37.444)	(37.425)
Dividend Payer	-2.358	-2.435	-1.750	-1.778
	(4.005)	(4.030)	(4.120)	(4.154)
Unrated	1.648	1.438	4.524	3.997
	(4.445)	(4.418)	(4.068)	(4.005)
Debt-to-Equity		5.600		2.894
		(5.736)		(4.994)
p-value	0.000	0.000	0.000	0.000
Clustered SE	Firm	Firm	Firm	Firm
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
# Observations	2,264	2,264	3,116	3,116

Columns (2) and (4), I control for the debt-to-equity ratio; the results are in line with those in Columns (1) and (3), where I control for book leverage. Finally, note that the magnitude of the results is large, corresponding to around 12% (=8.2%/66.2%) of the average share of unsecured debt for the sample period considered.

The effects on the share of unsecured debt are stronger for fiscal year 2007 than for the cumulative 2007–08 post-treatment period. This suggests that demand effects or changes in firms' investment opportunity set are not a concern in 2008 leading to the Lehman Brothers' bankruptcy filing, as most of the change in the composition of debt takes place right after the ABCP collapse in fiscal year 2007. This result is crucial for the exclusion restriction in the IV test.

When unsecured commercial paper becomes temporarily unavailable or too costly, some firms in the treatment group may need to find a substitute for the lost unsecured financing to avoid missing out on investment opportunities. Table 6 shows the results of a DID analysis of the substitution patterns arising from the shock. The dependent variables in this table correspond to secured and unsecured sources of debt standardized by total assets from Capital IQ. The results show that firms in the treatment group experience, on average, a 2.5% greater reduction in commercial paper standardized by total assets than the control group. This finding is consistent with the underlying assumption that the ABCP shock caused a temporary shortage in the supply of unsecured commercial paper.

Moreover, I observe an increase in the reliance on unsecured credit lines for firms in the treatment group of 1.9% more than the control group. Note that although the reliance on unsecured credit lines partly offsets the lost unsecured commercial paper, firms in the treatment group seem unable to replace all lost unsecured debt financing with new sources. Additionally, total secured debt goes up by 1.6% for firms in the treatment group, which is mainly driven by a 1.3% increase in senior secured term loans.[22] [23]

Finally, Table A3 in the Appendix shows the results of the DID analysis on book leverage after the ABCP shock, which rules out changes in total leverage for the treatment group as compared to the control group. Taken together, these results suggest that the main effects of the ABCP shock manifest through debt composition and not through level effects. Note that these results show that out of the three extreme cases discussed in the "Conceptual Framework and Empirical Strategy" in Section 2, Cases 2 and 3 prevail.

These results have four implications for debt and capital structure. First, evidence in Tables 5 and A3 in the Appendix are in line with the conclusions in Rauh and Sufi (2010) and Badoer et al. (2020), showing that firms exhibit remarkable variation in the priority debt structure while holding capital structure constant. Second, they suggest that there may be a pecking order for debt instruments. In other words, firms are willing to replace lost unsecured debt with the closest source of new unsecured debt: unsecured credit lines.[24]

Third, the results suggest that a *collateral rat race* arises as firms substitute toward secured debt (as in Donaldson et al. (2020a)). Some firms in the treatment group may lack access to the unsecured debt market, either because it is too costly or because further unsecured lending is limited. Those unable to replace each dollar of unsecured debt lost with new unsecured debt may substitute with (senior) secured (loans) instead.

To understand why borrowing senior unsecured loans may not be feasible in this case, note that issuing unsecured debt implies that the non-exclusion friction becomes tighter and the risk of dilution of unsecured creditors is more likely. Therefore, in anticipation of future dilution, creditors collateralize ex-ante. Collateral is required to prevent future collateralization.

Finally, the results are consistent with priority spreading as in Degryse et al. (2016) and Badoer et al. (2020). The main difference in my setup is that priority spreading arises due to the irreplaceability of unsecured commercial paper and not because of changes in credit quality. Overall, my results suggest that optimal debt priority and composition is set to mitigate (managerial and) creditor agency problems.

[22] These results are consistent with evidence in Colla et al. (2013). Table 5 and Table IA.2 in the Appendix, compare debt composition of firms with a decreasing share of commercial paper. The results show that while rated firms substitute toward more (unsecured) senior bonds and notes only, unrated firms substitute toward a more intensive use of credit lines, term loans, and senior bonds and notes. Unreported analysis shows that the strongest firms in the treatment group access the unsecured bond market, suggesting that the results of the ABCP shock may be driven by the reaction of unrated firms.

[23] The sample averages for the share of commercial paper, unsecured drawn credit lines, and senior secured term loans to total assets are 0.197%, 2.725%, and 4.698%, respectively.

[24] By "closest", I mean a short-term debt instrument used to presumably finance working-capital requirements or part of a firm's investment in fixed assets, as in the case of credit lines and commercial paper.

Table 6
DID Estimation. Substitution Patterns in Types of Debt in the Wake of the ABCP Shock. The table reports DID estimation results for the ATE on the share of debt types to total assets as a result of the ABCP shock as in Eq. (4). All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). Debt types are multiplied by 100, and data are from Capital IQ. SBN, STL, RC, and CP represent senior bonds and notes, senior loans, revolving credit, and commercial paper, respectively. Data are for U.S. public manufacturing firms (SIC codes 2000–3999) in Compustat. Standard errors are clustered at the source of variation, at the firm-level as in Petersen (2009), and all specifications include firm and year fixed effects. Columns (1)–(4) show the ATE for the share of secured debt types to total assets for fiscal year 2007, while columns (5)–(9) show the ATE for the share of unsecured debt types to total assets for the same fiscal year. The pre-treatment period is fiscal years 2005–06. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Table A1 in the Appendix describes the variables used in the analysis.

	Dependent Variable:								
	Share Secured				Share Unsecured				
Post-treatment	Total 2007	SBN	STL	RC	Total	SBN	STL	RC	CP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ATE 2007	1.560**	0.001	1.309***	0.218	-0.452	0.021	0.358	1.902**	-2.469***
	(0.760)	(0.254)	(0.393)	(0.244)	(0.876)	(1.826)	(0.833)	(0.814)	(0.859)
Size	1.980	-1.298	0.009	-0.222	3.086	2.497	0.550	0.840	-0.135
	(2.041)	(1.198)	(0.454)	(0.455)	(1.966)	(2.442)	(1.088)	(0.900)	(0.107)
Profitability	-8.010**	-0.472	0.504	-1.367	-14.364***	-1.751	-3.960	-2.043	0.331*
	(3.427)	(2.597)	(1.489)	(1.141)	(5.097)	(3.661)	(3.996)	(2.771)	(0.181)
Tangibility	4.743	0.639	-0.238	0.762	-1.959	7.737	1.203	1.030	-0.420
	(11.661)	(6.197)	(2.090)	(1.569)	(8.667)	(11.943)	(5.216)	(4.122)	(0.476)
M/B	-0.193	-0.357*	-0.149	-0.043	-0.178	-0.179	-0.198	-0.233	-0.022
	(0.401)	(0.186)	(0.104)	(0.103)	(0.587)	(0.539)	(0.213)	(0.199)	(0.023)
CF Volatility	17.243	0.677	-2.596	-6.126	12.468	27.693*	-9.071	-8.961	-0.322
	(13.615)	(6.818)	(3.652)	(6.702)	(13.381)	(16.482)	(6.950)	(5.907)	(0.409)
Dividend Payer	0.188	-1.306	0.803	-0.528	-0.551	0.315	1.178	1.995	0.029*
	(0.998)	(1.304)	(1.016)	(0.820)	(1.609)	(2.387)	(1.930)	(1.798)	(0.017)
Unrated	2.185	1.125	-1.168	0.838	3.600	0.361	0.008	-2.105	0.023
	(1.412)	(2.608)	(1.272)	(0.930)	(4.459)	(2.492)	(1.111)	(2.142)	(0.023)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Observations	2,214	2,214	2,214	2,214	2,214	2,214	2,214	2,214	2,214

4.3. Results: Effect of Changes in Debt Structure on Investment

I use the results from the DID analysis on the share of unsecured debt as an instrument for the IV estimation on investment as in Eqs. (2) and (3). In other words, I instrument the share of unsecured debt with treatment-induced exogenous variation from the ABCP shock to disentangle the effect of changes in the composition of debt on investment while controlling for level effects. Table 7 reports the second-stage results of the IV estimation (2SLS). Columns (1)–(2) report results for fiscal year 2007, and columns (3)–(4) report results for fiscal years 2007–2008.[25]

The results are positive and statistically significant for the IV estimation. Once I instrument the share of unsecured debt with exogenous variation from the ABCP shock, the change in investment accounts for 0.4–0.5%. To gauge the economic relevance of the results, as a benchmark, recall from Table 4 that the mean share of unsecured debt for the ABCP sample is 66.2% and the standard deviation is 37%. Also note that average investment is 4.4% of total assets, with a standard deviation of 3.6%. Therefore, a one-standard-deviation increase in the share of unsecured debt implies an increase in investment of 0.04 (=0.370*0.417/(100*0.036)) standard deviation units. This results corresponds to 3.5% (=0.370*0.417/0.044) of the average value of investment. Note that although the economic significance of the results may seem low, the contribution of debt structure to investment is equivalent to that of size, book leverage or cashflow volatility.

This main result has two primary implications. First, this result sheds new light on how the priority structure of debt affects real outcomes, including investment. According to the collateral channel literature, collateral availability increases (secured) debt capacity, thereby allowing a firm to increase its level of investment (Gan, 2007; Chaney et al., 2012) while lowering its cost of financing (Cerqueiro et al., 2016).[26] However, when the priority composition of debt is considered, more collateral pledged may imply a reduction in the level of investment. This paper is the first to show that debt structure, defined as secured versus unsecured debt, has real effects on investment.

Moreover, the positive relation also suggests that the pledge of collateral can exacerbate the effects of financial constraints. That is, firms trade off the benefits of pledging collateral with its associated costs (i.e., increased debt capacity versus loss of operational flexibility). The novelty of the result lies in that substitution toward secured debt may lead to the underinvestment problem in Myers (1977) even if firms are financially solvent.[27] Asset encumbrance reduces the operational flexibility of the firm as it may constrain borrowing and investment (the *collateral overhang* in Donaldson et al. (2020a)). This effect is also consistent with evidence in Giambona et al. (2021) in that increasing the share of secured debt leads to lower flexibility in terms of capital structure and a higher presence of covenants in new debt contracts. Overall, my results also support the evidence in Vig (2013), showing that reforms to strengthen creditor rights may lead to underinvestment

[25] Note that Table 5 reports the p-values for the instrument relevance tests. I test for weak instrumentation using the Kleibergen-Paap F-statistic for cluster-robust data.

[26] Variation in real estate collateral also leads to more bank debt, bonds and mortgages (and secured debt) according to Cvijanovic (2014)'s work.

[27] Firms relying on unsecured commercial paper are not financially contrained according to definitions in Almeida et al. (2004).

Table 7
IV Estimation. How Changes in the Share of Unsecured Debt Affect Investment. The table reports 2SLS estimation results of the effect of the share of unsecured debt on investment. Debt structure is instrumented with the ATE from the ABCP shock in Table 5 as in Eqs. (2) and (3). All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). Investment is multiplied by 100. Two variables are used to control for level effects on debt: book leverage and the debt-to-equity ratio. Data are from U.S. public manufacturing firms (SIC codes 2000–3999). Standard errors are clustered at the source of variation, at the firm-level as in Petersen (2009), and all specifications include firm and year fixed effects. The pre-treatment period considers fiscal years 2005–06. Columns (1)–(2) and (3)–(4) show results for the post-treatment periods of fiscal year 2007 and fiscal years 2007–08, respectively. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Table A1 in the Appendix describes the variables used in the analysis.

	Dependent Variable: Investment			
Post-treatment:	2007		2007–08	
	(1)	(2)	(3)	(4)
Share Unsecured	0.417**	0.406**	0.469***	0.459***
	(0.186)	(0.186)	(0.173)	(0.172)
Book Leverage	-1.659***		-1.221***	
	(0.415)		(0.368)	
Size	0.078*	0.076*	0.126***	0.126***
	(0.044)	(0.043)	(0.041)	(0.041)
Profitability	2.415***	2.391***	1.966***	1.952***
	(0.398)	(0.398)	(0.380)	(0.380)
Tangibility	14.083***	14.094***	14.653***	14.650***
	(0.375)	(0.374)	(0.347)	(0.346)
M/B	0.751***	0.761***	0.651***	0.658***
	(0.057)	(0.057)	(0.054)	(0.054)
CF Volatility	4.946***	4.927***	2.074	2.154
	(1.187)	(1.186)	(2.209)	(2.208)
Dividend Payer	-0.833***	-0.852***	-0.840***	-0.853***
	(0.145)	(0.146)	(0.127)	(0.127)
Unrated	0.424**	0.409**	0.690***	0.683***
	(0.175)	(0.174)	(0.148)	(0.147)
Debt-to-Equity		-0.908***		-0.662***
		(0.198)		(0.175)
Clustered SE	Firm	Firm	Firm	Firm
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
# Observations	2,264	2,264	3,116	3,116

or to substitution toward unsecured debt because of the costs associated with collateralization.[28]

The second implication of the results in Table 7 is related to macroeconomic fluctuations. Existing models with financial frictions inadequately incorporate this real-world feature of debt and capital structure. Previous macro-finance work has identified two main channels through which financial constraints could potentially reduce investment: a balance sheet channel and a credit channel.[29] My identification setup and the results in Tables 3–7 provide the micro-foundations for an alternative channel, the composition of debt, that could affect investment in the presence of financial constraints. Thus, I introduce a new context in which to study the transmission, propagation, and amplification of exogenous shocks to the real economy.[30]

[28] According to Vig (2013), coordination failure reduces the expected liquidation value of collateral. The bargaining between secured and unsecured creditors can distort the reorganization process due to the liquidation bias of secured creditors. As a result, the risk of premature liquidation by secured creditors increases (Gertner and Scharfstein, 1991, Bolton and Scharfstein, 1996, Ayotte and Morrison, 2009). Instead, unsecured creditors' incentives tend to be aligned with those of the firm and they typically prefer continuation over liquidation.

[29] See Bernanke et al. (1996), Kiyotaki and Moore (1997), Kroszner et al. (2007), Dell'Ariccia et al. (2008), and Gertler and Kiyotaki (2015) among others.

[30] In the macro-finance literature, Azariadis et al. (2016) show that unsecured debt is procyclical while secured debt is acyclical. Also, the recent paper by Benmelech, Kumar, Rajan, 2020 shows that secured debt is countercyclical.

4.4. Results: Effect of the ABCP Collapse on Contract Terms (Interest Rate, Maturity, and Covenants)

In this section, I shed further light on the mechanism behind the reduction in investment when access to unsecured debt becomes limited and firms have to substitute toward secured debt issues. A recent paper by Benmelech et al. (2022) overcomes selection issues in the study of secured debt spreads. They conclude that the secured debt spread is positive, especially when firms' credit quality deteriorates.[31] That is, when firms substitute toward secured debt, I should observe higher interest rates, ceteris paribus.

Covenants are another mechanism available to achieve priority and to deal with the non-exclusivity friction or the potential to dilute other creditors (Smith and Warner, 1979). Nini et al. (2009) examine a large sample of private credit agreements and find that conflicts of interest between creditors and firms have a significant impact on investment policy. They find that investment restrictions cause a reduction in firm investment.[32] Indeed, Badoer et al. (2020) show that the covenant structure in secured and unsecured bank debt contracts differs significantly, while results in Giambona et al. (2021) suggest that unsecured debt tends to have fewer and looser covenants. Finally, Lou and Otto (2019) conclude that debt heterogeneity entails additional covenants when raising future debt. Therefore, based on the extant literature, for firms that substitute toward secured (bank) debt, I expect to see more covenant intensity and the presence of dividend, investment, and financial covenants simultaneously, ceteris paribus.

I use the following empirical specification to test the effect of the ABCP shock on contract terms:

$$Outcome_{it} = \gamma_t + \theta_i + \kappa_o(D_i * Post_t) + \beta_{o,p} ShareUnsecured_{it} + X'_{it}\beta_o + \eta_{it}, \quad (5)$$

where $Outcome_{it}$ includes the three mechanisms being tested: interest rates, maturity, and covenants.[33] The remaining terms in the regression specification are analogous to those described in equations (1), (2), and (3). I expect $\kappa_m > 0$ for the interest rate mechanism and for average maturity. Finally, I expect $\kappa_m > 0$ for dividend, investment, and financial covenants in secured debt, and for the variable capturing covenant intensity in secured debt contracts.

Table 8 reports the results from the DID analysis of average interest rates, average maturity of corporate liabilities, and the presence and intensity of debt covenants in fiscal year 2007, right after the ABCP shock. The three mechanisms are statistically significant. In the wake of the ABCP shock, firms in the treatment group ex-

[31] Previous evidence showed the opposite. Berger and Udell (1990), Carey et al. (1993), and John et al. (2003) use the settings of bank debt, private placements, and public debt, respectively, to conclude that unsecured debt has lower interest rates (unsecured debt is less risky).

[32] The sample in Nini et al. (2009) covers the period 1996–2005 and shows that 65% of these agreements are secured by collateral, 32% of the agreements contain an explicit restriction on the firm's capital expenditures, 81% contain restrictions on dividend payments, and the presence of several financial covenants is widespread (e.g., coverage ratios, net worth covenants, or debt to balance sheet or cashflow covenants).

[33] I define "interest rate" as the average interest rate on financial debt, and I define "maturity" as the fraction of debt maturing in more than 1 year. Additionally, I use six different covenant variables in the analysis. For both secured and unsecured debt contracts, I generate dummy variables identifying covenants limiting capital expenditures and dividend payments, and covenants with leverage or net worth restrictions/thresholds (financial covenants). Building on Bradley and Roberts (2015), I also build covenant "intensity" variables for secured and unsecured debt, which are constructed as the sum of the three types of covenants included in the analysis. Subsection 3.1 describes the general text-search procedure, and Table A2 in the Appendix describes the specific textual analysis strategy.

Table 8
DID Estimation. Effect on Interest Rate, Maturity, and Covenants in Response to the ABCP Shock. The table reports DID estimation results for the ATE on the average interest rate on debt (Column (1)), the average maturity structure of corporate liabilities (Column (2)), and the ABCP shock's effect on dividend, investment, and financial covenants in secured (Columns (3)–(6)) and unsecured debt (Columns (7)–(10)) contracts as in Eq. (5). All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). Data are from U.S. public manufacturing firms (SIC codes 2000–3999) in Compustat. Standard errors are clustered at the source of variation, at the firm-level as in Petersen (2009), and regressions include firm and year fixed effects. The pre-treatment period considers fiscal years 2005–06. All columns show results for post-treatment period of fiscal year 2007. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Table A1 in the Appendix describes the variables used in the analysis, and Table A2 in the Appendix describes the text-search-built variables. The coefficients for Dividend Payer and Unrated are omitted for presentation purposes.

	Dependent Variable:									
			Covenants Secured Debt				Covenants Unsecured Debt			
Post-treatment:	Int Rate 2007	Maturity	Dividends	Investment	Financial	Intensity	Dividends	Investment	Financial	Intensity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ATE 2007	2.589**	4.617*	-0.090	0.941*	0.937**	1.789*	-0.398	-0.418	-0.608	-1.423
	(1.236)	(2.597)	(0.696)	(0.502)	(0.467)	(1.029)	(0.464)	(0.416)	(0.724)	(1.136)
Share Unsecured	-4.974*	-25.699***	-2.362	-0.882	-0.773	-4.017	-0.148	0.649	0.016	0.517
	(2.593)	(3.665)	(1.977)	(1.155)	(0.939)	(2.775)	(0.354)	(0.792)	(0.084)	(0.952)
Book Leverage	-38.598***	24.820***	-1.174	0.077	1.979	0.882	-0.284	0.612	0.423	0.751
	(6.958)	(9.407)	(2.578)	(2.839)	(2.435)	(5.127)	(1.902)	(1.818)	(1.606)	(4.074)
Size	-3.589	5.667**	0.477	-0.189	-0.964	-0.675	-0.435	-0.496	0.198	-0.733
	(2.422)	(2.818)	(1.709)	(1.490)	(0.845)	(2.911)	(0.954)	(0.732)	(0.707)	(1.850)
Profitability	-0.721	10.204	-1.128	1.484	-1.904	-1.548	0.104	0.288	-0.232	0.160
	(5.602)	(8.282)	(1.869)	(2.431)	(1.812)	(4.363)	(1.503)	(1.501)	(0.654)	(3.071)
Tangibility	0.133	7.333	7.371	-1.411	3.465	9.425	-3.318	-3.247	-1.006	-7.571
	(10.623)	(12.420)	(5.534)	(5.300)	(2.313)	(8.777)	(4.347)	(4.331)	(1.988)	(8.892)
M/B	-0.286	-0.316	-0.151	0.142	-0.454*	-0.462	-0.239	-0.026	-0.078	-0.343
	(0.697)	(0.962)	(0.207)	(0.308)	(0.242)	(0.526)	(0.187)	(0.179)	(0.084)	(0.341)
CF Volatility	25.639*	51.678**	17.843	-1.322	3.960	20.481	-3.445	0.002	-3.754	-7.197
	(13.100)	(25.803)	(20.941)	(6.503)	(7.146)	(23.627)	(4.086)	(4.016)	(3.944)	(8.970)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Observations	2,264	2,264	2,264	2,264	2,264	2,264	2,264	2,264	2,264	2,264

perienced a 3% increase in the average interest rate on debt contracts as compared to the control group, which translates to 26.2% (=2.589%/9.9%) of the sample average interest rate on debt (Column (1)). The results in Column (2) suggest that maturity of firms' financial debt increased by incorporating longer term debt. The ATE is 4%, which represents 6.1% (=4.617%/75.7%) of the sample average. Additionally, the results in Columns (3)–(5) indicate an increase in the presence of investment and financial covenants in new secured bank debt compared to the control group. The economic significance of the investment covenants in new secured debt contracts is large, 0.9%, which represents 18% (=0.941%/5.3%) of the sample average. The results in Column (6) confirm that covenant intensity increased for secured debt contracts.

I also look for suggestive evidence of substitution patterns and the mechanism behind the observed results in the SEC 10-K filings of firms in the treatment group.

> *"If our access to the commercial paper market is adversely affected due to a change in market conditions or otherwise, we would expect to rely on a combination of available cash and our* ***unsecured committed credit facility*** *to provide short-term funding. In such event, the* ***cost of borrowings*** *under our unsecured committed credit facility would be* ***higher than the cost of commercial paper*** *borrowings."*

> *"If for any reason our existing credit arrangements (commercial paper) were no longer available to us, we would be required to seek alternative sources of financing. We would expect to meet our financial liquidity needs by accessing the* ***bank market, which would further increase our borrowing costs.***"

The results in Table 8 and the above excerpts are consistent with the idea that different firms use different types of debt, and that access to and use of this pool of instruments may significantly alter the contractual terms faced by the firm. Assuming the firm already has its preferred cost-minimizing debt composition before the shock, any deviation from that scheme may imply an increase in the cost of financing or a loss of operational flexibility. That is, the ABCP shock forces firms to re-optimize their debt composition. My results are consistent with the lower share of unsecured debt leading to less operational and financial flexibility, higher costs of financing, and the presence of covenants in new debt contracts (Lou and Otto, 2019; Giambona et al., 2021). They are also consistent with secured and unsecured debt having different covenants as in Badoer et al. (2020). More importantly, my results are line with Nini et al. (2009), which show that covenants limiting capital expenditures lead to reductions in corporate investment. Overall, my results suggest that optimal debt priority and composition is set to mitigate (managerial and) creditor agency problems and to minimize total financing costs.

5. Robustness Checks

5.1. Threats to the Exclusion Restriction

Next, I use a DID analysis to test the plausibility of alternative channels through which the ABCP shock impacted investment. First, I include the share of unsecured debt as a control in the regression specification. The composition of debt is now assumed not to be the main channel through which the ABCP shock is transmitted to investment. Second, I change the definition of the treatment group to reflect four other possible explanations: covenants that limit capital expenditures (Chava and Roberts, 2008; Nini et al., 2009), costs of financing (Graham and Leary, 2011), the maturity structure of corporate liabilities (Almeida et al., 2011), and collateral scarcity (Chaney et al., 2012). I also modify the empirical strat-

egy as follows to use DID:

$$Investment_{it} = \gamma_t + \theta_i + \pi_c(D_i * Post_t) + \beta_{c,p} ShareUnsecured_{it} + X'_{it}\beta_c + \eta_{it}. \quad (6)$$

The alternative channels are tested by altering how D_i is defined. The remaining terms of the regression specification are analogous to those described in Eqs. (1), (2) and (3). I expect π_c not to be statistically significant for any of the alternative channels defined.

Covenants Limiting Investment (COV): Several studies have examined the effect of covenants on firm investment policy (Chava and Roberts, 2008; Nini et al., 2009). Nini et al. (2009) find that creditors regularly impose explicit restrictions on firm investment in private credit agreements, leading to lower investment than would otherwise occur. I use two text-search-generated dummy variables that identify the presence of this type of covenant in secured and unsecured debt ex-ante.

High Financing Costs (FIN): Graham and Leary (2011) conclude that firms choose (debt and) capital structure so as to minimize total financing costs. I use data on the average interest rate paid on total debt to generate a dummy variable that takes a value of 1 for firms belonging to the 75^{th} percentile ex-ante and zero otherwise.

Maturity Structure of Corporate Liabilities (MAT): Almeida et al. (2011) find that firms whose long-term debt was largely maturing right after the third quarter of 2007 cut their investment-to-capital ratio more than similar firms whose debt was scheduled to mature after 2008. I use the fraction of debt maturing in more than a year to generate a dummy variable that takes a value of 1 for firms belonging to the 25^{th} percentile ex-ante and zero otherwise.

Collateral Scarcity (COLL): Chaney et al. (2012) show that collateral helps alleviate financial constraints by increasing debt capacity and, thus, the level of investment. I use firm tangibility to generate a dummy variable that takes the value of 1 for firms belonging to the 25^{th} percentatile ex-ante and zero otherwise.

I conjecture that the observed response of investment is driven by the effect of the four alternative channels described. Table 9 reports the DID results for investment when different channels are tested. I only report the estimated ATE on investment using fiscal year 2007 as the post-treatment period, but results are very similar when using fiscal years 2007–08. None of the alternative channels tested are statistically significant.

Table 9
DID Estimation. Alternative Explanations for the Investment Response. The table reports DID estimation results for the ATE on investment as a result of the ABCP shock using alternative channels. Column (1) builds on Nini et al. (2009) to evaluate the effect of covenants limiting investment (*COV*). Column (2) tests the high financing costs hypothesis from Graham and Leary (2011) (*FIN*). Column (3) builds on Almeida et al. (2011) to evaluate the effect of corporate debt maturity (*MAT*), and Column (4) looks at ex-ante collateral scarcity as an explanation (*COLL*). All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). Investment is multiplied by 100. Data are from U.S. public manufacturing firms (SIC codes 2000–3999) in Compustat. Standard errors are clustered at the source of variation, at a firm-level as in Petersen (2009), and all specifications include firm and year fixed effects. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Table A1 in the Appendix describes the variables used in the analysis, and Table A2 in the Appendix describes the text-search-built variables.

	Dependent Variable: Investment			
Post-treatment:	*COV* 2007	*FIN*	*MAT*	*COLL*
	(1)	(2)	(3)	(4)
ATE 2007	-0.167	-0.072	-0.057	-0.210
	(0.454)	(0.460)	(0.423)	(0.540)
Share Unsecured	-0.135	-0.137	-0.109	-0.108
	(0.456)	(0.460)	(0.451)	(0.452)
Book Leverage	-1.352	-1.364	-1.255	-1.281
	(1.304)	(1.298)	(1.400)	(1.403)
Size	1.890***	1.881***	1.962***	1.963***
	(0.711)	(0.710)	(0.720)	(0.724)
Profitability	0.388	0.387	-0.349	-0.392
	(1.519)	(1.514)	(1.587)	(1.577)
Tangibility	36.596***	36.590***	36.939***	37.015***
	(3.499)	(3.499)	(3.609)	(3.626)
M/B	0.294**	0.293**	0.389***	0.393***
	(0.127)	(0.127)	(0.149)	(0.152)
CF Volatility	0.612	0.655	1.680	1.692
	(2.895)	(2.863)	(4.199)	(4.212)
Dividend Payer	0.410	0.409	0.423	0.427
	(0.395)	(0.395)	(0.398)	(0.397)
Unrated	0.467	0.464	0.513	0.497
	(0.632)	(0.633)	(0.643)	(0.641)
Clustered SE	Firm	Firm	Firm	Firm
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
# Observations	2,264	2,264	2,264	2,264

6. Conclusions and Discussion

I address the long-standing question in corporate finance of how firms' financing decisions affect investment policy. The novelty of my approach lies in analyzing the link between priority debt composition and investment. I add to the expansive literature on secured and unsecured debt by linking financial constraints to debt structure choice when firms lack access to the unsecured debt market. I conclude that debt structure is important for investment.

This paper has two main findings. First, my analysis suggests that there is a pecking order for debt instruments. That is, firms are willing to replace lost unsecured debt with the closest source of new unsecured debt, regardless of collateral availability. Additionally, the analysis suggests that some firms are unable to replace all missing unsecured debt with new unsecured debt either because it is too costly or because further unsecured lending is limited. Thus, they substitute toward secured debt. This lack of access to the unsecured debt market can be used as a proxy to measure financial constraints as in Almeida et al. (2004) or Sufi (2009).

Second, I show that abstracting from debt structure considerations may lead one to miss substantial changes in investment. I find a positive association between the share of unsecured debt and investment. As firms substitute toward secured debt, asset encumbrance reduces the operational flexibility of the firm and leads to underinvestment. In contrast to the extant literature, I find that underinvestment arises in my sample even if firms are solvent. These results are the first empirical evidence that debt structure, defined as secured versus unsecured debt, has real effects on investment.

My paper and its findings also have a number of implications for the policy debate on the absolute priority rule of secured debt and business cycle dynamics. My analysis shows that the pledge of collateral may imply a trade-off for firms of increased debt capacity versus the loss of operational flexibility. This result contributes to the policy debate on the absolute priority rule of secured debt. As in Vig (2013), my results support the view that a reform strengthening creditor rights may lead to underinvesment. Moreover, the results may also be relevant for business cycle dynamics. In contrast to the debt homogeneity assumption, unsecured debt can generate a sizable effect on investment when it is allowed to help modulate firms' financial constraints. Recognizing that the composition of debt may play a role in investment over the business cycle and in aggregate investment opens a new avenue for future study.

Data availability

Data will be made available on request.

Appendix

Table A1
Variable Definitions. This table summarizes all the variables used in the analysis. All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013).

Compustat Firm Characteristics	
Investment	Capital Expenditures (item 128) over Total Assets (item 6)
Profitability	Operating Income Before Depreciation (item 13) over Total Assets (item 6)
Tangibility	Property, Plant, and Equipment, Net (item 8) over Total Assets (item 6)
Total Debt	Debt in Current Liabilities (item 34) plus Long-Term Debt (item 9)
Book Leverage	Total Debt over Total Assets (item 6)
MV Equity	Stock Price (item 199) times Common Shares Used to Calculate Earnings Per Share (item 54)
Debt-to-Equity	Total Debt over MV Equity
M/B	Market Value of Equity plus Total Debt plus Preferred Stock Liquidating Value (item 10) minus Deferred Taxes and Investment Tax Credit (item 35) over Total Assets (item 6)
Size	Total Assets (item 6), in Million USD
CF Volatility	Standard Deviation of Quarterly Operating Income (item 13) over Previous 12 Quarters over Total Assets (item 6)
Dividend Payer	Dummy variable, takes a value of 1 if the firm-year observation pays common dividends (item 21)
Cash	Cash and Short-term Investments (item 1) over Total Assets (item 6)
R&D Expenses	Research and Development Expenses (item 46) over Total Assets (item 6)
Unrated	Dummy variable, takes a value of 1 if the firm-year observation does not have a bond rating (item 280)
Crisis	Dummy variable, takes a value of 1 if the time period is dated as a recession by the NBER
Debt Structure&Contract Terms	
Share Unsecured	Total Debt Minus Mortgages and Other Secured Debt (item 241) over Total Debt
Secured SBN	Senior Secured Bonds and Notes over Total Assets (item 6)
Secured STL	Senior Secured Term Loans over Total Assets (item 6)
Unsecured SBN	Senior Unsecured Bonds and Notes over Total Assets (item 6)
Unsecured STL	Senior Unsecured Term Loans over Total Assets (item 6)
CP	Commercial Paper over Total Assets (item 6)
RC	Revolving Credit over Total Assets (item 6)
Int Rate	Interest Expenses over Total Debt
Maturity	Long-Term Debt (item 9) over Total Debt
Textual Analysis	
Secured RC	Dummy variable, takes a value of 1 if the firm-year observation has a revolving credit line secured by collateral
Unsecured RC	Dummy variable, takes a value of 1 if the firm-year observation has a revolving credit line unsecured
Cov Sec Div	Dummy variable, takes a value of 1 if the firm-year observation has a covenant limiting dividend payments in a secured debt contract
Cov Unsec Div	Dummy variable, takes a value of 1 if the firm-year observation has a covenant limiting dividend payments in an unsecured debt contract
Cov Sec Inv	Dummy variable, takes a value of 1 if the firm-year observation has a covenant limiting investment in a secured debt contract
Cov Unsec Inv	Dummy variable, takes a value of 1 if the firm-year observation has a covenant limiting investment in an unsecured debt contract
Cov Sec Fin	Dummy variable, takes a value of 1 if the firm-year observation has a financial covenant in a secured debt contract
Cov Unsec Fin	Dummy variable, takes a value of 1 if the firm-year observation has a financial covenant in an unsecured debt contract
Cov Intensity	Sum of dummy variables “Cov Div”, “Cov Inv”, and “Cov Fin”

Table A2
Textual Analysis Strategy: Covenants. This table summarizes the data extraction process to identify covenants in secured and unsecured debt contracts in the 10-K filings for the SEC. The procedure is simple as firms are obliged to disclose this information in a relatively standardized manner. I first run Steps 1-3 in Part 1 and find candidate sentences. Then, I look in the neighborhood of the keywords in Part 1 to locate pre-specified neighboring words to verify that the covenant is real and to identify the type (Part 2). Finally, I drop the negations and false positives.

Part 1: Pre-selection of Candidate Sentences		
Step 1: Identify Type of Debt Contract (**green**)	Step 2: Identify Priority of Debt Contract (**red**)	Step 3: Move forward to Covenant Discussion (**black**)
Keywords	*Keywords*	*Keywords*
revolving credit	secured	covenant
credit line	unsecured	
line of credit		
credit facilit		
term loan		
loan		
bond		
note		
Part 2: Read Discussion on Covenant Content		
Step 1: Identify Type of Covenant (**blue**)	Step 2: Rule out Exclusions	
Keywords	*Keywords*	
dividend	no/not	
capital expenditure		
investment		
capex		
fixed asset		
asset		
net worth		
equity		
leverage		
debt		
borrowing		
indebtedness		
debt-to-(ebitda/net worth/equity)		
coverage		
negative-pledge		
lien		

I generate the following six dummy variables: covenants limiting dividends in secured and unsecured contracts, covenants limiting investment in fixed assets in secured and unsecured debt contracts, and financial covenants in secured and unsecured debt contracts. When a hit is found, if a firm-year's filing contains the specified keywords but the surrounding text suggests that the firm does not use/have that financial contract or limitation, I treat that firm-year as a nonuser.

"*In August 2003, we issued $250.0 million 9.75% senior unsecured notes, due 2013, at a price of 99.2% of par to yield 9.875%. [...] The senior* ***unsecured notes*** *contain* ***covenants*** *which restrict or limit our ability to declare or pay* ***dividends***, *incur additional debt or liens, issue stock, engage in affiliate transactions, undergo a change in control or sell assets.*"

"*In August 2005, the company amended its revolving credit facility by entering into a $130 million amended and restated revolving credit agreement [...]. [...] The* ***credit facility*** *is* ***secured*** *by substantially all assets other than real property of the company and its subsidiaries and contains* ***covenants*** *that require, among other things, the maintenance of the* ***leverage*** *ratio and a fixed charge* ***coverage*** *ratio as well as minimum* ***net worth*** *requirements.*"

"*The credit agreement and the indenture governing the* ***secured notes*** *contain numerous financial* ***covenants,*** *including restrictions on incurring indebtedness and liens, making investments in or purchasing the stock of all or a substantial part of the assets of another person, selling property, making* ***capital expenditures***, *and paying cash dividends.*"

I follow a similar procedure to identify firms that have secured or unsecured credit lines. I search for the keywords that specifically identify firms that have a credit line, including "credit facilit," "credit line," or "revolving credit." When a credit line holder is found in the text, to assign the credit line as secured or unsecured, I search for additional words in the text surrounding the keyword. To identify secured credit lines, I use "secured" or "security interest," and I use "unsecured" to identify credit lines that do not require the pledge of collateral. When a match is found, I read the surrounding text and discard false positives. A firm-year observation is treated as a nonuser if it that does not contain any of the keywords related to credit lines or if the match cannot be validated with any neighboring word. Finally, I match the dummy variable with the sample.

Table A3
DID Estimation. How Book Leverage Changes in Response to the ABCP Shock. The table reports DID estimation results for the ATE on book leverage in the wake of the ABCP shock. Columns (2) and (4) exclude the share of unsecured debt to avoid the "bad controls" problem in Angrist and Pischke (2009). All firm characteristics are defined as in Rauh and Sufi (2010), Chaney et al. (2012), and Colla et al. (2013). Book leverage is multiplied by 100. Data are from U.S. public manufacturing firms (SIC codes 2000–3999) in Compustat. Standard errors are clustered at the source of variation, at the firm-level as in Petersen (2009), and regressions include firm and year fixed effects. The pre-treatment period considers fiscal years 2005–06. Columns (1)–(2) and (3)–(4) show results for the post-treatment periods of fiscal year 2007 and fiscal years 2007–08, respectively. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Table A1 in the Appendix describes the variables used in the analysis.

	Dependent Variable: Book Leverage			
Post-treatment:	2007		2007–08	
	(1)	(2)	(3)	(4)
ATE 2007	-0.025	0.012		
	(1.147)	(0.924)		
ATE 2007–08			0.698	0.337
			(1.162)	(0.853)
Share Unsecured	-0.177		-0.238	
	(0.107)		(0.146)	
Size	4.653	4.602*	2.457	3.562**
	(3.563)	(2.652)	(2.137)	(1.693)
Profitability	-23.460***	-23.811***	-21.702***	-23.248***
	(7.852)	(6.276)	(5.357)	(4.456)
Tangibility	6.227	4.612	5.423	6.542
	(15.795)	(12.226)	(10.118)	(8.263)
M/B	-0.924	-0.404	-0.673	-0.213
	(0.671)	(0.688)	(0.532)	(0.493)
CF Volatility	30.192	27.337	34.987**	35.402**
	(21.770)	(18.833)	(16.277)	(14.854)
Dividend Payer	0.418	0.012	0.710	-0.239
	(1.857)	(1.515)	(1.585)	(1.301)
Unrated	-7.316	-6.408	-9.255*	-7.852*
	(6.243)	(5.035)	(5.488)	(4.304)
Clustered SE	Firm	Firm	Firm	Firm
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
# Observations	2,264	2,264	3,116	3,116

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