Annals of Finance
https://doi.org/10.1007/s10436-024-00457-2

RESEARCH ARTICLE

The (un)secured debt puzzle: evidence for U.S. public firms

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Received: 4 December 2023 / Accepted: 7 November 2024

Abstract
Collateral availability determines secured debt, while creditworthiness determines unsecured debt. Both are relevant for the debt structure. Regardless of the benefits that pledging collateral may offer, firms substitute away from secured debt as financial constraints relax. An increase in the share of unsecured debt leads to an increase in investment. A higher investment and the preference for unsecured debt can be explained by firms' desire to minimize financing costs, spreads on unsecured debt are on average lower. This novel evidence complements existing literature on the collateral channel.

Keywords Unsecured debt · Debt structure · Financial constraints · Investment · Collateral

JEL Classifications G31 · G32 · G35 · G1 · E44

1 Introduction

Since the 70's, the law literature emphasizes the key role unsecured debt plays in firms' financial and investment decisions, and on creditors' bargaining process upon default. The *"secured debt puzzle"* highlights the costs of collateralization. It states that regardless of the benefits that pledging collateral might offer, large and financially strong firms prefer to finance investment with unsecured debt.[1] Instead, the finance

[1] See e.g., Kronman and Jackson (1979), Schwartz (1981), Levmore (1982), Scott (1986), Shupack (1989), Triantis (1992), LoPucki (1994), Mann (1997).

I am grateful to Anna Villamil (the editor) and to an anonymous referee for useful comments. I also want to thank Filippo Ippolito, Lynn LoPucki, Ronald Mann, Hugo Rodriguez Mendizabal, Gregory Udell, the participants of the UPF Finance Seminar, and the UPF Student Seminar for useful comments.

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literature has mainly focused on the benefits of pledging collateral.[2] Just recently, several papers document the declining relevance of secured debt (Benmelech et al. 2024; Lian and Ma 2020).

Creditors lend on an unsecured basis considering firms' creditworthiness. Current and expected future cashflows are a sufficient repayment guarantee (cashflow-based lending). Unsecured debt does not require pledging collateral that can be liquidated in an event of default as secured debt does (asset-based lending). The benefits of pledging collateral to access secured financing are widely understood. However, evidence on the costs associated with collateralized borrowing is scant (Donaldson et al. 2020; Badoer et al. 2020; Biguri 2023). Acknowledging both costs and benefits of pledging collateral, identifying the determinants of debt and capital structure (secured versus unsecured), and understanding the real implications of financing choices is crucial for business cycle dynamics (Azariadis et al. 2016).

In this paper, I gather stylized facts on the usage of unsecured debt and its presence in debt and capital structure. I shed light on how firms' collateral availability and creditworthiness interact in shaping debt and capital structure, and I analyze the impact of debt composition on investment. Finally, I suggest a plausible mechanism for firms' preference for unsecured debt.

The lack of focus on unsecured debt financing in the literature is surprising as unsecured debt is as important as secured debt, at least quantitatively. In particular, 64% of total financial debt outstanding of U.S. public manufacturing firms is unsecured, using data from Standard&Poor's (S&P) Compustat database from 1994 to 2010.

The *"secured debt puzzle"* suggests that debt composition is determined by factors other than collateral availability. Survey evidence in Graham (2022) may validate this hypothesis. The survey highlights the most relevant factors in the decision to issue debt, where creditworthiness plays a central role. Four of the five main factors relate to past, current, and future cashflows and creditworthiness.[3] Therefore, it is key to understand the extent to which both, collateral availability and creditworthiness constraints prevent firms from having their preferred debt structure, capital structure, and hence, investment.

Next, I summarize the results in the paper. First, I analyze how debt structure is determined and the extent to which firms' collateral availability and creditworthiness are imperfect substitutes. A one standard deviation increase in creditworthiness leads to an increase in the share of unsecured debt of 0.07 standard deviation units, while collateral availability reduces the share of unsecured debt by 0.02 standard deviation units. My evidence suggests that even firms financially constrained exhibit a preference for unsecured debt. The share of unsecured debt is increasing in collateral availability for them.

[2] Agency costs are discussed in Myers (1977) or Smith and Warner (1979), adverse selection and/or moral hazard in Chan and Thakor (1987) or Stiglitz and Weiss (1981), and the role of collateral in limited contract enforceability can be further explored in Kiyotaki and Moore (1997), Hennessy and Whited (2005), Chaney et al. (2012) or Livdan et al. (2009) among others.

[3] See Figure 16 and Table VII in Graham (2022) for further reference. The five leading factors affecting the decision to issue debt are (i) financial flexibility, defined as restricting debt so as to have enough internal funds available to pursue new projects when they come along, (ii) credit rating, (iii) earnings and cash flow volatility, (iv) insufficient internal funds, and (v) interest rates, as they issue debt when interest rates are low.

Then, I shed light on how capital structure determinants vary once we allow for debt heterogeneity to play a role. Rajan and Zingales (1995) show that cross-sectional leverage increases with collateral availability. When I sort leverage into secured and unsecured, the positive relation with collateral availability is driven by secured debt. The correlation between collateral availability and the share of unsecured debt is negative and statistically significant. A one standard deviation increase in collateral availability, reduces (increases) the share of unsecured (secured) debt in firms' capital structure by 0.06 standard deviation units. This result highlights that once we allow for debt heterogeneity to play a role, traditional determinants of capital structure become unclear.

Next, I analyze whether debt composition affects firms' investment. Estimation results for investment on the share of unsecured debt yield a positive and statistically significant coefficient. A one standard deviation increase in the share of unsecured debt leads to an increase in investment of 0.07 standard deviation units. This result suggests that debt composition has real effects on investment. Moreover, it highlights a complementary channel to the collateral channel. This alternative channel may operate through unsecured debt and creditworthiness, and may generate very different investment dynamics in the aggregate.

Finally, I suggest a plausible mechanism behind the investment results. I analyze debt contract spread data by sorting between secured and unsecured debt contracts. To control for observed and unobserved heterogeneity across firms and contract characteristics, I analyze spread determinants in an OLS setup. I derive two main results. First, firms' creditworthiness point estimates are negative and highly significant, while the coefficient for collateral availability lacks statistical significance across different specifications. These results suggest that there is no substitutability between collateral and spreads in bank debt. Second, unsecured debt contracts are on average 48 basis points lower than secured debt spreads. A higher share of unsecured debt leading to increased investment may be driven by lower spreads on unsecured debt contracts. Ultimately, minimizing firms' total financing costs.

This paper offers several contributions to the literature. First, I provide novel descriptive evidence on how the priority debt and capital structure are determined, the effect of debt composition on investment, and one mechanism behind the results. While earlier work (Giambona et al. 2021; Vig 2013) has analyzed some debt and capital structure implications, this paper provides a complete picture of the usage of secured and unsecured debt and its implications at the corporate level. Giambona et al. (2021), Vig (2013), and this paper suggest, but do not empirically test, that the costs of collateralization cannot be ignored when discussing the role of collateral and its impact on corporate policy decisions. Second, this paper contributes to the macro-finance literature on the collateral channel (Bernanke et al. 1996; Kiyotaki and Moore 1997). It sheds light on how debt structure considerations might be key to understand the propagation and amplification of exogenous shocks to the real economy.

The structure of the paper is as follows. Section 2 describes the sample and presents descriptive summary statistics on debt structure and its interaction with collateral availability and creditworthiness. Section 3 presents the main results. It reports regression results for debt structure, capital structure, and investment. Section 4 sheds light on a

plausible mechanism: price-setting for secured and unsecured debt contracts. Section 5 concludes.

2 Data overview

I define total debt secured by means of item #241 in Compustat, *"Mortgages and Other Secured Debt"*, which allows to define unsecured debt as the difference between total financial debt, short- and long-term, minus total secured debt. This definition is consistent with that in Giambona et al. (2021) and Barclay et al. (1995).

I use four different creditworthiness proxies. Book and market creditworthiness are defined as the inverses of leverage. Book value creditworthiness reflects the extent to which the firm generated cash flows through investment decisions in the past for any given payout policy (backward-looking), while market value creditworthiness is the forward-looking version. It's the present value of the cash flows that the firm is expected to generate into the future. For robustness, two more proxies are analyzed: retained earnings over total assets and the S&P Bond Rating.

Collateral availability is proxied by tangibility [as in Almeida and Campello (2007)]. I also define net trade credit borrowing days. Two reasons motivate the inclusion as a control. First, trade credit has priority upon default over unsecured debt. Second, evidence in Cunat (2007) shows that trade credit has an effect in capital structure choices. I define this variable as the difference between accounts payable outstanding days minus accounts receivables outstanding days. I also define a trade credit dummy, which takes the value of 1 if the firm has accounts payable over total assets above receivables over total assets. In constructing the rest of firm characteristics, I build on Colla et al. (2013).

To construct the sample, I start with U.S. firms traded on the AMEX, NASDAQ, and NYSE, and covered by S&P's database Compustat from 1994 to 2010. I remove all firm-year observations which are not from the manufacturing sector (SIC codes 2000-3999). I further remove (i) firm-years with missing, negative or zero values for total assets; (ii) firm-years with missing, negative or zero common equity, and (iii) firm-years with missing, negative or zero values for net property, plant and equipment. Finally, I winsorize all key firm characteristics at the 1st and 99th percentiles. The final sample for the manufacturing sector comprises 25,096 firm-year observations. Table 1 presents descriptive statistics for the manufacturing sample from 1994 to 2010. "Appendix A1" provides a detailed description of the variables used in the analysis.

The main conclusion from Table 1 is that U.S. public manufacturing firms exhibit a pecking-order for unsecured debt. Summary statistics show that the average firm-year observation has a share of unsecured debt of 64%. The average share of unsecured debt in capital structure is 15%, while the share of secured debt over total assets is 8%. Regardless of the benefits that pledging collateral might offer, firms seem more eager to hold unsecured debt.

The remaining firm characteristics highlight that the average firm-year observation has book creditworthiness of 69%, which denotes a strong balance sheet condition, high collateral availability of 26%, and enjoys high investment opportunities, as evidenced by the market-to-book ratio. U.S. public manufacturing firms are large and

Table 1 Sample overview 1994–2010

	Mean	25th p	Median	75th p	Std. Dev.
Share Unsecured (Debt)	0.64	0.30	0.79	1.00	0.37
Share Unsecured (Assets)	0.15	0.02	0.11	0.24	0.15
Share Secured (Assets)	0.08	0.00	0.02	0.11	0.12
Book Creditworthiness	0.69	0.54	0.71	0.89	0.22
Market Creditworthiness	0.77	0.65	0.83	0.95	0.21
Tangibility	0.26	0.12	0.23	0.37	0.17
Size	1357.32	40.78	160.11	788.60	3570.52
Market-to-book	1.59	0.79	1.14	1.87	1.32
Profitability	0.05	0.03	0.11	0.16	0.20
Cash Holdings	0.17	0.02	0.08	0.23	0.21
Investment	0.08	0.02	0.04	0.09	0.10
Rated	0.22	0.00	0.00	0.00	0.53
Dividend Payer	0.31	0.00	0.00	1.00	0.46
Trade Credit	0.20	0.00	0.00	0.00	0.40
Net Trade Credit (days)	15.96	−26.75	−8.47	12.02	1,113.61
# Observations					25,096

This table contains summary statistics for key firm characteristics from U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010. "Appendix A1" provides a detailed description of the variables used in the analysis

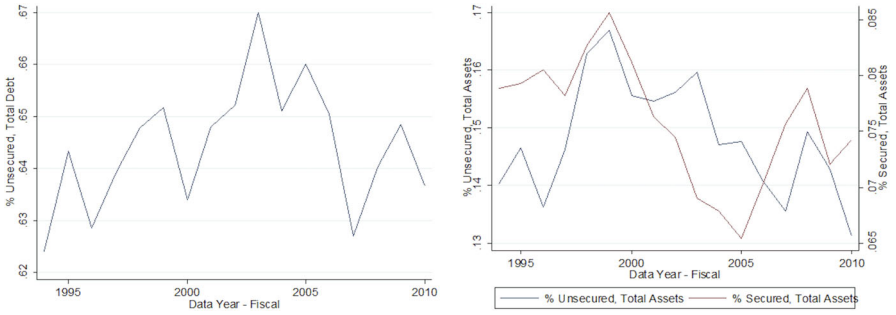

Fig. 1 Time Series for Debt and Capital Structure of U.S. Public Manufacturing Firms (SIC Codes 2000-3999) from 1994 to 2010. The left panel reports the share of unsecured debt (debt structure), while the right panel reports the evolution of the share of unsecured debt (left axis) and secured debt (right axis) in capital structure. "Appendix A1" provides a detailed description of the variables used in the analysis

profitable and seem to hold cash for precautionary reasons, 17%. Finally, 22% have a S&P long-term bond rating, 31% pay common dividends, and 20% use trade credit as an alternative source of financing as opposed to or in addition to financial debt.

Figure 1 presents the time series for U.S. public manufacturing firms' usage of secured and unsecured debt, including debt and capital structure. The share of unsecured debt exhibits well-defined cyclical properties; it increases during recessions (counter-cyclical). The pecking-order for unsecured is consistent across time since

1994. The capital structure graph shows that both secured and unsecured debt follow a downward trend since the late 90's, but they peak again at the beginning of the 2007 recession.

2.1 Overview of debt structure

I start by evaluating whether firms with different debt structures have different firm characteristics. Table 2 presents summary statistics for different debt structure thresholds. It also includes specialized debt structures, as firms financially constrained tend to specialize in one type of debt (Rauh and Sufi 2010; Colla et al. 2013).

Only 27% of the sample specializes on one type of debt, from which only 13.18% choose to specialize in secured debt. In terms of mixed debt structures, the highest concentration of firm-year observations is located in the interval in which firms hold more than 75% in unsecured debt but less than 100%. That is, 52% of firm-year observations have more than 75% of their debt in unsecured debt.

From the analysis of firm characteristics in specialized debt structures, I conclude that firms relying 100% in secured debt are on average less levered, are much smaller in size, they are less profitable, and hold higher cash balances.[4] Moreover, only 7% have a S&P Bond Rating, 18% pay common dividends, and 20% could be relying on trade credit.

The strong preference for unsecured debt shown by manufacturing firms and the firm characteristics displayed by those firms that uniquely borrow on secured debt suggests that these firms tend to be financially constrained. However, there are no significant differences in terms of average and median collateral availability. That is, the lack of collateral does not seem to be the reason for these firms to be financially constrained.

Considering non-linearities in terms of collateral availability seems important to provide further evidence about how debt structure is determined. Table 3 examines the relation of book creditworthiness and available collateral with the mean and median share of unsecured debt. I perform a two-way sorting procedure based on the quartiles of the creditworthiness and tangibility distributions.

Two important conclusions can be derived from the analysis in Table 3. First, firms with the highest share of unsecured debt locate in the second quartile of the creditworthiness distribution (0.58–0.71) and the propensity toward a higher share of unsecured debt seems independent of tangbility. Indeed, the highest average and median share of unsecured debt is found in the first and second quartiles of the collateral availability distribution. That is, whether or not firms' collateral availability is high seems irrelevant if their creditworthiness is high enough.[5] This finding challenges the idea that firms that lack collateral tend to be financially constrained. Instead, it shows that even for firms with low collateral availability, borrowing is not necessarily a constraint.

[4] Note that this is evidence for the positive cashflow sensitivity of cash holdings of financially constrained firms in Almeida et al. (2004).

[5] The t-test conducted to test the hypothesis of whether observations in the first and fourth quartiles of tangibility are significantly different yields a negative and statistically significant result.

Table 2 Summary statistics by debt structure category

	Specialized, 100%		Mixed			
	Secured	Unsecured	0–25%	25–50%	50–75%	75–100%
Share Unsecured (Debt)	0.00	1.00	0.10	0.38	0.63	0.93
	[0.00]	[1.00]	[0.09]	[0.38]	[0.62]	[0.95]
Share Unsecured (Assets)	0.00	0.22	0.02	0.08	0.14	0.23
	[0.00]	[0.21]	[0.01]	[0.06]	[0.12]	[0.22]
Share Secured (Assets)	0.19	0.00	0.20	0.13	0.08	0.02
	[0.14]	[0.00]	[0.18]	[0.10]	[0.07]	[0.01]
Book Creditworthiness	0.75	0.69	0.70	0.73	0.70	0.66
	[0.81]	[0.70]	[0.74]	[0.80]	[0.73]	[0.67]
Market Creditworthiness	0.81	0.80	0.76	0.79	0.76	0.75
	[0.88]	[0.84]	[0.83]	[0.88]	[0.84]	[0.80]
Tangibility	0.25	0.26	0.27	0.25	0.25	0.26
	[0.22]	[0.23]	[0.24]	[0.22]	[0.22]	[0.22]
Size	189	2166	333	430	644	2266
	[70.12]	[546.69]	[81.31]	[58.57]	[81.02]	[350.68]
Market-to-book	1.57	1.58	1.55	1.79	1.64	1.52
	[1.10]	[1.20]	[1.09]	[1.23]	[1.12]	[1.11]
Profitability	0.04	0.09	0.05	0.01	0.03	0.06
	[0.10]	[0.13]	[0.10]	[0.08]	[0.09]	[0.11]
Cash Holdings	0.19	0.16	0.17	0.23	0.18	0.15
	[0.10]	[0.08]	[0.08]	[0.11]	[0.07]	[0.07]

Table 2 continued

	Specialized, 100%		Mixed			
	Secured	Unsecured	0–25%	25–50%	50–75%	75–100%
Rated	0.07	0.36	0.09	0.09	0.14	0.30
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Dividend Payer	0.18	0.52	0.17	0.13	0.18	0.41
	[0.00]	[1.00]	[0.00]	[0.00]	[0.00]	[0.00]
Trade Credit	0.20	0.15	0.21	0.26	0.21	0.19
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Net Trade Credit (days)	2.67	−4.88	12.89	12.89	24.94	34.77
	[−11.35]	[−11.09]	[−9.04]	[−4.86]	[−7.1]	[−7.46]
# Observations	903	5947	4664	3398	3136	7048

This table contains mean and median (in brackets) for key relevant firm characteristics and controls by reliance on debt types for U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010. The first two columns contain the 100% secured and unsecured debt structures, respectively. For the rest of the columns, column 0-25% for instance, contains firm-year observations with a share of debt unsecured higher than zero but lower or equal to 25%. "Appendix A1" provides a detailed description of the variables used in the analysis

Table 3 Two-way sorting of the Share of Unsecured Debt, by Creditworthiness and Tangibility

Book Creditworthiness	Tangibility				
	1st Quartile (0.12)	2nd Quartile (0.23)	3rd Quartile (0.37)	4th Quartile	t-test
1st Quartile (0.54)	0.65	0.67	0.69	0.61	3.02***
	[0.91]	[0.88]	[0.90]	[0.75]	
2nd Quartile (0.71)	0.71	0.74	0.69	0.70	1.00
	[0.99]	[0.98]	[0.95]	[0.94]	
3rd Quartile (0.89)	0.55	0.51	0.51	0.57	1.16
	[0.77]	[0.60]	[0.62]	[0.76]	
4th Quartile	0.23	0.27	0.39	0.42	9.88***
	[0.00]	[0.00]	[0.00]	[0.08]	
t-test	31.32***	28.84***	18.88***	10.05***	

This table reports the relation between the share of unsecured debt, book creditworthiness, and tangibility for U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010. Two-way sorting is carried out year by year, and then, aggregated across years. Each cell in the table presents mean and median (in brackets) share of unsecured debt (debt structure). The last row reports the result of a difference in means test between the first and fourth quartile of the creditworthiness distribution. The last column reports the result of a difference in means test between the first and fourth quartile of the tangibility distribution. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively. "Appendix A1" provides a detailed description of the variables used in the analysis

Second, firm-year observations with the lowest share of unsecured debt locate in the fourth quartile of the creditworthiness distribution and in the first quartile of the tangibility distribution (where the financially constrained firms are located). The average share of unsecured debt is 23%. As collateral availability increases, firms increase the share of unsecured debt. When firms face a weak balance sheet condition, incorporating more tangible assets provides access to unsecured debt markets. However, if the median holdings are considered for financially constrained firms, they exhibit no unsecured debt holdings. The median financially constrained firm does not have access to unsecured debt markets.

The descriptive analysis so far yields the following conclusions. First, unsecured debt is quantitatively more relevant than secured in terms of debt and capital structure. This evidence is consistent across time. The majority of firms show a strong reliance on debt and capital structures with a high share unsecured debt. Second, collateral availability and creditworthiness appear to be imperfect substitutes. As a result, debt structure seems to be determined by the interaction between both, not solely by collateral availability. Finally, the descriptive evidence seems to validate the collateral channel: higher collateral availability leads to higher borrowing capacity.

3 Results: the (un)secured debt puzzle

In this section, I present the main results of the paper. I report ordinary least squares (OLS) regression results on debt and capital structure determinants and on the effects of debt structure on investment.

3.1 Determinants of debt structure

The empirical specification is defined as follows:

$$\frac{Unsecured_{i,t}}{TotalDebt_{i,t}} = \theta_i + \varphi_t + \gamma Creditworthiness_{i,t-1} + \delta Collateral_{i,t-1} + X'_{i,t-1}\beta + \epsilon_{i,t}. \quad (1)$$

Equation (1) is estimated using OLS for the sample of manufacturing firms from 1994 to 2010. $\frac{Unsecured_{i,t}}{TotalDebt_{i,t}}$ is the share of unsecured debt, $Creditworthiness_{i,t-1}$ is firms' creditworthiness, and $Collateral_{i,t-1}$ is collateral availability proxied by the firms' tangible assets. The regression contains a set of control variables $X'_{i,t-1}$, including the log of size, market-to-book, profitability, cash holdings, and dummies to control for whether or not the firm is rated, pays a common dividend and uses trade credit. All specifications are estimated with lagged regressors, using firm-fixed effects to control for unobserved firm heterogeneity, θ_i, and year-fixed effects, φ_t. Finally, I include heterokedasticity-consistent errors clustered at a firm level, as in Petersen (2009).

The hypotheses being tested are $\gamma > 0$ and $\delta < 0$. That is, collateral availability determines secured debt, while creditworthiness determines unsecured debt holdings. Table 4 reports the results for the determinants of debt structure for four different

Table 4 Debt structure determinants

	Dependent Variable: Share Unsecured (Debt)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Book Creditworthiness	0.199***	0.109***						
	(0.0336)	(0.0300)						
Market Creditworthiness			0.0914***	0.148***				
			(0.0278)	(0.0291)				
Retained Earnings					0.0960**	0.108**		
					(0.0424)	(0.0440)		
A-Rated							0.0808***	0.0562***
							(0.0195)	(0.0188)
B-Rated							0.0745***	0.0527***
							(0.0173)	(0.0158)
Tangibility	−0.279***	−0.245***	−0.155***	−0.182***	−0.0750	−0.0505	−0.168***	−0.197***
	(0.0428)	(0.0359)	(0.0484)	(0.0526)	(0.0696)	(0.0742)	(0.0479)	(0.0528)
Log (Size)		0.0588***		0.0398***		0.0630***		0.0323***
		(0.00345)		(0.00887)		(0.0136)		(0.00892)
Market-to-book		0.0186***		−0.00804***		0.00543		−0.00359
		(0.00456)		(0.00307)		(0.00526)		(0.00295)
Profitability		−0.175***		−0.0750***		−0.0825		−0.0493*
		(0.0314)		(0.0286)		(0.0623)		(0.0283)
Trade Credit		0.00186		−0.00307		−0.0243*		−0.00404
		(0.0115)		(0.00925)		(0.0129)		(0.00919)
# Observations	25,096	25,048	25,096	25,048	25,096	25,048	25,096	25,048
R^2	0.626	0.631	0.638	0.642	0.693	0.698	0.638	0.641

This table reports regression results for the determinants of debt structure for U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010. Columns (1)–(2) report results for book creditworthiness, Columns (3)–(4) for market creditworthiness, Columns (5)–(6) for retained earnings over total assets, and Columns (7)–(8) for S&P Bond Rating dummies. All specifications include firm- and year-fixed effects. Robust standard errors are clustered at the firm level [as in Petersen (2009)] and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively. Point estimates on some controls are omitted for presentation purposes. "Appendix A1" provides a detailed description of the variables used in the analysis

creditworthiness proxies. In addition to book (columns (1) and (2)) and market creditworthiness (columns (3) and (4)), I include retained earnings over total assets (columns (5) and (6)), and S&P's bond rating (columns (7) and (8)) for robustness.

If we focus in column (2), the estimate of 0.109 on book creditworthiness suggests that a 1% increase leads to a 0.109% increase in the share of unsecured debt. Firms appear to adjust their debt structure towards less secured debt in response to positive changes in creditworthiness. These findings are consistent across the different creditworthiness definitions (in columns (2) and (3)–(8)). The estimated coefficients in all specifications are both economically and statistically significant.

On the other hand, the coefficient on tangibility in column (2), −0.245, suggests that a 1% increase generates a decrease in the share of unsecured debt equal to 0.245%. Firms adjust their debt structure towards more secured debt in response to positive changes in collateral availability, which is in line with the predictions from the collateral channel.

Results on the sensitivity of unsecured debt to changes in collateral availability and creditworthiness imply the existence of a trade-off. A strong balance sheet condition guarantees that debt structure will pivot around 75-100% unsecured debt. However, higher collateral availability reduces this dependence. A one standard deviation increase in firms' creditworthiness leads to an increase in the share of unsecured debt of 0.07 standard deviation units, while collateral availability reduces the share of unsecured debt by 0.02 standard deviation units.

Summing up, two relevant conclusions can be derived from the analysis of the determinants of debt structure. First, although collateral availability and creditworthiness seem imperfect substitutes, creditworthiness has a first-order effect on debt structure. Above some creditworthiness thresholds, collateral availability seems irrelevant. Second, firms that are financially constrained, on average, have access to unsecured debt. As collateral availability increases, firms increase the share of unsecured debt.

3.2 Determinants of capital structure

Next, I focus on the role of collateral availability and creditworthiness as determinants of capital structure. The empirical specifications are defined as follows:

$$\frac{DebtType_{i,t}}{TotalAssets_{i,t}} = \theta_i + \varphi_t + \gamma^{type} Creditworthiness_{i,t-1} + \delta^{type} Collateral_{i,t-1} + X'_{i,t-1}\beta^{type} + \epsilon_{i,t}, \quad (2)$$

where $DebtType_{i,t}$ can be either total, secured, or unsecured debt, $Creditworthiness_{i,t-1}$ is firms' creditworthiness, and $Collateral_{i,t-1}$ is collateral availability proxied by the firms' tangible assets. The hypotheses being tested is $\delta^{sec} > 0$ in the secured debt over total assets regression and $\delta^{unsec} < 0$ in the unsecured debt over total assets regression.[6]

[6] The regressions maintain the same set of controls, $X'_{i,t-1}$, as in the debt structure regressions: log of size, market-to-book, profitability, and dummies for whether the firm is rated, pays a common dividend or uses trade credit.

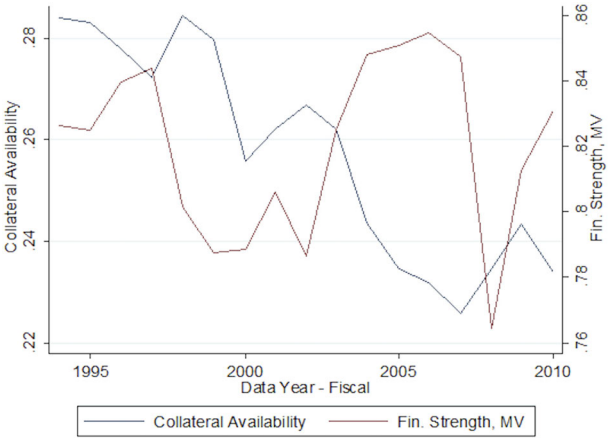

Fig. 2 Time Series for Collateral Availability and Creditworthiness of U.S. Public Manufacturing Firms (SIC codes 2000-3999) from 1994 to 2010. Collateral availability is proxied by property, plant and equipment, net (left axis), while creditworthiness is reported at market value (right axis). "Appendix A1" provides a detailed description of the variables used in the analysis

The balance sheet channel literature establishes that higher collateral availability increases borrowing capacity of firms. However, it remains silent on whether it increases secured, unsecured, or both types of debt. The sign for the estimated parameters in equation (2) would provide sufficient evidence to understand the effect of collateral.

Moreover, $\delta^{unsec} < 0$, would provide evidence for an additional channel, complementary to the balance sheet channel. This channel would operate through firms' creditworthiness and unsecured debt, and could play a role in the transmission of exogenous shocks to the real economy. Kiyotaki and Moore (1997) or Bernanke et al. (1996) show that a reduction in the market value of collateral reduces borrowing capacity. This effect is amplified in a dynamic setup. However, these papers generally rely on a debt homogeneity assumption: all debt is secured debt. The cross-sectional evidence presented so far in the paper shows that the dependence on secured debt to finance investment is more likely for financially constrained firms. Therefore, these firms are also more likely to be affected by exogenous shocks. Figure 2 shows a reduction in market creditworthiness in the 2007 recession, and thus, it suggests that creditworthiness is as pro-cyclical as the prices of assets.

Table 5 reports the estimation results for the determinants of the capital structure regression. Columns (1)–(2) report the estimated coefficients for book leverage, while columns (3)–(4) and (5)–(6) report those for secured and unsecured over total assets, respectively. Odd columns report results using book creditworthiness as a control, while even columns report results using market creditworthiness.

The results in columns (3)–(4) suggest that a higher collateral availability increases secured debt holdings in terms of capital structure. More precisely, a 1% increase in collateral availability, increases the share of secured debt in the capital structure by 0.077% (book, column (3)) and 0.0541% (market, column (4)).

Table 5 Capital structure determinants regression results

	Book leverage		Share secured (Assets)		Share unsecured (Assets)	
	(1)	(2)	(3)	(4)	(5)	(6)
Book Creditworthiness	−0.709***		−0.227***		−0.482***	
	(0.005)		(0.010)	(0.010)		
Market Creditworthiness		−0.564***		−0.269***		−0.295***
		(0.011)		(0.011)		(0.014)
Tangibility	0.036***	−0.000765	0.077***	0.0541***	−0.041**	−0.055***
	(0.007)	(0.017)	(0.016)	(0.016)	(0.016)	(0.019)
Log (Size)	0.014***	0.009***	−0.004	−0.008***	0.017***	0.017***
	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Market-to-book	5.87e−05	0.010***	−0.000	0.006***	0.000	0.004***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Profitability	0.002	−0.048***	0.014*	0.012	−0.012	−0.060***
	(0.004)	(0.011)	(0.008)	(0.080)	(0.008)	(0.011)
Trade credit	−0.014***	−0.008**	−0.006**	−0.004	−0.008***	−0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Firm &Year FE	yes	yes	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm	firm	firm
# Observations	25,096	25,096	25,096	25,096	25,096	25,096
R^2	0.972	0.818	0.719	0.716	0.806	0.690

This table reports regression results to examine the relation between capital structure, creditworthiness, and collateral availability for U.S. public manufacturing firms (SIC codes 200-3999) from 1994 to 2010. All specifications include firm- and year-fixed effects. Robust standard errors are clustered at the firm level [as in Petersen (2009)] and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively. Point estimates on some controls are omitted for presentation purposes. "Appendix A1" provides a detailed description of the variables used in the analysis

The results in columns (5)–(6) suggest that higher collateral availability does not lead to a higher share of unsecured debt once we control for unobserved variation at the firm level. Firms appear to adjust their capital structure towards a lower share of unsecured debt (by 0.041% in column (5) and 0.055% in column (6)) as their collateral availability increases (a 1% increase). A one standard deviation increase in collateral availability, reduces (increases) the share of unsecured (secured) debt in capital structure by 0.06 standard deviation units.

This result is very interesting from a balance sheet channel perspective. More collateral availability decreases the degree of financial frictions faced, which increases secured borrowing capacity. However, it does not increase unsecured debt holdings. The result suggests the existence of a different mechanism, in addition to the conventional collateral channel, which would operate through unsecured debt: the unsecured channel. This alternative channel could generate very different investment dynamics, which I analyze in the next section.

3.3 Effect of debt structure on investment

The empirical specification is defined as follows:

$$\frac{Capex_{i,t}}{TotalAssets_{i,t}} = \theta_i + \varphi_t + \gamma\, Punsec_{i,t} + X'_{i,t-1}\beta + \epsilon_{i,t}, \tag{3}$$

where $Capex_{i,t}$ is investment in fixed assets and $Punsec_{i,t}$ is the share of unsecured debt. The hypothesis being tested is the sign of γ. That is, testing whether debt composition has real effects on investment. The regressions contains a set of controls, $X'_{i,t-1}$, relevant to the investment decision including log of size, market-to-book, profitability, collateral availability, and firms' creditworthiness proxies. A positive and statistically significant sign on γ would imply that a higher share of unsecured debt increases firm investment.

Table 6 shows the estimated coefficients for the different creditworthiness proxies defined on the regression of debt structure on investment. Columns (1)–(2) show results for book creditworthiness, (3)–(4) for market creditworthiness, and (5)–(6) for retained earnings over total assets. The difference between odd and even columns is that even columns account for possible non-linearities in the relation between debt structure and investment (they include $Punsec^2_{i,t}$ as control).

Estimated coefficients across different creditworthiness proxies yield the same conclusion. A higher share of unsecured debt implies a higher level of investment. A 1% increase in the share of unsecured debt leads to an increase in investment of 0.8%, 0.9%, and 0.3% for book creditworthiness, market creditworthiness, and retained earnings, respectively. That is, a one standard deviation increase in the share of unsecured debt leads to an increase in investment of 0.07 standard deviation units. Results suggest that the composition of debt has real effects on investment. The most important implication of this result is that while more collateral availability increases investment when the level of debt is considered, the results suggest the opposite impact when the composition of debt structure is considered [as in Biguri (2023)].

Table 6 Investment determinants regression results

	Dependent Variable: Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Share Unsecured	0.00239**	0.00874**	0.000645	0.00982**	0.00217*	0.00305***
	(0.00117)	(0.00353)	(0.00116)	(0.00455)	(0.00117)	(0.00118)
Book Creditworthiness	0.0182***	0.0238***				
	(0.00226)	(0.00379)				
Market Creditworthiness			0.0320***	0.0385***		
			(0.00264)	(0.00422)		
Retained Earnings					0.00350***	0.00218***
					(0.000673)	(0.000745)
Tangibility	0.153***	0.154***	0.155***	0.156***	0.151***	0.150***
	(0.00634)	(0.00633)	(0.00627)	(0.00624)	(0.00643)	(0.00643)
Log(Size)	0.00429***	0.00428***	0.00512***	0.00507***	0.00201**	0.00172**
	(0.000768)	(0.000768)	(0.000771)	(0.000770)	(0.000833)	(0.000839)
Profitability	0.0136***	0.0137***	0.0118***	0.0119***	0.0121***	0.0112***
	(0.00328)	(0.00328)	(0.00323)	(0.00323)	(0.00337)	(0.00334)
Market-to-book	0.00351***	0.00350***	0.00273***	0.00273***	0.00378***	0.00374***
	(0.000403)	(0.000403)	(0.000403)	(0.000403)	(0.000404)	(0.000404)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.620	0.620	0.623	0.623	0.619	0.619
# Observations	23,794	23,794	23,794	23,794	23,758	23,758

This table reports regression results to examine the relation between investment and the composition of debt for U.S. public manufacturing firms (SIC codes 200-3999) from 1994 to 2010. All specifications include firm- and year-fixed effects. Robust standard errors are clustered at the firm level [as in Petersen (2009)] and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively. Point estimates on some controls are omitted for presentation purposes. "Appendix A1" provides a detailed description of the variables used in the analysis

4 A possible mechanism: bank debt spreads

It is still unclear what is the underlying mechanism behind the strong preference for unsecured debt. While Giambona et al. (2021) suggest spare collateral capacity as the factor contributing to the preference for unsecured debt, the survey by Graham (2022) remains silent on it. Instead, it highlights interest rates and a strong balance sheet condition as the primary factors affecting debt issuance. Moreover, results presented so far suggest that the lack of collateral capacity may be substituted with creditworthiness. In this section, I test the role of spreads in the preference for unsecured debt. The hypothesis being tested is whether the preference comes from the fact that unsecured debt allows firms to minimize total financing costs [as in Graham and Leary (2011)].

The conventional wisdom regarding interest rates is that secured debt contracts have a lower interest rate than unsecured. This is the case as the ex-ante risk of unsecured debt contracts for financial intermediaries is very high due to the lack of collateral. However, in practice, the interest rate for unsecured debt contracts is competitive.

Moreover, the construction of interest rate spreads could also suggest that unsecured debt contracts could be cheaper. The cost of debt is computed as the sum of the risk-free rate plus a risk premium. The risk premium is a function of the probability of default or credit quality. Other things being equal, firms with higher credit quality should exhibit a lower risk-premium, and thus, a lower cost of debt. Evidence in Rauh and Sufi (2010) shows that as credit quality increases, firms substitute toward unsecured debt (debt structure) and toward equity (capital structure). Then, one should expect firms borrowing predominantly on an unsecured basis to experience a lower spread over the risk-free or reference rate.[7]

To test this hypothesis, I analyze interest rate and borrower and loan characteristics at loan origination.

4.1 Debt contract data overview

Table 7 shows the summary statistics, for interest rates, borrower and loan characteristics, from all bank debt contracts signed by U.S. public manufacturing firms from 1994 to 2010. I classify them into secured and unsecured. The information on interest rates of loans comes from LPC's Dealscan. "Appendix A2" contains detailed information on how the sample for debt contracts has been constructed.

The average secured debt contract has the spread over the reference rate of 242.44 basis points, while the spread for unsecured debt contracts is equal to 105.67 basis points. Figure 3 reports the time series of spreads for both types of debt contracts. It shows that the average spreads have been systematically lower for unsecured debt contracts since 1994. Figure 4 reports the time series for the number of secured and unsecured debt contracts. The graphs exhibit a decreasing pattern since 1998 for the

[7] To the best of my knowledge, Hester (1979) is the first to show that firms borrowing on a secured basis are riskier. Additionally, Berger and Udell (1990) analyze the commercial and industrial loans market in the U.S. and they conclude that when risk is observable secured debt is riskier (e.g., a higher interest rate premium than unsecured debt contracts). Similarly, Carey et al. (1993) analyze the market for private placements and John et al. (2003) focus on bonds, reaching the same conclusion.

Table 7 Summary statistics for secured and unsecured debt contracts from 1994 to 2010

	All contracts			Secured contracts			Unsecured contracts			t-test
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	
Spread	171.82	150.00	137.26	242.44	236.25	134.98	105.67	72.00	101.87	0.00
Borrower Characteristics										
Share Unsecured (Debt)	0.71	0.95	0.37	0.45	0.43	0.35	0.94	1.00	0.19	0.00
Share Unsecured (Assets)	0.19	0.18	0.16	0.14	0.10	0.15	0.24	0.23	0.15	0.00
Share Secured (Assets)	0.09	0.01	0.14	0.17	0.13	0.15	0.01	0.00	0.05	0.00
Book Creditworthiness	0.60	0.62	0.23	0.58	0.58	0.25	0.63	0.64	0.21	0.00
Market Creditworthiness	0.77	0.82	0.20	0.73	0.77	0.23	0.81	0.84	0.17	0.00
Tangibility	0.26	0.23	0.16	0.26	0.22	0.17	0.27	0.24	0.16	0.05
Size	3600	553	12,250	917	180	4494	6112	1497	16,084	0.00
Market-to-book	1.51	1.14	1.46	1.47	1.06	1.78	1.55	1.22	1.06	0.07
Profitability	0.11	0.13	0.15	0.07	0.11	0.18	0.15	0.14	0.10	0.00
Cash Holdings	0.10	0.04	0.14	0.10	0.04	0.16	0.09	0.04	0.11	0.02
Trade Credit	−11.34	−10.70	169.70	−8.13	−10.46	161.73	−14.33	−11.17	176.77	0.18
Loan Characteristics										
Amount Facility	18.06	18.42	1.89	17.15	17.22	1.77	18.90	19.11	1.58	0.00
Maturity Facility	3.55	3.69	0.72	3.62	3.69	0.67	3.50	3.69	0.76	0.00
Seniority	1.00	1.00	0.05	1.00	1.00	0.02	1.00	1.00	0.06	0.40
Syndication	0.82	1.00	0.08	0.73	1.00	0.44	0.89	1.00	0.31	0.00
Term Loans	0.22	0.00	0.42	0.32	0.00	0.47	0.12	0.00	0.33	0.00
Revolving Credit	0.73	1.00	0.44	0.63	1.00	0.48	0.84	1.00	0.37	0.00
# Debt Contracts	4615			2232			2383			

This table presents the comparison of spreads over reference rate (LPC's Dealscan) and firm and loan characteristics of secured and unsecured debt contracts at date of origination for U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010. The last column reports the result of a difference in means test between firm and loan characteristics of secured and unsecured debt contracts. "Appendix A1" provides a detailed description of the variables used in the analysis

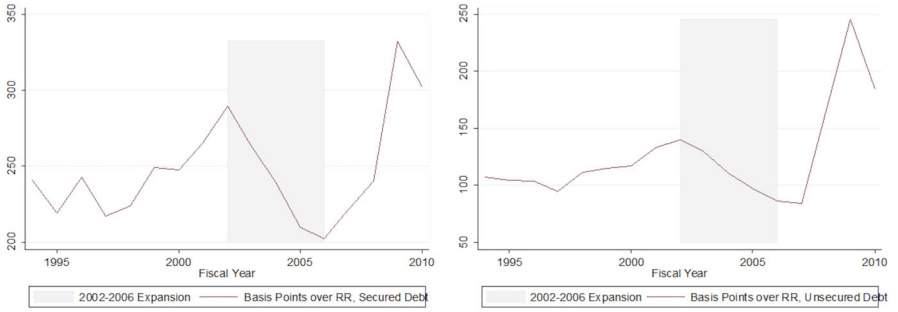

Fig. 3 Time Series for Basis Points over Reference Rate of U.S. Public Manufacturing Firms (SIC Codes 2000-3999) from 1994 to 2010. The left panel reports the time series for basis points over reference rate for secured debt contracts, while the right panel reports the time series for basis points over reference rate for unsecured debt contracts in LPC's Dealscan

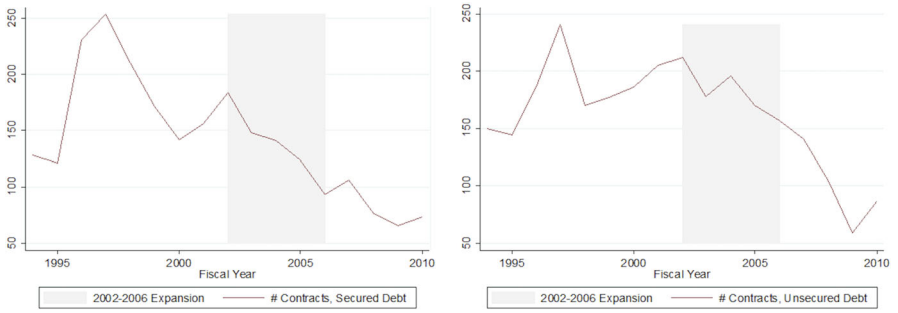

Fig. 4 Time Series for the Number of Debt Contracts of U.S. Public Manufacturing Firms (SIC Codes 2000-3999) from 1994 to 2010. The left panel reports the time series for the number of secured debt contracts, while the right panel reports the time series for the number of unsecured debt contracts in LPC's Dealscan

number of secured debt contracts signed. Instead, unsecured debt contracts seem to decrease only after the 2007 recession.

4.2 Regression results

To formally test the pecking-order mechanism for unsecured debt, I implement the following regression specification:

$$SpreadType_{i,t} = \theta_i + \varphi_t + \gamma^{type} Creditworthiness_{i,t-1} + \delta^{type} Collateral_{i,t-1} + Borrower'_{i,t-1}\beta_b^{type} + Loan'_{i,t-1}\beta_l^{type} + \epsilon_{i,t}. \quad (4)$$

The empirical specification is estimated using OLS for the sample of debt contracts from 1994 to 2010. $SpreadType_{i,t}$ is the spread over the reference rate of all, secured, and unsecured debt contracts, $Creditworthiness_{i,t-1}$ is firms' creditworthiness, and $Collateral_{i,t-1}$ is collateral availability. The regression contains a set of borrower characteristic as control variables, $Borrower'_{i,t-1}$. I include the log of size, market-to-book, profitability, cash holdings, and dummies to control for whether or not the

firm is rated, pays a common dividend and uses trade credit. $Loan'_{i,t-1}$ contains loan characteristic controls: principal amount, maturity, and dummies for syndication, term loans, revolving credit facilities, and seniority. All specifications are estimated with lagged regressors and facility-fixed effects. θ_i controls for unobserved heterogeneity in debt contracts and φ_t controls for unobserved heterogeneity across time. All specifications include heterokedasticity-consistent errors clustered at a facility level.

First, I focus on how collateral availability and creditworthiness affect interest spreads. In Table 8, columns (1)–(2) report results for the determinants of interest rate spreads for all contracts signed by manufacturing firms from 1994 to 2010. A higher book or market creditworthiness decreases debt contract spreads. A 1% increase in book or market creditworthiness reduces spreads by 110.1 and 142.2 basis points, respectively. The effect is both statistically and economically significant. Financial institutions charge a lower spread to firms with a strong balance sheet condition. The relation between collateral availability and spreads is negative. Higher collateral availability reduces the cost of debt. However, the effect is not statistically significant.

Columns (1)–(2) moreover suggest a pecking-order for unsecured debt. The estimated coefficient on the dummy for unsecured debt contracts shows that they have on average a 50.45 lower spread over the reference rate than secured debt contracts. The results suggest that the pecking-order for unsecured debt (Rauh and Sufi 2010; Giambona et al. 2021) could arise because it allows firms to save in financing costs. The interest rate on unsecured bank debt contracts is lower than that of secured (Berger and Udell 1990).

In columns (3)–(4), we learn about the sensitivity of secured debt contract spreads to changes in collateral availability and creditworthiness. Secured debt contract spreads are statistically-significantly decreasing in book and market creditworthiness, size, and maturity. Columns (5)–(6) report the same results for unsecured debt contracts. Unsecured debt contract spreads are statistically-significantly decreasing in book and market creditworthiness, size, profitability, and principal amount.

The comparison of results between secured (columns (3)–(4)) and unsecured debt contracts (columns (5)–(6)) yield two relevant conclusions. First, it validates the hypothesis that creditworthiness has a first-order effect on the costs of financing firms face when issuing debt. Second, collateral availability is not statistically significant for any type of debt contract.

One could definitely argue that the timing of secured and unsecured debt issuance matters. For instance, unsecured debt contracts could be originated at the beginning of expansions when lending standards soften. Moreover, the low interest rates for so long in the 2002–2006 expansion could have motivated the lower interest rates for unsecured debt contracts. Columns (1)–(2) in Table 8 formally test this hypothesis. The results suggest this is not the case. The estimated coefficient on the interaction dummy for the 2002–2006 and unsecured debt dummy is not statistically significant.

All in all, the evidence I report suggests the pecking-order for unsecured debt could arise because it allows firms to minimize total costs of financing. Financial intermediaries may be willing to offer lower interest rates for unsecured debt contracts because, ex-ante, these firms have higher creditworthiness and a lower probability of default.

Table 8 Determinants of interest rate spreads for secured and unsecured debt contracts

	All contracts		Secured contracts		Unsecured contracts		t-test
	(1)	(2)	(3)	(4)	(5)	(6)	
Book Creditworthiness	−110.1***		−97.31***		−95.79***		0.11
	(18.75)		(33.91)		(23.76)		
Market Creditworthiness		−142.2***		−113.1***		−153.7***	0.00
		(22.11)		(34.84)		(37.31)	
Tangibility	−29.92	−47.37	−82.05	−88.95	−19.25	−32.39	0.00
	(38.60)	(38.26)	(72.22)	(71.81)	(45.11)	(43.97)	
Log (Size)	−32.46***	−37.98***	−25.94**	−29.57***	−26.96***	−32.29***	0.00
	(6.269)	(6.420)	(10.64)	(10.81)	(9.881)	(10.15)	
Market-to-book	0.393	3.836	−0.314	1.549	5.868	10.72***	0.00
	(2.638)	(2.709)	(4.244)	(4.111)	(4.067)	(4.014)	
Profitability	−65.83	−57.12	−42.20	−39.99	−201.3***	−170.3***	0.00
	(47.83)	(47.11)	(76.37)	(76.46)	(59.60)	(63.79)	
Facid & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	
Clustered SE	Facid	Facid	Facid	Facid	Facid	Facid	
# Observations	3987	3987	1925	1925	2062	2062	
R-squared	0.741	0.743	0.730	0.731	0.756	0.759	
	All Contracts		Secured Contracts		Unsecured Contracts		
	(1)	(2)	(3)	(4)	(5)	(6)	
Log (Amount)	−8.416**	−7.218**	−4.421	−4.251	−9.394**	−7.782*	
	(3.347)	(3.360)	(5.593)	(5.644)	(4.615)	(4.706)	
Log (Maturity)	−9.402**	−10.58**	−32.16***	−33.54***	7.061*	6.310	
	(4.287)	(4.317)	(11.64)	(11.48)	(3.862)	(3.910)	

Table 8 continued

	All contracts		Secured contracts		Unsecured contracts		t-test
	(1)	(2)	(3)	(4)	(5)	(6)	
Term Loans	25.11	25.17	57.41**	61.97**	−4.583	−6.881	
	(17.33)	(17.29)	(25.83)	(25.97)	(23.79)	(23.80)	
2002-06	38.89**	42.68***	16.37	16.09	39.81**	46.27***	
	(16.55)	(16.47)	(34.40)	(34.71)	(16.65)	(16.79)	
Unsecured	−50.45***	−47.90***					
	(8.569)	(8.616)					
Unsecured*2002-06	8.316	6.179					
	(8.877)	(8.896)					
Year & Facid FE	Yes	Yes	Yes	Yes	Yes	Yes	
Clustered SE	Facid	Facid	Facid	Facid	Facid	Facid	
# Observations	3987	3987	1925	1925	2062	2062	
R-squared	0.741	0.743	0.730	0.731	0.756	0.759	

This table reports regression results to examine the determinants of interest rate spreads and the contribution of collateral availability and creditworthiness controlling for borrower and loan characteristics at loan origination for U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010. All specifications include facility- and year-fixed effects. Robust standard errors are clustered at the facility level and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively. The last column reports the result of a difference in estimated coefficients test between secured and unsecured debt contracts. "Appendix A1" provides a detailed description of the variables used in the analysis

5 Discussion

This paper provides descriptive evidence on the determinants of secured and unsecured debt choices in debt and capital structure: collateral availability and creditworthiness. Moreover, I evaluate whether debt composition choices impact the level of investment. Finally, I test one plausible mechanism for firms preference for unsecured debt. I analyze the effect of firm and loan characteristics on the spreads of secured and unsecured contracts.

I derive three main results. First, debt structure is determined by the interaction of collateral availability and creditworthiness. Both exhibit an imperfect substitutes relation. However, creditworthiness has a first-order effect. Second, the capital structure results validate the convention on the collateral channel, but only for secured debt. Higher collateral availability reduces the degree of financial constraints faced and increases secured borrowing capacity of firms. Results show that this is not the case for unsecured debt. Third, I show that debt structure has real effects on investment. A higher share of unsecured debt leads to higher investment by firms. Higher collateral availability increases secured debt capacity (level effect). However, when the composition of debt is considered, the opposite effect arises (composition effect). Finally, the analysis on interest rates on bank debt for secured and unsecured debt contracts yields two conclusions. First, the pecking-order for unsecured debt may arise because it allows to minimize total costs of financing. Spreads on unsecured debt are lower. Second, creditworthiness also has a first-order effect in terms of the cost of debt.

The findings in this paper complement the literature on the collateral channel and suggest an alternative channel that operates through firms' creditworthiness and unsecured debt, which could have relevant business cycle implications.

Appendix

Appendix A1. Compustat variable description

- **Total Debt**: Debt in current liabilities (item 34) plus Long-term debt (item 9).
- **Share Unsecured (Debt):** Total Debt minus Mortgages and Other Secured Debt (item 241) over Total Debt.
- **Share Unsecured (Assets):** Total Debt minus Mortgages and Other Secured Debt (item 241) over Total Assets (item 6).
- **Share Secured (Assets):** Mortgages and Other Secured Debt (item 241) over Total Assets (item 6).
- **MV Equity:** Stock price (item 199) times Common shares used to calculate earnings per share (item 54).
- **Book Creditworthiness:** Equity (item 6 minus item 181) over Equity plus Total Debt (item 6 minus item 181 plus item 9). Equity is computed as Total Assets minus Total Liabilities.
- **Market Creditworthiness:** MV Equity over MV Equity plus Total Debt.
- **Tangibility or Collateral Availability:** Property, Plant and Equipment, Net (item 8) over Total Assets (item 6).

- **Size:** Total assets (item 6), total assets in million USD.
- **Profitability:** Operating income before depreciation (item 13) over Total assets (item 6).
- **Market-to-Book:** 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).
- **Cash Holdings:** Cash and short-term investments (item 1) over Total assets (item 6).
- **Rated:** Dummy variable, takes the value of 1 if the firm-year observation has a S&P Long-term Bond Rating (item 280).
- **Dividend Payer:** Dummy variable, takes the value of 1 if the firm-year observation has a positive value for common dividends (item 21).
- **Trade Credit:** Dummy variable, takes the value of 1 if the firm-year observation has trade payable above trade receivables (item 70 minus item 151).
- **Net Trade Credit Borrowing Days:** Days outstanding in Accounts Payable (item 70) minus days outstanding in Accounts Receivable (item 151).

Appendix A2. LPC dealscan sample construction

The data on Dealscan are organized by "Deal" and by "Facility". A deal defines a contract signed between a borrower and a lender (or lenders) at a particular date. Each deal is comprised of one or more facilities (debt contracts). During the 1994–2010 period, there were 5,266 facilities on Dealscan. That is, 5,266 distinct debt contracts signed by manufacturing firms.

Interest rate information on debt contracts is obtained from variable "allindrawn" in "Current Facility Pricing". This variable considers the basis points above reference rate for each debt contract, which in the majority of the cases happens to be the LiBOR rate.

While Dealscan has very good information on loan contract features, it has very little information about the borrower, and therefore, borrower characteristics (firm characteristics) are from Compustat. I merge the LPC's Dealscan data on debt contracts and interest rates with the Compustat manufacturing firms' sample from 1994 to 2010 to include firm characteristics the borrower had at the date of origination of the debt contract.

Funding Open access funding provided by OsloMet - Oslo Metropolitan University.

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