Universitat Autònoma de Barcelona

ESSAYS IN CORPORATE FINANCE

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Amatxorentzat...
Nere herriko neskatxa maite
ahozko lorez zaitut gaur laztantzen
itxaso garden, lur gozoko landare
kresalaren usain, zeru kolore
nere bihotzaren taupaden hotsez
zure grazia dut kantatzen.

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Abstract

This dissertation studies how debt structure and risk management decisions affect firms' investment. The first chapter focuses on building the stylized facts on the relation between debt structure, capital structure and investment when firms' have both, secured and unsecured debt available. Results suggests that firms with higher creditworthiness tend to borrow more unsecured debt, higher collateral availability may not lead to more investment and more reliance on unsecured debt leads to more investment. The second chapter uses two identification strategies to test the causal effect of the relations derived in chapter one. Results show that the composition of debt structure of firms has real implications. The higher the unsecured debt in debt structure, the more firms can invest. Finally, the last chapter uses a panel of shocks to the cost of hedging to different firms at different points in time to study the relation between hedging and risk. I find evidence suggesting that access to hedging, reduces the volatility of cashflows and thus, increases firms' investment.

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Chapter 1

THE (UN)SECURED DEBT PUZZLE: EVIDENCE FROM U.S. PUBLIC MANUFACTURING FIRMS, 1994-2010

1.1 Introduction

This paper gathers stylized facts on the usage of unsecured debt and its presence in debt and capital structure of U.S. public manufacturing firms. It sheds light on how collateral availability and firms' creditworthiness interact in shaping debt and capital structure and analyzes the role of debt structure heterogeneity, defined as secured and unsecured debt, in firms' investment decisions. Moreover, it suggests a possible mechanism for firms relying more heavily on unsecured debt: the cost-effectiveness of unsecured debt. To the extent that firms choose debt and capital structure to minimize total costs of financing, a higher loading of unsecured debt in debt structure might allow firms investing more.

Creditors lend on an unsecured basis as a function of the firms' financial strength

or creditworthiness, where the cashflows that the firm is expected to generate into the future represents a sufficient guarantee of repayment (cashflow-based lending). That is, unsecured debt does not require the encumbrance of a specific set of assets that can be liquidated by the creditor in the event of default to satisfy debt repayment, as it is the case for secured debt contracts (asset-based lending).

Generally, the existing empirical and theoretical work implicitly focuses on secured debt financing only. This is for several reasons. First, collateral availability helps solving market imperfections caused by asymmetric information. Second, it plays a role in the context of limited contract enforceability in which borrowers can only leverage up to the market/reposition value of their collateral. Finally, it is key in the propagation and amplification of exogenous shocks to the real economy, the so-called "collateral channel".[1]

However, the lack of attention to unsecured debt financing is surprising as unsecured debt is as important in the financing structure of firms as secured debt, at least quantitatively. In particular, 64% of total financial debt outstanding of U.S. public manufacturing firms is unsecured, using Standard&Poor's Compustat database (S&P hereafter), from 1994 to 2010.[2] As opposed to the economics and finance literature, back since the late 70's the law literature has emphasized the relevant role that unsecured debt plays in the context of firm's financial and investment policies and, on creditors' bargaining process upon default. They introduced the "secured debt puzzle": the fact that regardless of the benefits that pledging collateral might offer, firms that are large and financially strong rather want to rely on unsecured debt in order to finance their investment projects (LoPucki [2004] and Mann [2005]). According to this theory, debt choice is also determined by firm characteristics other than collateral availability.

[1] I will base the analysis on inside collateral, the pledgeable assets of the firm, as opposed to external collateral, which considers the personal assets of shareholders. External collateral does not play any role in public firms that are atomistically owned, which is the set-up that I will consider in the present work.

[2] Data on all commercial and industrial loans secured by collateral from commercial banks provided by the Federal Reserve of Saint Louis shows that the average uncollateralized loans in the U.S. account for 63% since 1997.

These stylized facts are consistent with evidence in Graham and Harvey [2001]'s survey. It displays the responses of 392 CFOs on the most relevant factors that affect the decision to issue debt and they seem to allow for a second dimension to play a role: firms' creditworthiness. Four of these factors relate to accumulated past, current and future cashflows and firms' creditworthiness, which indeed determine unsecured debt holdings.[1] Therefore, one would like to know the extend to which both, collateral availability and firms' creditworthiness constraints prevent firms from having their preferred debt structure, capital structure and hence, investment.

On the other hand, the literature has also emphasized the empirical relation between collateral and borrower's risk. Berger and Udell [1990], using data on term loans from public and private firms and controlling for loan characteristics, prove that not only secured loans are riskier, but also secured creditors are riskier too.[2] Therefore, high-risk firms tend to pledge more collateral and ultimately, borrow more on a secured basis.[3] In a related paper, John et al. [2003] provide analogous evidence for public debt using data from the Securities Data Corporation. This evidence suggests that the heavy reliance on unsecured debt financing might be due to cost-effectiveness.

Given the quantitative relevance of unsecured debt and the popularity of secured debt and collateral for credit risk mitigation, we seem to know very little about how exactly debt structure is determined and whether and how debt

[1] Figure 5 and Tables 6 and 9 show that the five leading factors affecting this decision are financial flexibility (59.38%) defined as restricting debt so as to have enough internal funds available to pursue new projects when they come along, credit rating (57.10%), earnings and cash flow volatility (48.08%), insufficient (recently generated) internal funds (46.78%) and the level of interest rates (46.35%), as they issue debt when interest rates are low.

[2] The authors use data from commercial and industrial loans from the Federal Reserve's Survey of Terms of Bank Lending, containing information on over one million business loans for years 1977, 1981, 1983 and 1987. Their study is consistent with later results by Carey et al. [1993] in which they analyze the private placement market and conclude that riskier firms borrow secured debt and stronger firms unsecured debt (with looser covenants).

[3] They called this empirical fact the "sorting-by-observed-risk paradigm". As opposed to the "sorting-by-private-information paradigm", which establishes a negative relationship between collateral and borrower's risk. Literature validating this view include Besanko and Thakor [1987] and Chan and Kanatas [1985].

structure choice affects investment. This paper contributes to the literature by shedding light on these topics. It is a purely descriptive paper about the relationship between unsecured debt and the rest of relevant firm characteristics defined. However, it is not the aim of the paper to provide a theory about unsecured debt or to imply causality from firm characteristics to debt or capital structure or investment.

First, I analyze how debt structure, defined as secured and unsecured debt, is determined and the extent to which collateral availability and firms' creditworthiness are imperfect substitutes. A one standard deviation increase in firms' creditworthiness relates to an increase in unsecured debt in debt structure of 0.07-0.09 standard deviation units, while collateral availability reduces unsecured debt holdings by 0.02-0.10 standard deviation units. Moreover, according to the evidence even firms financially constrained exhibit a preference for unsecured debt. Unsecured debt holdings are increasing in firms' collateral availability for firms financially constrained.

Then, I focus on analyzing how implications of existing literature on capital structure determinants vary once we allow for debt structure heterogeneity to play a role. Rajan and Zingales [1995] show that cross-sectional leverage increases with fixed assets, investment opportunities and size, while decreases with volatility, probability of bankruptcy and profitability. The positive relation with fixed assets is driven by the proportion of secured debt in firms' capital structure, as the correlation of tangibility with unsecured debt over total assets is negative and statistically significant. These results validate the well-known fact that more collateral availability ensures a higher debt capacity; however, it only ensures secured debt capacity. A one standard deviation increase in fixed assets, reduces (increases) the presence of unsecured (secured) debt in capital structure by 0.06 standard deviation units. This results suggests that there might be a complementary channel to the so-called "collateral channel" which operates through unsecured debt and that might generate different dynamics in terms of investment and in the aggregate. This is a research line that would be worth exploring further.

On the other hand, the positive relation of leverage with size and the negative relation with profitability are driven by the results from the unsecured debt over total assets regression. The estimated coefficients for the secured debt regression are opposite sign and moreover, statistically significant. This result highlights that once we allow for debt structure heterogeneity to play a role we seem to know very little about what affects capital structure decisions. Smaller firms and firms that are less profitable tend to borrow secured debt. This is consistent with previous results on how firms that are financially constrained are firms that tend to rely on secured debt issues. In other words, firms without access to unsecured debt markets are more likely to render financially constrained.

Considering how secured and unsecured debt are determined by different objects, I analyze whether the composition of debt structure affects firms' investment decisions. OLS estimation results on capital expenditures standardized by total assets on unsecured debt over total debt yield a positive and statistically significant coefficient, controlling for different proxies of firms' creditworthiness. A one standard deviation increase in unsecured debt in debt structure leads to an increase in investment of 0.03-0.07 standard deviation units. Results suggest that the composition of debt structure has real effects on investment. More interestingly, note that while more collateral availability increases investment when the level of debt is considered, the results suggest the opposite direction when the composition of debt structure is considered. That is, more collateral reduces investment by firms.

Finally, I suggest a possible mechanism behind the striking investment results. I analyze debt contract spread data by sorting between secured and unsecured debt contracts. A simple summary statistics comparison between secured and unsecured debt contracts highlights an interest fact: spreads on unsecured debt contracts are on average 140 basis points lower. In order to control for observed and unobserved heterogeneity across firms and contract characteristics, I analyze through OLS estimation spreads determinants. I derive two main results.

First, firms' creditworthiness point estimate is negative and highly significant, while the coefficient for collateral availability lacks statistical significance across specifications. These results suggest that there is no substitutability between collateral and spreads in bank debt. Moreover, the spread-creditworthiness sensitivity for unsecured debt contracts is quantitatively more relevant. Second, regression results controlling for firm and contract characteristics suggest that unsecured debt contracts are on average 48 basis points lower than secured debt spreads. These results are aligned with the initial hypothesis: a higher loading of unsecured debt in debt structure increasing firms' investment might by driven by lower spreads charged which helps minimizing total financing costs.

A final remark is required. This definition of debt structure heterogeneity becomes relevant in terms of the priority structure of corporate liabilities upon default and the presence of trade credit. First, while secured creditors have first- and second-priority claims to collect and liquidate the assets pledged by the firm, unsecured creditors must stand in line in order to receive a pari-passu or pro-rata rate of what is left according to their own priority.[1][2] Moreover, Ayotte and Morrison [2008] analyze firms filing in chapter 11 in the 2001 recession and find that nearly 25% secured creditors where under-secured: secured claims exceeded the value of the company. This evidence suggests that there might also be imperfections in the collateralization process.

Additionally, the role of trade credit cannot be ruled out when analyzing the role of unsecured debt or financial constraints, as trade credit is indeed unsecured and has priority upon default over unsecured financial debt. Rajan and Zingales [1995] build a sample of non-financial U.S. firms and conclude that trade credit amounts to 15% of firms' total assets. Furthermore, Cunat [2007] states that firms financially constrained receive trade credit when financial institutions are unavailable or too costly. This requires the consideration of the existence and

[1] Appendix A1. explains in more detail the priority structure of corporate liabilities. See Barclay and Smith [1995], LoPucki [2004] for further reference.

[2] Pari-passu is a term used in bankruptcy proceedings where creditors are said to be paid pari-passu, or each creditor is paid pro rata in accordance with the amount of his claim. The meaning is equally and without preference.

quantitative relevance of trade credit along with financial debt, as the implications for financially constrained firms can have an impact on debt and capital structure choice.

This paper is closely related to Giambona and Golec [2012], who analyze how firms' usage of unsecured debt is linked to future growth opportunities to preserve financial flexibility in the form of spare collateral capacity. On the other hand, capital structure implications of secured and unsecured debt are related to evidence in Vig [2013]. He shows that a reform addressed to strengthen creditor rights leads to a reduction in secured debt and total leverage, especially for those firms with a higher proportion of tangible assets. However, it differs from these two papers in that they do not analyze real effects or provide evidence of a possible mechanism. My paper also 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 heterogeneity considerations might be key in order 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 sortings by collateral availability and firms' creditworthiness. Section 3 introduces the results on the "(un)secured debt puzzle". It shows regression results for debt structure, capital structure and investment when we allow for debt structure heterogeneity to play a role. Section 4, sheds light on the possible mechanism. It analyzes price-setting behavior in bank lending for secured and unsecured debt contracts. Finally, section 5 concludes.

1.2 Data Overview

There are three key issues regarding sample construction: the definition and classification of secured and unsecured debt, how to proxy creditworthiness and collateral availability and how to include the effect of trade credit, if any, on debt and capital structure.

To begin with, total debt secured is defined 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 and Golec [2012] and Barclay and Smith [1995].[1]

The second conflicting issue relates to defining financial strength or a firm with a strong balance sheet condition and therefore, four different proxies will be defined. Book and market financial strength are defined as the inverses of leverage. Book value financial strength resembles the fortune with which the firm has generated cash flows through investment decisions in the past for any given payout policy (backward-looking), while market value financial strength is the forward-looking version: the present value of the cash flows that the firm is expected to generate into the future. Moreover, for robustness two more proxies are analyzed: retained earnings over total assets and the S&P Bond Rating.

Collateral availability of manufacturing firms is proxied by tangibility (as in Almeida and Campello [2007]). In practice, firms can pledge more assets beyond property, plant and equipment. A quick glance to 10Ks on SEC filings shows that financial institutions can have a first and second lien over receivables, inventories, cash or intangible assets of the firm in addition to property, plant

[1]However, they assume that all short-term debt is unsecured. They define *"...Unsecured Debt, as the ratio of unsecured debt (COMPUSTAT items dlc + dltt -dm) to total debt (dlc + dltt)"*. They continue in footnote 8 *"...dm consists of all long-term secured by..."*. The main problem is how Compustat defines item #241, as a component of long-term debt. Barclay and Smith [1995] already talk about the problem of how to assign short-term debt, dlc, between secured and unsecured debt. However, item #241 includes in general both, short-term and long-term secured debt. For consistency, I analyze data from Capital IQ and this is the case from 2002. Capital IQ has been compiling detailed information on capital structure and debt structure by going through financial footnotes contained in firms 10K SEC filings since the SEC mandated electronic submission of filing in 1996. Capital IQ provides richer information in terms of debt structure heterogeneity defined as secured and unsecured debt, including seniority and type of debt instrument; however, coverage by Capital IQ is comprehensive only from 2002 onwards. I additionally analyzed a sample of SEC 10k filings covering the period 1994-2002 and it was also the case.

and equipment.[1] Appendix A2. shows excerpts from the SEC filings on collateral requirements of several types of secured debt contracts, including revolving credit facilities, term loans and medium term notes.

Finally, following Cunat [2007] I define net trade credit borrowing days, as the difference between accounts payable outstanding days minus accounts receivables outstanding days and I also define a trade credit dummy, which takes value 1 if the firm has accounts payable above receivables over total assets, in order to gauge the impact of trade credit on debt and capital structure. In constructing the rest of firm characteristics I use the same definitions as in 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. Note that these sample corrections do allow for the existence of financially distressed firms in the sample.

Finally, I winsorize all key firm characteristics at the 1^{st} and 99^{th} percentiles and the final sample for the manufacturing sector comprises 25,096 firm-year observations.[2] Appendix A3. provides a detailed description of the variables used in the analysis and their construction. Table 1.1 presents descriptive statistics for the manufacturing sample, 1994-2010.

The main conclusion is that U.S. public manufacturing firms exhibit a pecking-order for unsecured debt, both in terms of debt and capital structure. This is

[1] To better account for collateral effectively pledged, Berger and Udell [1995] define it as a linear combination of receivables, inventories and property, plant and equipment: $collateral_t = 0.715 * receivables_t + 0.547 * inventories_t + 0.535 * capital_t$.

[2] I finally merge the resulting sample of the Compustat leveraged firms with Capital IQ, which allows for checking whether defining total secured debt as item #241 from Compustat leads to inconsistencies when compared to the same figures reported in Capital IQ.

surprising as regardless of the benefits that pledging collateral might offer, firms seem reluctant to sign secured debt contracts.[1] Summary statistics show that the average (median) firm holds 64% (79%) of unsecured debt in debt structure, while holding 15% (11%) of unsecured debt in capital structure, as opposed to the 8% (2%) of secured debt holdings over total assets.

The remaining firm characteristics highlight that the average (median) firm-year observation has equity in the capital structure of 69% (71%), which denotes (a priori) a strong balance sheet condition, high collateral availability of 26% (23%) and enjoys high investment opportunities 1.59 (1.14), as evidenced by market-to-book. Despite the remarkable heterogeneity across observations, U.S. public manufacturing firms are large and profitable and seem to hold cash for precautionary reasons, 17% (8%). Finally, 22% have a S&P long-term bond rating, 31% pay common dividends and 20% could be using trade credit as an alternative source of financing as opposed or in addition to financial debt (net trade credit borrowing days are positive (negative), 15.96 (-8.47) on average (median)).[2]

Beyond cross-sectional properties, Figure 1.1 presents time series evidence on U.S. public manufacturing firms' usage of secured and unsecured debt, both in terms of debt and capital structure. Debt structure exhibits well-defined cyclical properties; it increases during recessions (counter-cyclical) and the pecking-order for unsecured is consistent across time since 1994. The capital structure graph shows that both secured and unsecured debt have followed a downward trend since the late 90's, but they peaked again at the beginning of the 2007 recession. The trade credit literature suggests that the way in which you manage your clients and/or suppliers could affect the firm's financial debt issues and Figure 1.2 precisely, allows to deepen on time series properties of net trade credit borrowing days from U.S. public manufacturing firms. The figure shows that net

[1] For a literature describing the benefits of collateral pledged, agency costs are discussed in Myers [1977] or Smith and Warner [1979], for collateral in adverse selection and/or moral hazard Chan and Kanatas [1985] or Stiglitz and Weiss [1981] and finally, collateral in limited contract enforceability set-ups can be seen in Kiyotaki and Moore [1997], Hennessy and Whited [2005] or Livdan et al. [2009] among others.

[2] Note that dividend payouts and the S&P's Bond Rating conform measures for being financially constrained in Almeida et al. [2004].

trade credit borrowing days increase during recessions until they become positive. That is, in times in which credit conditions tighten and firms face higher financial constraints, the average days of payable outstanding increase beyond days of receivables, and thus, manufacturing firms have been financing part of their activity through the delay of payments to suppliers.

1.2.1 Overview of Debt Structure from U.S. Public Manufacturing Firms

The first relevant step for this descriptive section is to evaluate whether firms with distinct firm characteristics choose differentiated debt structures and whether creditworthiness, in conjunction with collateral availability, is a major determinant of debt and capital structure. For this purpose, Table 1.2 presents summary statistics for different categories of debt structure heterogeneity, including those of specialized and mixed debt structures provided that solely financially constrained firms tend to specialize in one type of debt (Rauh and Sufi [2010] and Colla et al. [2013]).

Only 27% of the sample specializes in terms of one type of debt, from which only 13.18% choose to specialize in secured debt. In terms of mixed debt structures, the highest concentration 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 structure in unsecured debt.

From the analysis of firm characteristics in specialized debt structures, we can conclude that firms relying 100% in secured debt are on average less levered (18.6% vs. 22.2%), are much smaller in size (189.4 vs. 2166.1), they are less profitable (4% vs. 9%) and hold higher cash balances (19% vs. 16%).[1] Moreover, only 7% (vs. 36%) have a S&P Bond Rating, 18% (vs. 52%) pay common dividends and 20% (vs. 15%) could be relying on trade credit as an additional source of financing.

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

The strong preference for unsecured debt shown by manufacturing firms and the firm characteristics displayed by those firms that uniquely borrow on a secured basis suggests that firms relying 100% in secured debt tend to be financially constrained. However, note that surprisingly, 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.

Controlling for the possible non-linearity in terms of collateral availability seems coherent in order to further validate that debt structure is determined by the interaction between collateral and creditworthiness. Table 1.3 examines the relationship of book financial strength and available collateral with mean and median unsecured debt holdings by means of a two-way sorting procedure based on the quartiles of the financial strength and tangibility distributions.[1]

Two important conclusions can be derived from the analysis in Table 1.3. First, those firms with the highest unsecured debt holdings in their debt structure are located in the second quartile of the financial strength distribution (0.58-0.71) and the tendency towards high proportions of unsecured debt is independent of collateral availability. Indeed, the higher average and median unsecured debt is found in the first and second quartiles of the collateral availability distribution. That is, whether or not you have collateral is irrelevant if you financial strength is good enough.[2] This finding contradicts the convention in that firms that lack collateral will be financially constrained and evidences that even for firms with low collateral availability, collateral is not a scarce resource.

Second, those firm-year observations with the lowest proportion of unsecured debt are located in the fourth quartile of the financial strength distribution and in the first quartile of the collateral availability distribution (where the financially

[1]For simplicity, I do not report results for other proxies of financial strength but the results remain the same.

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

constrained firms are located), with an average 23% in unsecured debt. As collateral availability increases, surprisingly, firms rather prefer to incorporate more unsecured debt in their debt structure. That is, 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, independent of the collateral holdings.

1.3 Results: The (Un)secured Debt Puzzle

The descriptive analysis of the sample performed yields the following conclusions. First, unsecured debt is quantitatively more relevant than secured in terms of debt and capital structure and this evidence is consistent across time. The majority of firms show a strong reliance on debt and capital structures with a predominant proportion of unsecured debt over secured. Second, collateral availability and financial strength appear to be substitutes and thus, debt structure choice seems to be determined by the interaction between the two determinants, not solely by collateral availability. Finally, the descriptive evidence seems to validate the "collateral channel": higher collateral available implies higher borrowing capacity.

1.3.1 Determinants of Debt Structure Choice

This section aims to deepen further on the determinants of debt structure to achieve robustness in terms of the conclusions derived in the descriptive analysis previously performed. The empirical specification is defined as follows:

$$\frac{Unsecured_{i,t}}{TotalDebt_{i,t}} = \theta_i + \varphi_t + \gamma FStrength_{i,t-1} + \delta Collateral_{i,t-1} + X'_{i,t-1}\beta + \epsilon_{i,t} \quad (1.1)$$

The above specification is estimated using OLS for the sample of manufacturing firms over the period 1994-2010. 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 divi-

dend and uses trade credit as a complement/substitute to financial debt. All the specifications are estimated with lagged regressors, using firm-fixed effects, θ_i, to control for possible simultaneity biases from unobserved individual heterogeneity and year-fixed effects, φ_t. Finally, they include heterokedasticity-consistent errors clustered at a firm level, as in Petersen [2009].

The hypothesis being tested is $\gamma > 0$ and $\delta < 0$. That is, collateral availability determines secured debt, while financial strength determines unsecured debt holdings and therefore, debt structure is determined by the interaction between financial strength and collateral availability. Table 1.4 reports the results for the determinants of debt structure for four different proxies of financial strength. In addition to the book (columns (1) and (2)) and market financial strength (columns (3) and (4)) previously defined, retained earnings over total assets (columns (5) and (6)) and S&P's bond rating (columns (7) and (8)) are also included as proxies for financial strength for robustness.

If we focus in columns (1) and (2), the specification including book financial strength, the estimate of 0.109 on financial strength suggests that a 1% increase in book financial strength, generates an increase in unsecured debt equal to 0.109% and firms appear to adjust their debt structure towards less secured debt in response to positive changes in financial strength.[1] These findings are consistent across the different definitions for financial strength: market financial strength, retained earnings over total assets and credit ratings validate the previous conclusion. Moreover, the estimated coefficients for each specification are both eco-

[1]Note that in columns (1) and (2) I only consider the part of the sample which lies below the median financial strength, 71%, to avoid the non-linearity in the relation between the percentage of unsecured debt and financial strength caused by firms that are likely to be financially constrained. The comparison of estimated coefficients from sub-samples from below and above the median (unreported), denotes that the sample above the median has a negative coefficient for financial strength. The interpretation for this sign is that as firms exhibit a higher percentage of equity in the capital structure, it could evidence a higher degree of financial constraints faced and therefore, they will show a negative and very sensitive (-0.4070) reaction to further increases in equity. Moreover, it is worth mentioning that the sensitivity of constrained with respect to increases in collateral is lower than that of unconstrained (-0.2144 vs. -0.2753). It again highlights the restricted access of constrained firms to capital markets: they tend to adjust debt structure less towards more secured when collateral availability increases.

nomically and statistically significant.[1]

On the other hand, the coefficient on collateral availability, -0.245, suggests that a 1% increase in tangibility, generates a decrease in unsecured debt equal to 0.245%. That is, firms appear to adjust their debt structure towards more secured debt in response to positive changes in collateral availability. These findings are consistent with the convention regarding the role of collateral: the higher the available collateral, the higher secured debt holdings.

Results on the sensitivity of unsecured debt to changes in collateral availability and financial strength imply that a trade-off exists in terms of debt structure choice. 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 unsecured debt in debt structure of 0.07-0.09 standard deviation units, while collateral availability reduces unsecured debt holdings by 0.02-0.10 standard deviation units.

The rest of the controls imply that unsecured debt in debt structure increases with size, being rated and paying common dividends, while decreases with profitability, cash holdings and the existence of trade credit. Interestingly, the dummy for trade credit is not statistically significant across financial strength proxies, except for the retained earnings specification with negative sign. This finding suggests that although some firms may use trade credit as an additional source of financing, the effect on debt structure choice on average is irrelevant.

Compared to the results in Giambona and Golec [2012], the positive correlation between investment opportunities and the usage of unsecured debt does not seem consistent across the different financial strength proxies: only book financial

[1]Two additional proxies for financial strength have been considered: Altman's Z Score and the Interest Coverage Ratio, so as to have proxies which were not capital structure-related. Results are unreported because first, there is an immense non-linearity in the relation between Altman's Z Score and the percentage of unsecured debt. In terms of the interest coverage ratio, the results are consistent; however, there are too few observations.

strength supports with both, statistical significance and sign, the growth opportunity channel of debt structure.[1] However, note that the specification for book financial strength rules out firms in the third and fourth quartile of the financial strength distribution, which in Table 1.3 had the highest average and median investment opportunities in the sample.

Summing up, two relevant conclusions can be derived from the analysis of the determinants of debt structure. First; although collateral availability and financial strength seem substitutes, financial strength has a first-order effect on debt structure choice because above some financial strength threshold, collateral becomes irrelevant (not solely when unconstrained). Second, firms that are financially constrained, on average, have access to unsecured debt and as collateral availability increases, they prefer to incorporate more unsecured debt. However, when the median is considered, firms specialize in 100% secured debt as they have no access to unsecured debt markets.

1.3.2 Determinants of Capital Structure Choice

This section aims to deepen on the role of collateral availability and financial strength as determinants of capital structure. The empirical specifications are defined as follows:

$$\frac{DebtType_{i,t}}{TotalAssets_{i,t}} = \theta_i + \varphi_t + \gamma FStrength_{i,t-1} + \delta Collateral_{i,t-1} + X'_{i,t-1}\beta + \epsilon_{i,t} \quad (1.2)$$

where $DebtType_{i,t}$ in the dependent variable can be either total debt, secured debt or unsecured debt. The hypothesis 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.[2] The balance sheet channel establishes that higher collateral availability increases borrowing capacity of firms but is silent regarding the effect

[1] Unreported results show that, as in the case of book financial strength, the percentage of unsecured debt also exhibits a non-linearity with respect to Tobin's Q. Additionally, Giambona and Golec [2012] only account for industry fixed effects.

[2] The regressions maintains 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.

on both secured and unsecured debt holdings. The cited sign for the estimated parameters would provide sufficient evidence for the existence of an additional channel, complementary to the balance sheet channel: the unsecured channel, which would operate through firms' financial strength and could play a role in the transmission of exogenous shocks to the real economy.[1]

The relevance of this complementary channel is undubious from an aggregate perspective. Research from Kiyotaki and Moore [1997] or Bernanke et al. [1996] show that the reduction in the market value of collateral reduces borrowing capacity and that the effect is amplified relying on the dynamic structure. But what if firms do not borrow on a secured basis? Similarly, according to Braun and Larrain [2005] for instance, firms that pledge collateral should be, all else equal, less sensitive to shocks. However, the cross-sectional evidence presented throughout shows that precisely, the higher the dependence on secured debt to finance investment, the more likely the firm will be financially constrained. Thus, will be more likely to be affected by exogenous shocks. Moreover, Figure 1.3 shows the reduction in market value financial strength experienced in the 2007 recession indicating that it is as pro-cyclical as the prices of assets.

Table 1.5 reports the estimation results for the determinants of the capital structure regression. Columns (1)-(2) report the estimated coefficients for total debt over total assets as the dependent variable, while columns (3)-(4) and (5)-(6) report those for secured over total assets and unsecured over total assets respectively. Each dependent variable reports the estimated coefficients for both, book and market value financial strength.

If we focus on the results for the secured debt over total assets regressions, columns (3)-(4), we see that the results for the capital structure still validate the convention regarding the role of collateral: more collateral availability also increases secured debt holdings in the capital structure of the firm. More precisely, a 1% increase in collateral availability, increases secured debt holdings in

[1]Note that $\gamma < 0$ for any type of debt being considered. That is, if more equity is incorporated in the capital structure, necessarily the amount of leverage should be reduced.

the capital structure by 0.077% (book) and 0.0541% (market). Additionally, secured debt holdings are increasing in investment opportunities, while decreasing in size and dividend payers.

On the other hand, the results for the unsecured debt over total assets regression, columns (5)-(6), show that higher collateral availability does not contribute to more unsecured debt holdings once we control for unobserved variation at a firm level using firm-fixed effects. Firms appear to adjust their capital structure towards less unsecured debt (by 0.041% and 0.055%) as their collateral availability increases (a 1% increase).[1] That is, a one standard deviation increase in fixed assets, reduces (increases) the presence 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 and this increases secured borrowing capacity of firms, but not unsecured borrowing capacity. The above result would suggest the existence of a different mechanism, in addition to the conventional collateral channel, which would operate through unsecured debt and could generate very different dynamics in terms of investment: the unsecured channel.

The results for the existence of trade credit financing in shaping the debt component of capital structure are now key: the use of trade credit does not affect the composition of debt in debt structure but it does affect the extent to which firms display leverage in their balance sheet . Firms using trade credit exhibit on average lower secured and unsecured leverage in the capital structure (Cunat [2007]), being unsecured debt more sensitive to the existence of trade credit financing. Finally, note that unsecured debt is increasing in size, investment opportunities, rated firms and dividend payers, while decreasing in profitability.

[1]Note that the evidence from debt structure suggested that only firms that are financially constrained increase unsecured debt holdings as collateral availability increases.

1.3.3 Determinants of Investment Policy

Finally, this section analyzes whether debt structure defined as secured and unsecured debt plays a role in firms' investment. The empirical specifications are defined as follows:

$$\frac{Capex_{i,t}}{TotalAssets_{i,t}} = \theta_i + \varphi_t + \gamma Punsec_{i,t} + X'_{i,t-1}\beta + \epsilon_{i,t} \tag{1.3}$$

where $Capex_{i,t}$ in the dependent variable is capital expenditures or investment in fixed assets and $Punsec_{i,t}$ is unsecured debt standardized by total debt. The hypothesis being tested is the sign of γ, whether unsecured debt holdings in debt structure have a significant effect on firms' investment policy decisions. That is, testing whether debt structure 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.[1] A positive and statistically significant sign on γ would imply that the composition o f debt structure plays a relevant role in firms investment.

Table 1.6 shows the estimated coefficients for the different proxies of financial strength defined on the regression of debt structure on investment. Columns (1)-(2) show results for book financial strength, (3)-(4) for market financial strength and (5)-(6) for retained earnings. The difference between the two specifications is that the second specification accounts for possible non-linearities in the relation between debt structure and investment ($Punsec^2_{i,t}$). Estimated coefficients on the relation between debt structure and investment across the different creditworthiness proxies yield the same conclusion. The more unsecured debt firms hold in their debt structure, the higher the level of investment. A 1% increase in unsecured debt in debt structure, increases the level of investment by 0.8%, 0.9% and 0.3% for book and market financial strength and retained earnings, respectively. That is, a one standard deviation increase in unsecured debt in debt structure leads to an increase in investment of 0.03-0.07 standard deviation units. Results suggest that the composition of debt structure has real effects on invest-

[1] I exclude trade credit as a control from the regression specification as it is no longer statistically significant.

ment. More interestingly, note that while more collateral availability increases investment when the level of debt is considered, the results suggest the opposite direction when the composition of debt structure is considered. That is, more collateral reduces investment by firms.

1.4 A Possible Mechanism: Price-setting in bank debt

It remains a question the mechanism behind the strong preference for unsecured debt. According to Giambona and Golec [2012], there is a pecking order for unsecured debt because it allows firms to maintain spare collateral capacity in connection with future growth opportunities. However, the survey by Graham and Harvey [2001] does not highlight the relevance of spare collateral capacity, but interest rates charged on debt and a strong balance sheet condition as the primary factors affecting debt issuance. Moreover, results in the present paper show that collateral does not seem a scarce resource as it can be substituted out with the firm's financial strength. Therefore, spreads seem a better candidate for the mechanism behind the preference for unsecured debt, because borrowing on an unsecured basis allows to minimize the total costs of financing (Graham and Leary [2011]).

The conventional wisdom regarding interest rates is that secured debt contracts should have a lower interest rate attached than unsecured debt contracts. This should be the case because the ex-ante risk that unsecured debt contracts have for financial intermediaries is so high due to the lack of collateral pledged, that the interest rate consistent with the risk assumed would be very large. However, in practice, financial intermediaries set the interest rate for unsecured debt such that it is competitive.

Additionally, the theoretical construction of interest rate spreads further suggests that unsecured debt contracts should be cheaper. The cost of debt is a function of the risk-free rate plus a risk premium that is a function of the prob-

ability of default or the credit quality of the firm. That is, other things being equal, firms with a 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 incorporate more unsecured debt into their debt structure and more equity in the capital structure (higher financial strength). Then, one should expect that firms borrowing predominantly on an unsecured basis (i.e high financial strength), to experience a lower spread over the risk-free or reference rate.

As far as I know, 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 controlling for loan characteristics, as well as for macroeconomic conditions, they conclude that when risk is observable secured debt is riskier, evidenced by a higher interest rate premium than unsecured debt contracts. Carey et al. [1993] analyze the market for private placements and John et al. [2003] focus on bonds, concluding that secured debt is riskier even after controlling for the credit ratings. They show that the spread between secured and unsecured is larger for low credit rating firms, large non-mortgage assets, longer maturities and for proxies for lower levels of monitoring.

While Berger and Udell [1990] control for loan characteristics, my interest is on interest rate and borrower characteristics at origination of the loans, to understand if there is descriptive evidence that can validate the hypothesis that unsecured debt contracts have a lower interest rate attached as a function of firm characteristics. Note that the substitute relation between financial strength and collateral availability will also have an impact on the price-setting process of secured and unsecured debt contracts.

1.4.1 Debt Contract-Level Data Overview and Results

The information on the interest rates of loans comes from LPC's Dealscan, including the majority of loans made to large publicly traded companies but there is a selection bias: information on lending to small and middle-market firms is

limited. This is a drawback in order to analyze interest rates for both types of debt contracts as we are not able to cover the complete Compustat manufacturing sample considered in the previous analysis.

Nevertheless, there is a reason why this should not be a problem and we could still derive consistent relations between interest rates attached to debt contracts and the associated firm characteristics. Dealscan contains loan information from the largest public firms in the U.S., which are most likely unconstrained. Therefore, other things being equal, there is no reason to believe that the interest rates on secured and unsecured debt for unconstrained firms should be significantly different.

Table 1.7 shows the summary statistics, for interest rates, borrower and loan characteristics, from all debt contracts signed by U.S. public manufacturing firms during the period 1994-2010, classified as secured and unsecured debt contracts. Appendix A4. contains detailed information on how the sample for debt contracts from Dealscan has been constructed.

The average (median) secured debt contract has the spread over the reference rate of 242.44 (236.25) basis points, while the spread for unsecured debt contracts is equal to 105.67 (72.00) basis points. That is, the interest rate on unsecured debt contracts is lower than that of secured (Berger and Udell [1990]), providing preliminary evidence for the idea that the pecking-order for unsecured (Rauh and Sufi [2010], Giambona and Golec [2012]) arises because it allows to minimize total financing costs.

Focusing on borrower characteristics at origination of debt contracts, secured debt borrowers have average lower book and market financial strength (0.58 vs. 0.63), collateral availability (0.26 vs. 0.27), size (917.28 vs. 6112.98), investment opportunities (1.47 vs. 1.55), profitability (0.07 vs. 0.15), probability of being rated (0.31 vs. 0.59) and of paying dividends (0.18 vs. 0.64) and seem more likely to use trade credit as a source of financing in addition to financial debt (-8.13 vs.

-14.33).[1]

Regarding loan characteristics at origination, secured debt contracts have lower average principal amount (17.15 vs. 18.90), probability of syndication (0.73 vs. 0.89) and fraction of revolving credit facilities (0.63 vs. 0.84), both with maturities below and above 365 days. However, secured debt contracts have higher maturities and fraction of term loans (0.32 vs. 0.12). The seniority of debt contracts, both secured and unsecured, is senior. Descriptive evidence suggests that unsecured debt contracts tend to be short-term although large in terms or the amount of the facility, while secured debt contracts tend to be term loans. This is evidence in favour of Brunnermeier and Oehmke [2013] and their maturity rat race: the fact that a borrower may have an incentive to shorten the maturity of an individual creditor's debt contract because this dilutes other creditors.

This is certainly the case in terms of unsecured debt contracts due to the priority structure of corporate liabilities. Secured creditors have priority upon default independent of the seniority of unsecured debt contracts and shortening maturities of debt contracts is the manner to artificially recover priority for unsecured creditors. Moreover, although maturities are shorter for unsecured debt contracts, we can see from summary statistics that the principal on this debt contracts is on average much larger.

Figure 1.4 provides the time series properties of spreads for both types of debt contracts, showing that the average spreads have been systematically lower for unsecured debt contracts since 1994. The total number of financial debt contracts outstanding is 4,615, being 51.64% of them unsecured. Figure 1.5 shows the time series properties of the number of contracts signed, exhibiting how the number of secured debt contracts has experienced a decreasing pattern since 1998, while unsecured debt contracts seem to decrease only after the 2007 recession.

To further investigate how exactly spreads for secured debt contracts depend on

[1] A negative sign for net trade credit borrowing days implies that the firm is not using trade credit.

borrower and loan characteristics, to formally test the pecking-order mechanism and to learn whether or not financial strength and collateral availability affect the price-setting process in secured and unsecured debt contracts, I implement the following regression specification:

$$SpreadType_{i,t} = \theta_i + \varphi_t + \gamma FStrength_{i,t-1} + \delta Collateral_{i,t-1} \tag{1.4}$$

$$+Borrower'_{i,t-1}\beta_b + Loan'_{i,t-1}\beta_l + \epsilon_{i,t} \tag{1.5}$$

The empirical specification is estimated using OLS for the sample of debt contracts over the period 1994-2010. $SpreadType_{i,t}$ can be the spread over the reference rate of all contracts, secured debt contracts or unsecured debt contracts. The regression contains a set of borrower characteristic control variables $Borrower'_{i,t-1}$, 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 as a complement/substitute to financial debt. $Loan'_{i,t-1}$ contains loan characteristic controls: principal amount, maturity and dummies for syndication, term loans, revolving credit facilities and seniority. All the specifications are estimated with lagged regressors, using facility-fixed effects, θ_i, to control for possible simultaneity biases from unobserved individual heterogeneity in debt contracts and year-fixed effects, φ_t. Finally, they include heterokedasticity-consistent errors clustered at a facility level, as in Petersen [2009].

The first focus is on how collateral availability and financial strength affect interest spreads and testing if unsecured debt is cheaper than secured debt. Table 1.8, columns (1)-(2), present the results for the determinants of interest rate spreads for all contracts signed by manufacturing firms from 1994-2010. Both book and market financial strength have a decreasing effect on the spreads of debt contracts: a 1% increase in book and market financial strength, generate a decrease in spreads charged of 110.1 and 142.2 basis points respectively and the effect is both statistically and economically significant. That is, financial institutions charge a lower spread to manufacturing firms that have a strong balance sheet condition or are financially strong.

Collateral availability and spreads charged on the debt contracts present a negative correlation, implying that higher collateral availability reduces the cost of debt; however, the effect is not even statistically significant and the economic significance is lower than that of financial strength. The lack of statistical significance is easy to rationalize: collateral availability does not play any role for firms unconstrained.

The other important result from columns (1)-(2) is the formal proof for the unsecured pecking-order mechanism. The estimated coefficient on the dummy for unsecured debt contracts shows that unsecured debt contracts have on average a spread over the reference rate which is lower by 50.45 basis points with respect to secured debt. The pecking-order for unsecured debt takes place because it allows firms to save in financing costs: unsecured debt is on average cheaper. Figure 1.4 also validates the above result: the average spread for unsecured debt contracts has been systematically below that of secured since 1994. Finally, spreads on debt contracts are increasing in investment opportunities, for term loans and decreasing for larger firms, more profitable, larger facility amounts and for longer maturities.[1]

Focusing in columns (3)-(4) allows us to learn on the sensitivity of secured debt contract spreads with respect to changes in collateral availability and financial strength, borrower and loan characteristic controls, controlling for unobserved facility heterogeneity and time fixed-effects. Secured debt contract spreads are statistically-significantly decreasing in book and market financial strength, size, longer maturities and only increasing in secured term loans. Columns (5)-(6) present the same results for unsecured debt contracts. Unsecured debt contracts spreads are statistically-significantly decreasing in book and market financial strength, size, profitability, principal amount and only increasing in investment opportunities.

[1] Although not intuitive, data on all commercial and industrial loans from FRED also exhibits this property. Lower spreads are charged on average to longer maturity contracts.

The comparison of results between secured and unsecured debt contracts yields several important conclusions. First, it validates the assumption that financial strength has a first-order effect not only in shaping debt and capital structure, but on the costs of financing firms will face when issuing debt. However, the selection bias in Dealscan does not allow to gauge the interaction between collateral availability and financial strength in reducing spreads. Second, the effect of financial strength in reducing spreads (for presumably unconstrained firms) is larger for secured debt contracts.

One could definitely argue that unsecured debt contracts tend to have lower interest rates attached because of the timing in which they have been originated. That is, unsecured debt contracts tend to be originated at the beginning of expansions when lending standards soften. In addition to his, the low interest rates for so long in the 2002-2006 expansion could have motivated the lower interest rates for unsecured debt contracts. The descriptive evidence in Figures 1.4 and 1.5 seem to rule out this possibility but columns (1)-(2) in Table 1.8 formally test this hypothesis and proves that this is not the case, as the estimated coefficient on the interaction dummy for the 2002-2006 and borrowing unsecured dummy is not statistically significant

The descriptive evidence provided allows to conclude that there is a pecking-order for unsecured debt because it allows to minimize total costs of financing and financial intermediaries are willing to offer lower interest rates for unsecured debt contracts because, ex-ante, firms that borrow on an unsecured basis tend to have a better quality balance sheet and a built-in reputation of repayment.

1.5 Discussion

The motivation for the present paper was to provide descriptive evidence, not causal, on the relation between secured-unsecured debt choice along with its determinants, collateral availability and financial strength. The literature has discussed in depth all the benefits that pledging collateral might offer for firms, however, we seem to know very little about when and how is collateral pledged, as

there are other schemes that guarantee the same ends as the pledge of collateral. Moreover, if when and how collateral is pledged is not clear, how the price-setting process is determined as a function of borrower and loan characteristics cannot be clear either.

This paper aims to fill the gap in the literature by analyzing the effect of these relevant firm characteristics, along with loan characteristics, on the spreads of secured and unsecured contracts and studies whether the lower spreads on unsecured debt can be the reason for the observed pecking-order for unsecured debt.

The results on debt structure determinants suggest that debt structure is determined by the interaction of collateral availability and financial strength. Moreover, both key firm characteristics exhibit an imperfect substitutes relation; however, financial strength has a first-order effect because above some financial strength threshold, collateral becomes irrelevant (not solely when unconstrained). Thus, collateral is not a scarce resource. Moreover, even firms financially constrained exhibit a pecking-order for unsecured debt: as their collateral availability increases, so does the percentage of unsecured debt in debt structure.

The capital structure results validate the conventional collateral channel but only for secured debt: the higher the collateral availability, lowers the degree of financial constraints faced and increases secured borrowing capacity. Results show that this is not the case for unsecured debt, provided that they exhibit a negative correlation. This finding could allow for an alternative channel, the unsecured channel, that would operate through financial strength and could have interesting macro-implications.

The results on the investment regression are striking. Results suggest that the composition of debt structure has real effects on investment. More precisely, the higher the presence of unsecured debt in debt structure, the higher the level of investment of firms. Note that this contradicts existing evidence on the collateral channel. According to the convention, higher collateral availability, by increasing debt capacity, allows more investment. However, when the composition of debt

structure is considered, results show the opposite pattern. The more collateral firms pledge, by borrowing more on a secured basis, firms tend to reduce investment. This seems an interesting venue for additional research, which I address in the second chapter of this thesis.

On the analysis of debt contract interest rates, several interesting conclusions have been derived. First, the pecking-order for unsecured debt is not due to the fact that it provides spare collateral capacity, but because it allows to minimize total costs of financing. Moreover, the sensitivity of secured debt spreads to increases in financial strength is higher than that of unsecured debt spreads. Once again, financial strength has a first-order effect also in terms of the cost of debt. Finally, the composition of debt contracts shows that unsecured debt contracts are more likely to be revolving credit facilities, while secured debt contracts are more prone to be term loans. This validates the maturity rat race. Unsecured debt contracts, although with higher average principal amounts, show that unsecured creditors shorten maturities to artificially achieve priority.

This definition of debt structure heterogeneity offers room for future research. First, preliminary evidence on the analysis of debt and capital structure of manufacturing firms filing in chapters 7 and 11 shows that although unsecured debt borrowers could be less risky that secured debt borrowers ex-ante, upon default the proportion of firms filing is predominantly with unsecured debt holdings. That is, it suggests that ex-post, unsecured debt borrowers are riskier. Baird and Rasmussen [2006] explain Warnaco's experience. A company that flourished during the 90's and had unsecured debt spread over more than 20 different banks/financial institutions. In the late 90's, they borrowed heavily and undertook a share repurchase to raise additional funds in order to finance an investment project, but the investment turned out unsuccessful. In 2001, they filed into chapter 11 and finally, filed into chapter 7.

Therefore, it could be the case that the probability of positive net present value projects is higher for those debt structures with lower proportions of unsecured debt, at least ex-post. Perhaps the combination of cheap financing costs and the

lack of commitment from the pledge of collateral generate a moral hazard and/or adverse selection problem. Thus, firms that borrow on an unsecured basis could be more likely to undertake unproductive investment projects. This a line of research that is worth exploring.

On a macro dimension, allowing for this definition of debt structure heterogeneity to play a role and under the assumption that debt structure heterogeneity has an effect over investment decisions of firms, a new mechanism for the transmission of exogenous shocks to the real economy and over the business cycle could emerge. The cross-sectional evidence in this paper shows that market financial strength could generate an alternative transmission mechanism in addition to the so-called collateral channel: the unsecured channel. Moreover, the opposite effect that collateral availability generates in secured and unsecured debt holdings in capital structure suggests that it is worth exploring whether the traditional balance sheet channel suffers modifications in its effect when debt structure heterogeneity is introduced. Finally, note that both prices of assets and the price of the stock, which determines market value financial strength, are pro-cyclical and could generate an amplification mechanism for exogenous shocks in a similar fashion as in the case of the prices of assets.

Table 1.1: **Cross-sectional Properties, Sample Overview 1994-2010:** This table contains summary statistics for key firm characteristics from U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010.

	Mean	25^{th} P.	Median	75^{th} P.	St. Dev.
% Unsecured (Total Debt)	0.64	0.30	0.79	1.00	0.37
% Unsecured (Total Assets)	0.15	0.02	0.11	0.24	0.15
% Secured (Total Assets)	0.08	0.00	0.02	0.11	0.12
Book Financial Strength	0.69	0.54	0.71	0.89	0.22
Market Financial Strength	0.77	0.65	0.83	0.95	0.21
Tangibility	0.26	0.12	0.23	0.37	0.17
Size	1,357.32	40.78	160.11	788.60	3,570.52
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					
Dummy Rated	0.22	0.00	0.00	0.00	0.53
Dummy Dividend Payer	0.31	0.00	0.00	1.00	0.46
Dummy 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

Table 1.2: **Summary Statistics by Debt Structure Category:** This table contains mean and median of 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 100% unsecured debt structures respectively. For the rest of the columns, column 0-25% for instance, contains firm-year observations which have a percentage of debt unsecured higher than zero but lower or equal to 25%.

	Specialized, 100%		Mixed			
	Secured	Unsecured	0-25%	25-50%	50-75%	75-100%
% Unsecured (Total 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
% Unsecured (Total 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
% Secured (Total 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 Financial Strength	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 Financial Strength	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	2,166	333	430	644	2,266
	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
Dummy 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
Dummy 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
Dummy 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	5,947	4,664	3,398	3,136	7,048

Table 1.3: **Two-way sorting of Percentage of Debt Unsecured, by Financial Strength and Tangibility:** This table presents the relation between the percentage of debt unsecured, book financial strength 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 percentage of debt unsecured in debt structure. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Tangibility				
Book Financial Strength	1^{st} Quartile (0.12)	2^{nd} Quartile (0.23)	3^{rd} Quartile (0.37)	4^{th} Quartile	t-test
1^{st} Quartile (0.54)	0.65	0.67	0.69	0.61	3.02***
	0.91	0.88	0.90	0.75	
2^{nd} Quartile (0.71)	0.71	0.74	0.69	0.70	1.00
	0.99	0.98	0.95	0.94	
3^{rd} Quartile (0.89)	0.55	0.51	0.51	0.57	1.16
	0.77	0.60	0.62	0.76	
4^{th} 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***	

Table 1.4: **Debt Structure Determinants Regression Results:** This table presents regression results to examine the relation between debt structure, financial strength and collateral availability as determinants, along with usual controls in the literature for U.S. public manufacturing firms (SIC codes 2000-3999) from 1994 to 2010. Columns (1)-(2) show the results for book value financial strength, Columns (3)-(4) for market value financial strength and Columns (5)-(8) contain results using retained earnings over total assets. All specifications include firm- and year-fixed effects and 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.

	Dependent Variable: % Unsecured over Total Debt							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Book FS	0.199***	0.109***						
	(0.0336)	(0.0300)						
Market FS			0.0914***	0.148***				
			(0.0278)	(0.0291)				
RetEarnings					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)
# Obs	12,444	12,407	25,096	25,048	15,249	15,212	25,096	25,048
R^2	0.626	0.631	0.638	0.642	0.693	0.698	0.638	0.641

Table 1.5: **Capital Structure Determinants Regression Results:** This table presents regression results to examine the relation between capital structure, financial strength and collateral availability as determinants, along with usual controls in the literature for U.S. public manufacturing firms (SIC codes 200-3999) from 1994 to 2010. All specifications include firm- and year-fixed effects and 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.

	Total over Total Assets		Secured over Total Assets		Unsecured over Total Assets	
	(1)	(2)	(3)	(4)	(5)	(6)
Book FS	-0.709***		-0.227***		-0.482***	
	(0.005)		(0.010)	(0.010)		
Market FS		-0.564***		-0.269***		-0.295***
Strength		(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
# Obs.	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

Table 1.6: **Investment Determinants Regression Results:** This table presents regression results to examine the relation between investment and the composition of debt structure for U.S. public manufacturing firms (SIC codes 200-3999) from 1994 to 2010. All specifications include firm- and year-fixed effects and 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.

	Dependent Variable: Investment over Total Assets					
	(1)	(2)	(3)	(4)	(5)	(6)
% 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 FS	0.0182***	0.0238***				
	(0.00226)	(0.00379)				
Market FS			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
# Obs.	23,794	23,794	23,794	23,794	23,758	23,758

Table 1.7: **Summary Statistics, Interest Rates and Firm Characteristics, for Secured and Unsecured Debt Contracts, 1994-2010:** This table presents the comparison of spreads over reference rate (LPC's Dealscan) and firm 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.

	All Contracts			Secured Contracts			Unsecured Contracts		
	Mean	Median	St. Dev.	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Spread	171.82	150.00	137.26	242.44	236.25	134.98	105.67	72.00	101.87
% Unsecured (Total Debt)	0.71	0.95	0.37	0.45	0.43	0.35	0.94	1.00	0.19
% Unsecured (Total Assets)	0.19	0.18	0.16	0.14	0.10	0.15	0.24	0.23	0.15
% Secured (Total Assets)	0.09	0.01	0.14	0.17	0.13	0.15	0.01	0.00	0.05
Book FS	0.60	0.62	0.23	0.58	0.58	0.25	0.63	0.64	0.21
Market FS	0.77	0.82	0.20	0.73	0.77	0.23	0.81	0.84	0.17
Tangibility	0.26	0.23	0.16	0.26	0.22	0.17	0.27	0.24	0.16
Size	3,600	553	12,250	917	180	4,494	6,112	1,497	16,084
Market-to-book	1.51	1.14	1.46	1.47	1.06	1.78	1.55	1.22	1.06
Profitability	0.11	0.13	0.15	0.07	0.11	0.18	0.15	0.14	0.10
Cash Holdings	0.10	0.04	0.14	0.10	0.04	0.16	0.09	0.04	0.11
Trade Credit	-11.34	-10.70	169.70	-8.13	-10.46	161.73	-14.33	-11.17	176.77
Amount Facility	18.06	18.42	1.89	17.15	17.22	1.77	18.90	19.11	1.58
Maturity Facility	3.55	3.69	0.72	3.62	3.69	0.67	3.50	3.69	0.76
Dummy Seniority	1.00	1.00	0.05	1.00	1.00	0.02	1.00	1.00	0.06
Dummy Syndication	0.82	1.00	0.08	0.73	1.00	0.44	0.89	1.00	0.31
Dummy Term Loans	0.22	0.00	0.42	0.32	0.00	0.47	0.12	0.00	0.33
Dummy Revolving Credit	0.73	1.00	0.44	0.63	1.00	0.48	0.84	1.00	0.37
# Debt Contracts	4,615			2,232			2,383		

Table 1.8: **Determinants of the Interest Rate Spreads, Secured and Unsecured Contracts:** This table presents regression results to examine the determinants of interest rate spreads and the contribution of collateral availability and financial strength 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- (Facid) and year-fixed effects and 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.

	All Contracts		Secured Contracts		Unsecured Contracts	
	(1)	(2)	(3)	(4)	(5)	(6)
Book FS	-110.1***		-97.31***		-95.79***	
	(18.75)		(33.91)		(23.76)	
Market FS		-142.2***		-113.1***		-153.7***
		(22.11)		(34.84)		(37.31)
Tangibility	-29.92	-47.37	-82.05	-88.95	-19.25	-32.39
	(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***
	(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***
	(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***
	(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
# Obs.	3,987	3,987	1,925	1,925	2,062	2,062
R-squared	0.741	0.743	0.730	0.731	0.756	0.759

Table 1.9: **Determinants of the Interest Rate Spreads, Secured and Unsecured Contracts:** Table 1.8 Continued

	All Contracts		**Secured Contracts**		**Unsecured Contracts**	
	(1)	(2)	(3)	(4)	(5)	(6)
Log (Facility	-8.416**	-7.218**	-4.421	-4.251	-9.394**	-7.782*
Amount)	(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)
Dummy Term	25.11	25.17	57.41**	61.97**	-4.583	-6.881
Loans	(17.33)	(17.29)	(25.83)	(25.97)	(23.79)	(23.80)
Dummy 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)
Dummy Unsecured	-50.45***	-47.90***				
	(8.569)	(8.616)				
Dummy Unsecured	8.316	6.179				
2002-06	(8.877)	(8.896)				
Year & Facid FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered SE	Facid	Facid	Facid	Facid	Facid	Facid
# Obs.	3,987	3,987	1,925	1,925	2,062	2,062
R-squared	0.741	0.743	0.730	0.731	0.756	0.759

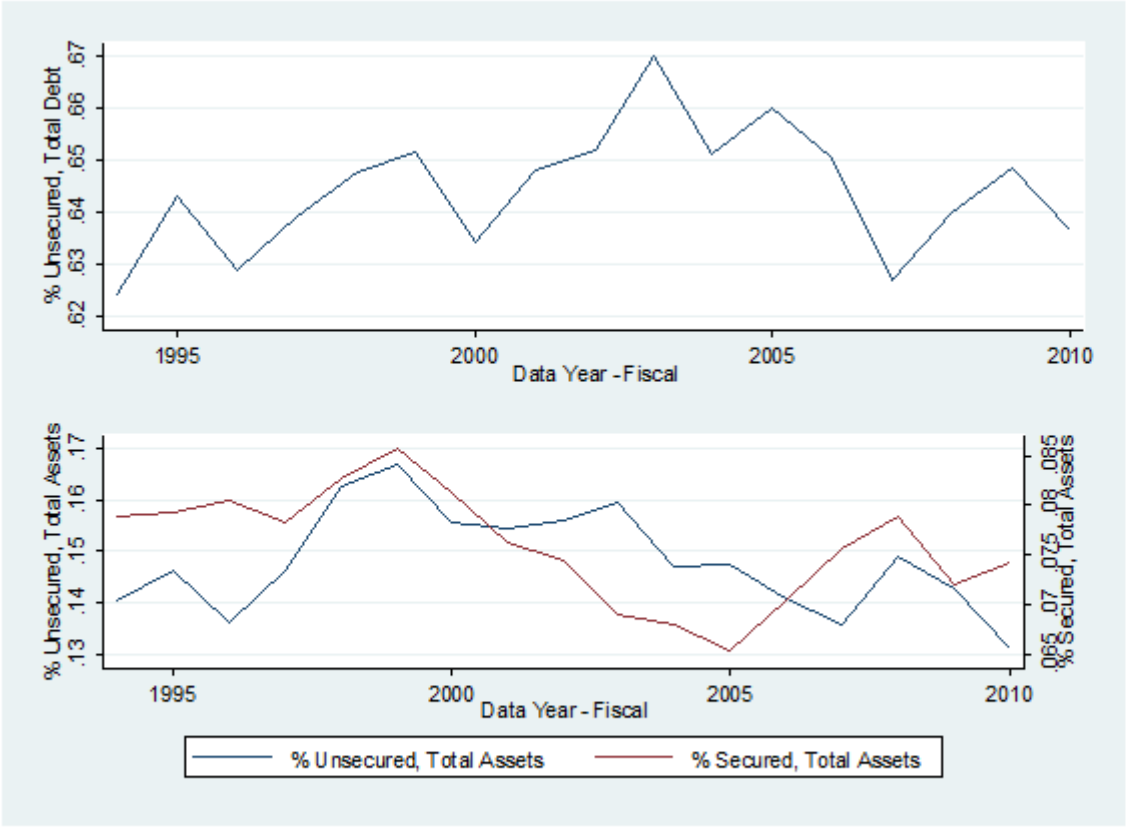


Figure 1.1: **Evolution of Debt Structure and Capital Structure, U.S. Public Manufacturing Firms (SIC Codes 2000-3999), 1994-2010.** The top panel shows unsecured debt over total outstanding financial debt, while the bottom panel shows the evolution of the percentage of unsecured debt over total assets in the left axis and the percentage of secured over total assets in the right axis.

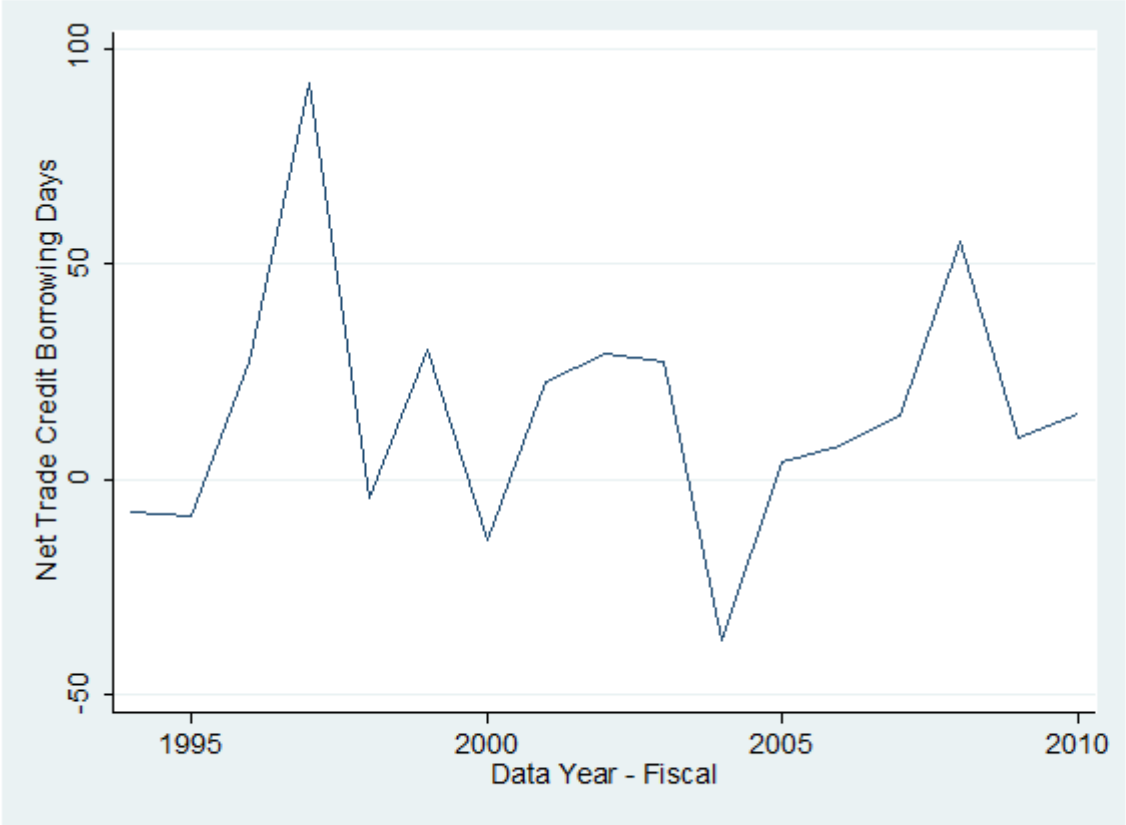


Figure 1.2: **Net Trade Credit Borrowing Days, U.S. Public Manufacturing Firms (SIC Codes 2000-3999), 1994-2010.** Days payable outstanding minus days receivable outstanding, trade.

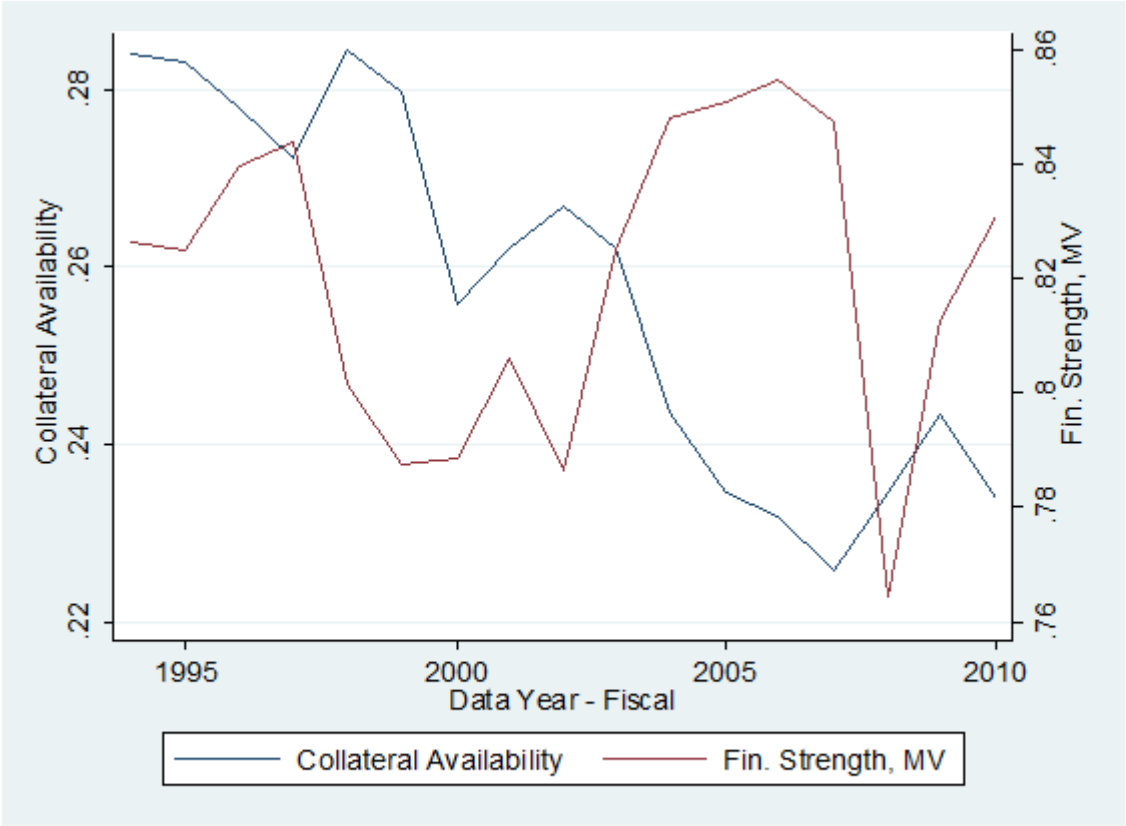


Figure 1.3: **Evolution of Collateral Availability and Financial Strength, U.S. Public Manufacturing Firms (SIC codes 2000-3999), 1994-2010.** Financial strength is represented at market value, while collateral availability is proxied by property, plant and equipment, net.

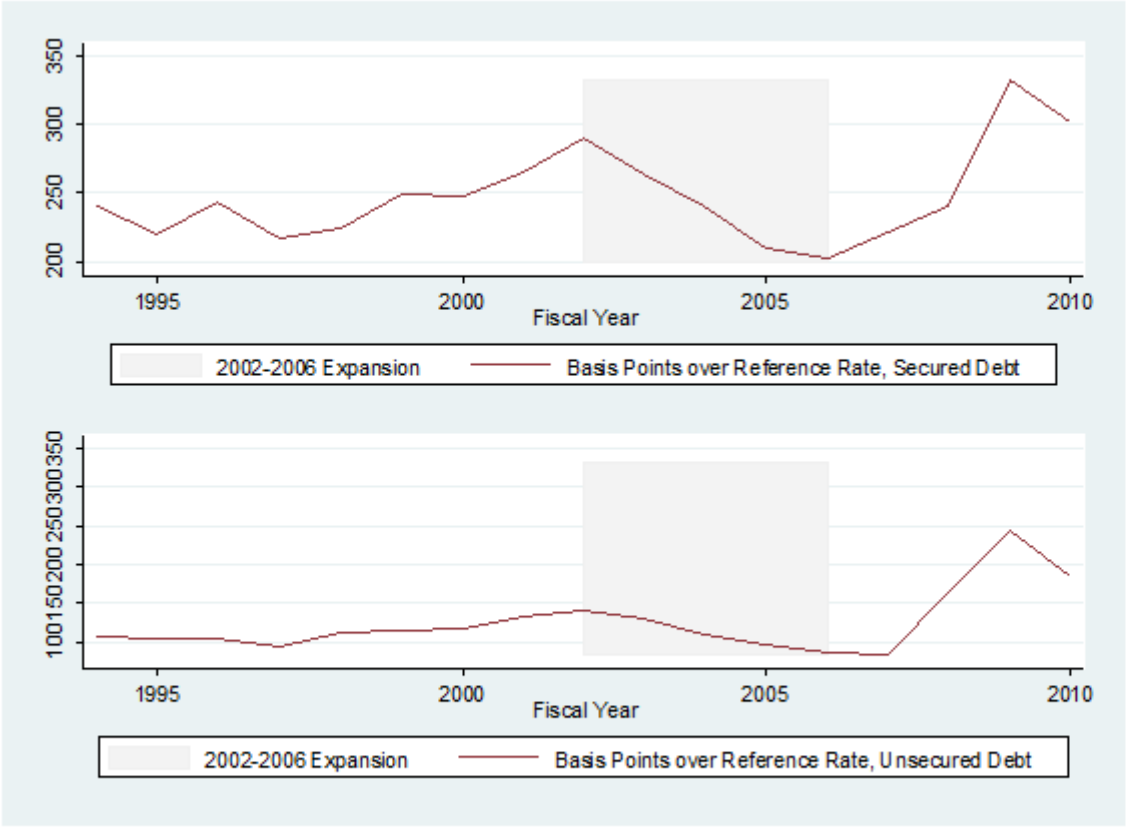


Figure 1.4: **Evolution of Basis Points over Reference Rate, U.S. Public Manufacturing Firms (SIC Codes 2000-3999), 1994-2010.** The top panel shows the evolution of basis points over reference rate for secured debt contracts, while the bottom panel shows the evolution of basis points over reference rate for unsecured debt contracts in LPC's Dealscan.

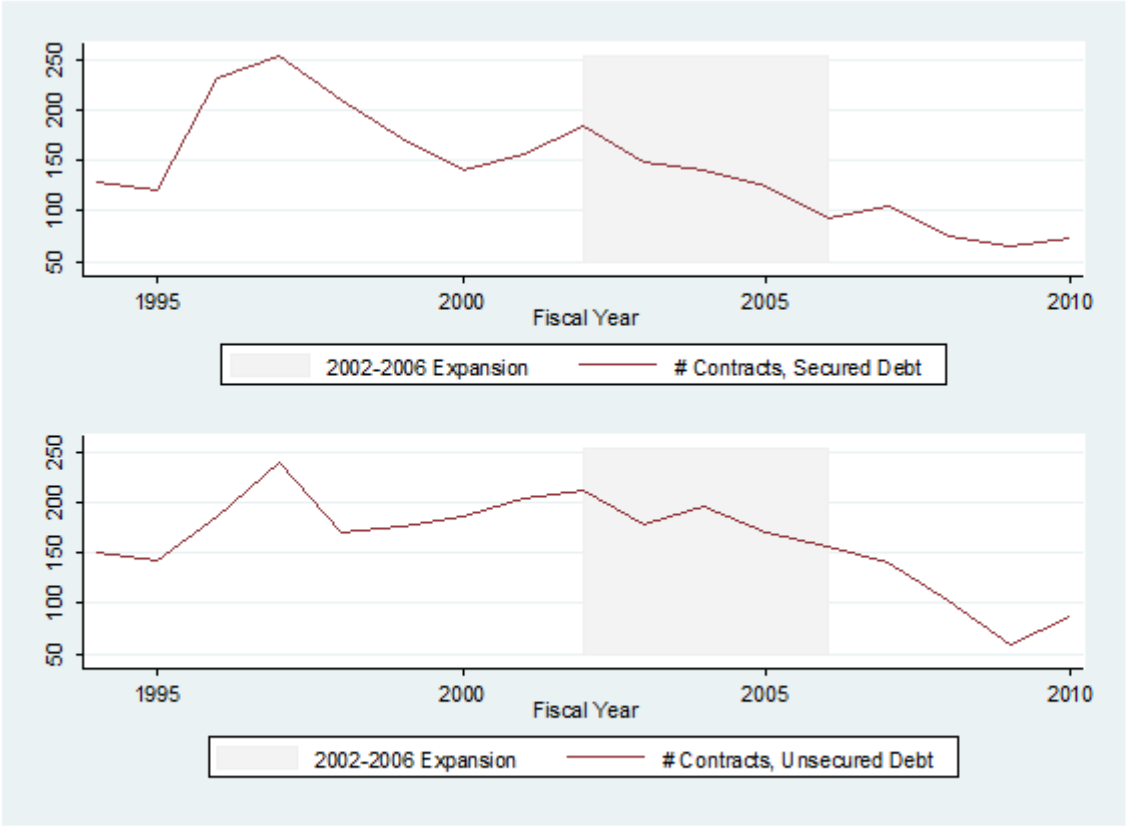


Figure 1.5: **Evolution of the Number of Debt Contracts, U.S. Public Manufacturing Firms (SIC Codes 2000-3999), 1994-2010.** The top panel shows the evolution of the number of secured debt contracts, while the bottom panel shows the evolution of the number of unsecured debt contracts in LPC's Dealscan.

Chapter 2

HOW DOES ACCESS TO THE UNSECURED DEBT MARKET AFFECT INVESTMENT?

2.1 Introduction

Under perfect capital markets, debt and capital structure decisions of firms are irrelevant (Modigliani and Miller [1958]). However, in practice firms use different debt instruments that serve different purposes, and access and usage of this pool of instruments may significantly affect firms' corporate policy in the presence of financial constraints. More precisely, investment and debt structure are closely linked and understanding how access to debt markets affects investment is an empirical challenge due to endogeneity concerns.

Financial constraints limit the availability of external funds for firms with profitable investment opportunities. They may take the form of asymmetric information or limited contract enforceability. Either way, collateral is typically used to alleviate these frictions. Collateral availability increases firms' debt capacity and reduces the likelihood that a firm may be rendered financially constrained.[1]

[1] Chaney et al. [2012] show that for each additional dollar of real estate collateral, the average U.S. corporation invests \$0.06. Gan [2007] undertakes a similar empirical approach and estimates that the land market collapse of the early 1990's in Japan caused a reduction in

Additionally, it reduces risk from a lender's perspective as it provides enforcement and because it offers protection against claims from other creditors upon default (priority).

In most cases, the literature on financial constraints assumes that debt is homogeneous and can be secured by the collateral that the firm posts. However, in practice unsecured debt is quantitatively more relevant than secured debt and does not require the pledge of collateral because creditworthiness of borrowers suffices as a guarantee of repayment.[1] Although counter-intuitive because secured debt offers higher protection to lenders, unsecured debt financing is associated with less risky borrowers and it includes contractual devices that may accomplish the same ends as the pledge of collateral.[2] On one hand, negative pledge covenants avoid firms encumbering assets to borrow secured debt beyond some threshold. Consequently, they artificially guarantee that the pool of assets to liquidate in case of default is sufficiently large to satisfy debt repayment. On the other hand, net worth covenants maintain the creditworthiness "cushion" at desired levels. As a result, unsecured bank debt, private placements and public debt tend to have lower interest rates attached and the combination of lower spreads and looser covenants helps to minimize total costs of financing as in Graham and Leary [2011].[3]

A natural question arises as a result: Can a firm invest more if it has access

investment of 0.8% as a result from a decrease of 10% in the valuation of collateral.

[1] Rauh and Sufi [2010] show that senior unsecured debt holdings in debt structure are positively related to credit quality for rated firms and to the accumulation of internal funds in the capital structure. Giambona and Golec [2012] prove causality from firms' investment opportunities to higher unsecured debt holdings in debt structure by means of the passage of a new law affecting growth prospects of the pharmaceutical sector. Similarly, Vig [2013] analyzes the effect of a securitization reform strengthening creditor rights and shows that secured debt dependence decreased as a result from the policy change.

[2] Only recourse secured debt has priority upon default over unsecured debt. When secured debt is non-recourse and collateral attached has been depleted, the residual secured claims are pooled together with unsecured claims of the highest seniority. See LoPucki et al. [2012] and LoPucki [2003] for further information.

[3] Berger and Udell [1990] find that secured borrowers are riskier for bank debt, while Carey et al. [1993] and John et al. [2003] do the analogous for private placements and public debt respectively.

to the unsecured debt market? In this paper, I address this question by investigating how shocks to unsecured debt influence investment decisions in the presence of financial constraints. The key challenge for this type of cross-sectional analysis is that financial decisions tend to be made jointly along with payout and investment decisions. An ideal experiment would control for the endogeneity in the relation between debt structure and investment, but also for the endogeneity in retention/payout policy and investment. To overcome these concerns, I use two different identification strategies.[1]

First, I examine the effects of the decrease in the tax rate on dividends in the U.S. associated with the *Jobs and Growth Tax Relief Reconciliation Act* of 2003 (JGTRRA). More precisely, I exploit the heterogeneity in firm ownership structure and the fact that individual investors suffer a tax disadvantage on dividend payouts. The clientele effects literature states that firms attract specific investors by setting their dividend policies. While institutional investors and corporations prefer companies paying high dividends, this is not the case for individual investors that face a tax disadvantage on dividend payouts. Therefore, the tax environment prior to the tax cut promoted share repurchases in detriment of dividend payouts. However, evidence in Chetty and Saez [2005] and Brown et al. [2007] suggests that the main action in the JGTRRA was driven by dividend initiations of firms with large presence of executive stock holdings and independent shareholders and moderate earnings growth prospects. Therefore, individual investors are better off with the policy change as the cost of dividend payouts decreases significantly.

I analyze whether firms with a high percentage of individual investors (treatment group) react to a lower tax rate on dividends by increasing dividends relatively more than similar firms with a low percentage of individual investors (control group). From an accounting perspective, an increase in dividends reduces re-

[1]The research question addressed in this paper builds on empirical evidence gathered in the descriptive paper Biguri [2014] (a companion paper), in which I analyze how unsecured debt holdings are determined in debt and capital structure of firms. Moreover, I analyze how debt structure affects investment and suggest a possible mechanism, debt spreads, for the observed positive relation between unsecured debt holdings in debt structure and investment.

tained earnings in stockholders' equity by the same amount. This means that the reduction in dividend taxes represents a shock to a firm's creditworthiness, which itself is a shock to the ability of a firm to raise unsecured debt.

The JGTRRA is a quasi-natural experiment that helps examine two related questions. First, one can examine how unsecured debt holdings change as a result of lower retained earnings, whereby the latter is instrumented by the shock to dividends (instrumental variable estimation, IV). Second, one can analyze if a decrease in creditworthiness leads firms to substitute away from unsecured debt toward secured debt. One can then evaluate the effect that an exogenous variation in debt structure generates on investment for firms in the treatment group. I also estimate a causal effect in reduced-form to rule out that retained earnings could be directly affecting investment, as suggested by Kaplan and Zingales [1997].

The second identification strategy that I consider is a direct shock to the availability and cost of unsecured debt that occurred during the *collapse of the asset-backed commercial paper market* (ABCP) in 2007. The collapse in the ABCP market led to a temporary shortage of short-term unsecured non-financial corporate commercial paper (Acharya and Schnabl [2010]). Non-financial firms do not have access to this type of securitization instrument but commercial banks exposed to the collapse of ABCP market were suppliers to the corporate commercial paper market. Thus, they were indirectly affected by the unwillingness of banks to roll-over commercial paper (Ivashina and Scharfstein [2010]). Firms with a commercial paper program tend to be the least financially constrained firms and tend to use unsecured debt financing only (Rauh and Sufi [2010], Colla et al. [2013]). I sort firms according to their usage of commercial paper before the shock. I conjecture that firms with a large percentage of commercial paper financing (treatment group) face refinancing problems when the ABCP market comes to a halt. Moreover, refinancing problems are more severe for firms facing some degree of restricted access to the unsecured bond market. I expect the firms in the treatment group to reduce the share of unsecured debt in total debt more severely than firms without commercial paper.

The above strategy based on double identification allows me to distinguish between the effects that come from the firm side (balance sheet channel) from those that come from capital markets (credit channel). My focus is on the substitution effect that arises from shocks that affect both channels. When firms face restricted access to the unsecured debt market, they are forced to substitute toward secured debt issues and inefficiencies may arise in the investment decision.

The main findings are as follows. The JGTRRA quasi-natural experiment shows that a one standard deviation decrease in creditworthiness as measured by retained earnings over total assets causes the share of unsecured debt over total debt to decrease by 0.2 standard deviations. This means that a deterioration in the financial condition of the firm leads to lower usage of unsecured debt. As a result from JGTRRA, firms in the treatment group react to a lower tax rate on dividends by initiating dividends more pronouncedly, consistent with life-cycle theories of dividend initiations in DeAngelo et al. [2006] and the free cashflow hypothesis in Jensen [1986]. The tax reform generates a trade-off between payout policy and short-term financing and longer term investment decisions. As firms try to issue debt in order to finance both dividend payouts and investment projects, lower creditworthiness reduces repayment capacity in the eyes of unsecured (bank) creditors and puts upward pressure on spreads. This in turn may restrict access to the unsecured debt market and force substitution toward secured debt issues for firms in the treatment group. When there is substitution, different financial constraints become more relevant. In the context of JGTRRA, limited contract enforceability becomes more relevant. Creditors require the pledge of collateral to enforce repayment. Senior secured bank debt issues increase by 1.2%, while senior secured bonds increase by 0.6% more than the control group.

The ABCP test shows that firms in the treatment group experience an average reduction of 7% in unsecured debt over total debt. The temporary shortage in unsecured commercial paper forces firms in the treatment group to substitute toward other unsecured debt sources of financing as senior unsecured bonds. Firms with a commercial paper program increased senior unsecured bond holdings as a

result from the supply shock by 3.7% more than the control group. However, some firms may face restricted access to the bond market and thus, they are forced to substitute toward bank debt instead. Creditors require the pledge of collateral to enforce repayment. More precisely, firms reduced senior unsecured bond holdings by 2.2% and increased senior secured bank debt by 0.9% more than the control group. These results are consistent with evidence in Ivashina and Scharfstein [2010] and Berrospide and Meisenzahl [2015] that credit line drawdowns increased during the financial crisis. Moreover, it also explains the shift in the composition of credit between loans and bonds evidenced in Adrian et al. [2012].

Then, I focus on the consequences for the inefficiency of investment decisions or post-treatment real outcomes of changes in the composition of debt structure. By means of the ABCP test and combining differences-in-differences (DID) with IV estimation as in Waldinger [2010], I show that a one standard deviation decrease in unsecured debt in debt structure causes investment to reduce by 0.06 standard deviations. To strengthen the external validity of results, I analyze the effect of financial constraints on investment when arising from firms' side, through the JGTRRA. A policy change deteriorating firms' creditworthiness forces them to substitute toward secured debt issues. This in turn causes investment to decrease by 0.8% more compared to the control group. For robustness, I address the endogeneity concerns in debt structure choice, payout policy and investment decisions altogether. I quantify the reduced-form causal effect on investment when both retained earnings and unsecured debt in debt structure are "instrumented" with exogenous variation from JGTRRA and ABCP, respectively. I find that a reduction in unsecured debt in debt structure causes a significant decrease in investment as compared to the counterfactual, by 1.4%. Moreover, results remain unchanged when considering an estimation of collateral actually pledged by firms built through a text-search algorithm.[1]

According to the evidence reported in both identification strategies, JGTRAA

[1]Using collateral actually pledged as opposed to collateral availability proxied by tangibility reduces the specification's exposure to measurement error. I conduct the text-search on the EDGAR Security Exchange Commission's 10-K filings by looking for the sources of collateral pledged in secured debt contracts.

and ABCP, when a negative shock impacts unsecured debt holdings in debt structure and firms find themselves unable to substitute toward other unsecured debt sources of financing, they substitute toward secured debt. When substitution occurs, different types of financial constraints become more relevant as the substitution is not solely limited to debt types (secured vs. unsecured), but also to instrument types (bank debt vs. bonds and private placements). The reduction in investment when substitution occurs depends on the extent to which contract terms are adjusted to reflect the presence of the specific financial constraints that become more relevant.[1] The fact that restricted access to unsecured debt markets can operate both from a demand and a supply side of credit provides cross-sectional evidence for a balance sheet and a credit channel and thus, debt structure choice can have aggregate implications.

Moreover, the results in this paper suggest that facing restricted access to the unsecured debt market offers a valid benchmark to proxy financial constraints faced by firms. The traditional ex-ante definitions for being financially constrained tend to yield inconsistent conclusions across definitions as evidenced in Farre-Mensa and Ljungqvist [2015]. The innovation in this paper relies on the fact that firms that are unconstrained according to traditional definitions, or have access to a credit line as in Sufi [2009], can still be constrained if their access to the most cost-effective source of financing is limited. Therefore, there is a pecking-order in terms of debt types and instruments and restricted access to the unsecured debt market has a theoretical justification and is statistically significant enough to understand whether a firm is exposed to financial frictions.

This paper relates to the finance literature on the relevance of debt structure heterogeneity and to the macroeconomics literature on the collateral channel. I contribute to this literature by shedding light on an alternative definition for financial constraints: restricted access to the unsecured debt market. Focusing on the corporate finance literature, Rauh and Sufi [2010] demonstrate that abstracting from debt structure heterogeneity considerations may lead to missing substantial variation in capital structure. On the other hand, Colla et al. [2013]

[1] Including amount outstanding, collateral requirements, maturity, spreads and covenants.

show that most firms tend to specialize in one type of debt, and then relate usage to demand- and supply-driven factors.[1] Additionally, Giambona and Golec [2012] conclude that firms actively manage their debt structure and that unsecured debt tends to have looser covenants attached and shorter maturities.[2] I contribute to this strand of the finance literature by being the first to show that debt structure heterogeneity defined as secured vs. unsecured debt has real effects on investment.

On the other hand, it relates to the extensive macro-finance literature on how collateral helps to solve market imperfections caused by asymmetric information (Holmstrom and Tirole [1997] or Stiglitz and Weiss [1981]) or limited contract enforceability (Kiyotaki and Moore [1997], Bernanke and Gertler [1989], Hennessy and Whited [2005] or Livdan et al. [2009]). Moreover, this literature concludes that collateral plays a role in the transmission, propagation and amplification of exogenous shocks to the real economy, as in the seminal papers by Kiyotaki and Moore [1997] and Bernanke and Gertler [1989]. I contribute to this literature by providing the micro-foundations to recognize a balance sheet channel and a credit channel through which the composition of debt structure could generate real effects on investment. Although the role of collateral is relevant in generating cyclical fluctuations, the channel through unsecured debt should be further explored to shed light on the specific mechanisms and to quantify the effect in business cycle dynamics.

2.2 Identification Strategy

In this section, I explain each identification strategy in detail, justify how the treatment and control groups are defined, provide the empirical specification to be implemented and finally identify the possible threats to the exclusion restriction for IV estimation.

[1] Rauh and Sufi [2010] look at secured debt, senior unsecured debt, and subordinated debt. Colla et al. [2013] use the different debt structure components available in S&P's Capital IQ, including commercial paper, drawn credit lines, term loans, senior bonds and notes, subordinated bonds and notes, capital leases, and other debt.

[2] This is consistent with evidence in Brunnermeier and Oehmke [2013], who argue that creditors shorten maturities to artificially achieve priority.

2.2.1 The Jobs and Growth Tax Relief Reconciliation Act of 2003

President Bush first proposed the JGTRRA on January 7, 2003. The tax reform was passed by Congress on May 23 and signed into law on May 28, 2003. The new law reduced the tax rate on capital gains (τ^{cap}) from 20% to 15%. The tax rate on qualified dividends (τ^{div}) also decreased for all taxpayers from the ordinary income tax rate of 39% to the long-term capital gains rate of 15%. The special tax treatment applied retroactively to any payment done after January 1, 2003.[1] The direct implication of this tax reform was making dividend payouts, share repurchases and earnings retention cheaper from a shareholders perspective.

The fiscal environment prior to the tax-cut discouraged dividend payouts in favor of share repurchases (Grullon and Michaely [2002]).[2] Taxing dividend income at an individual level causes firms to retain instead of paying out. As a result, agency problems in inefficient investment of retained earnings arise (Jensen [1986], Scharfstein and Stein [2000]). However, the JGTRRA lead to a large surge in dividend initiations, where firms with large executive stock holdings, independent shareholders, taxable institutional owners and firms with moderate earnings growth responded to the policy change more pronouncedly (Brown et al. [2007], Chetty and Saez [2005]).[3] This is consistent with the life-cycle theory of divi-

[1] Qualified dividends require two conditions to be satisfied: i) they must be paid by a U.S. corporation or a foreign company whose stock trades on the U.S. stock market (e.g., an American Depositary Receipt), and ii) they must have held the stock for more than 60 days during the 121-day period that begins 60 days before the ex-dividend date.

[2] In 1982, *Rule 10b-18* was adopted. This SEC rule provided a safe harbor for companies and their affiliated purchasers when the company repurchased shares of common stock. Firms would not be deemed to have violated the anti-fraud provisions of the Security Exchange Act of 1934. Moreover, in 1986, the *Tax Reform Law* was enacted. Although it reduced the tax rate on dividends (from 50 to 39%) and increased the tax rate on capital gains (from 20 to 28%), the effective dividend tax rate still discouraged dividend payouts (Allen and Michaely [2002]). As a result, the average share repurchase-dividend ratio was 57.7% in the 1980's, reaching a maximum of 113.1% in 2000.

[3] The authors show that while payers accounted for 17% in 2000, they increased up to 25% in 2004. Similarly, Brav et al. [2005] performed a survey on payout policy prior to the policy change. 13% of non-payer respondents said that a tax cut would lead to an initiation if tax rates on dividends were lower. The authors introduced a new survey after JGTRRA, and 6% of the 13% that were non-payers had already increased dividends at the beginning of 2004.

dend payouts in DeAngelo et al. [2006]. Non-payers tend to be in the capital infusion stage (Fama and French [2001], Jaganathan et al. [2000]) and only initiate dividend payouts when the costs of paying out are lower than the costs of retaining. Moreover, initiations carry a positive stock price reaction because they convey relevant information to the market by signaling the firm will remain profitable (Bhattacharya [1979]) and reduce exposure to agency conflicts.[1] As Jensen [1986] concludes, dividends imply managers will be subject to monitoring by capital markets as the firm may be forced to issue new debt to finance both, investment and the payout.

However, dividend payouts are a permanent cashflow commitment.[2] Shareholders' preference for dividend smoothing and dividend downward stickiness (Lintner [1956], Leary and Michaely [2011]), causes firms to cut dividends only as a last resort.[3] Therefore, from a capital structure channel perspective, for the same level of net income generated every fiscal year, a lower amount will be effectively devoted to retained earnings when dividend payouts increase. As a result, firms' repayment capacity in connection with unsecured debt financing is temporarily reduced, which may restrict access to the unsecured debt market. Thus, firms closer to a binding constraint may become financially constrained in terms of unsecured debt as a result of the new law.[4]

Another way to think about it is that there are adjustment costs to reach back the optimal capital structure (Myers [1984], Shyam-Sunder and Myers [1999], Leary

[1] Asquith and Mullins [1983] and Michaely et al. [1995] find that the abnormal returns associated with dividend initiations are around 3.7%.

[2] I rule out special dividends for the purpose of the present work. Special dividends are one-time or temporary dividend payouts occurring as a result of a temporary increase in cashflows (Jaganathan et al. [2000]). I do so, as they are unlikely to generate capital re-allocations.

[3] A dividend cut causes an average stock price decline of about 6% on the three days surrounding the announcement (Lintner [1956]).

[4] In Biguri [2014], I tested how different proxies for creditworthiness related to unsecured debt holdings in debt structure. I used book net worth, market net worth, retained earnings over total assets, credit ratings and Altman's Z score. All proxies are positively and significantly correlated with unsecured debt holdings in debt structure. Additionally, I tested how unsecured debt holdings in debt structure affected investment. The effect was positive and statistically significant. Moreover, the interaction term between higher unsecured debt and high creditworthiness yielded a stronger positive impact on investment.

and Roberts [2005]). Firms experience a lag between the increase in dividends and the time when optimal capital structure is restored. No matter what the new long-term equilibrium is or how long it takes for the firm to revert back to that equilibrium, in the short-run, the policy change generates a trade-off between short-term payout and financing and longer term investment decisions (as in Hennessy and Whited [2005]). Furthermore, the speed at which the new equilibrium is reached will depend on the degree of financial constraints faced. The more severely restricted access is to the unsecured debt market, the more likely firms will need to adjust the composition of their debt structure toward more secured debt issues. As a result, the probability of decreasing the size of their investment projects is heightened.

In my analysis, I face two main identification challenges. First, the tax reform affected all U.S. corporations. Therefore, even if exogenous or unpredicted, the decision on how much to alter payout/retention policy will still be endogenously determined. Second, there might be confounding effects from a lower τ^{div} and τ^{cap} if firms substitute dividend payouts for share repurchases.[1]

I address the first concern by looking at the ownership structure of firms to measure the degree of exposure to the policy change. The clientele effects literature indicates that a firms' dividend policy reflects the tax preference of its investor clientele (Graham and Kumar [2006]). Individual investors in the highest tax brackets have traditionally preferred stocks that pay low dividends due to the tax disadvantage, whereas nontaxed investors like corporations, institutions, or pension funds preferred stocks that pay high dividends. Taking this into account and building on results by Brown et al. [2007] and Chetty and Saez [2005], I define the *treatment group* as firms in the fourth quartile of the individual investors' share ownership distribution. Once the tax rates drop, at the margin, firms in

[1] The cash inflow could partly (or completely) offset the cash outflow. From the statement of cashflows (CF) identity:

$$OperatingCF + InvestingCF + FinancingCF + ExchangeRateEffects = \Delta CashBalance, \tag{2.1}$$

where cash dividends and share repurchases reduce $FinancingCF$.

the treatment group will be more likely to find it profitable to initiate/increase payouts than those in other quartiles of the distribution.

On the other hand, whether firms substituted share repurchases for dividend payouts is key in the context of this identification strategy. A substitution would imply no re-allocation of capital due to off-setting cashflows. Chetty and Saez [2005] show that the new law caused an increase in total payouts as opposed to a substitution effect. From the free cashflows to equityholders identity, higher dividend payouts need to be compensated for, either with higher operating cashflows, lower reinvestment needs, and/or further debt issues (holding share repurchases fixed). Operating cashflows are fixed in the short-term because the JGTRRA did not vary the set of investment opportunities available; consequently, debt issues may be insufficient to finance both higher dividend payouts and reinvestment needs, leading to a reduction in investment.

Assuming that the substitution hypothesis has been ruled out, the accounting treatment of each policy decision allows me to identify a clear causation channel. Although net income not paid out to shareholders as dividend payouts directly impacts retained earnings in stockholders' equity, share repurchases have no direct effect. They impact the "Treasury Stock Account" in stockholders' equity rather than retained earnings. Thus, I look at how retained earnings rather than cash holdings/dividend payouts responded to the new law. Moreover, this methodology allows me to directly link the change in policy to firms' debt and capital structure decisions.[1]

[1] Although I focus on the response of retained earnings for practical reasons, an equivalent causation channel can be established between cash holdings and unsecured debt holdings in debt structure. Two assumptions are required. First, we need to rule out the share repurchase-dividends substitution hypothesis. Second, we need to assume that cash is negative debt as in Acharya et al. [2005]. Then, as a result of the tax cut, firms that increase dividends reduce cash holdings upon payment. If cash is considered negative debt, net worth's share over total capital decreases. Provided that net worth is another proxy for firms' creditworthiness, the share of unsecured debt over total debt decreases.

2.2.1.1 Empirical Design: Unsecured Debt Is Determined by Firms' Creditworthiness

I follow an empirical design similar to that of Waldinger [2010] in which he combines DID estimation with an IV set-up. I perform DID estimation to quantify the effect of the JGTRRA on retained earnings among firms in the treatment group. To alleviate concerns regarding other sources of firm heterogeneity underlying the observed relations, I choose treatment and control groups with similar firm characteristics in terms of debt structure determinants (tangibility), with the only difference being their pre-treatment ownership structure. Treatment assignment should thus be independent, conditional on observed covariates, minimizing the possibility of a selection bias.

Then, I use treatment-induced variation on retained earnings as an instrument to test the causal effect of firms' creditworthiness on unsecured debt over total debt choice in an IV set-up. Figure 2.1 shows a causal diagram with the associated empirical tests. The structural equation for unsecured debt in debt structure ($Punsec_{it}$) is as follows:

$$Punsec_{it} = \alpha + \alpha_1 D_i + \alpha_2 Post_t + \rho Rete_{it} + X_{it}^{'}\beta_p + \varphi_{it} \tag{2.2}$$

$$Rete_{it} = \gamma + \gamma_1 D_i + \gamma_2 Post_t + \psi Z_{it} + X_{it}^{'}\beta_r + \eta_{it} \tag{2.3}$$

where D_i are firms in the fourth quartile of individual investors' share ownership distribution, and $Post_t$ takes a value of one in the post-treatment fiscal years. $Rete_{it}$ is retained earnings over total assets, the variable that we want to instrument. $Z_{it} = (D_i * Post_t)$ is the instrument, the source of exogenous variation from JGTRRA. X_{it} contains all observable firm characteristics that are relevant for the proportion of unsecured debt in the overall debt structure, including tangibility, size, profitability and investment opportunities, proxied by market-to-book. I also cluster the standard errors at the firm level, as in Petersen [2009], which relaxes the i.i.d. assumption of independent errors. Doing so allows for correlation between errors within clusters of observations, as the source of variation exploited takes place at a firm level.

First, I am interested in the statistical and quantitative significance of ρ. I test whether $\rho > 0$: the more earnings the firm is able to retain, the higher the unsecured debt holdings it will be able to achieve, ceteris paribus. This proves the causal relation of interest. Second, as data is clustered at the firm level, I use the Kleibergen-Paap rk Wald F-statistic to test whether instrument relevance is satisfied.[1] I also focus on the statistical and quantitative significance of ψ. The hypothesis being tested is $\psi < 0$: firms in the fourth quartile of individual investors' share distribution reduced retained earnings as result from JGTRRA more than the control group.[2]

Second, I perform a battery of falsification tests as the reduction in retained earnings should only respond to the increase in dividends and not to other confounding factors. I perform three main tests. First, I replicate my estimation procedure but choose other pre-treatment and post-treatment periods (2005-2010). In principle, firms' whose shareholders are not subject to an improved dividend tax treatment should not display the behavior seen in 2003. Second, I use the same pre-treatment and post-treatment years (2000-2005) but substitute retained earnings for restricted retained earnings. These are internal funds restricted from use due to requirements in financial debt contracts. Therefore, restricted retained earnings should not significantly respond to JGTRRA. Additionally, I redefine treatment and control groups by adding a second baseline characteristic: whether firms have a covenant limiting dividend payouts in secured or unsecured debt contracts. For firms in the fourth quartile of individual investors' share ownership with a covenant limiting dividend payouts, I should not observe a significant decrease in retained earnings compared to the control group. This would definitely pose a threat to the identification strategy. I conclude that retained earnings'

[1] The comparisson with Stock and Yogo [2005]'s weak identification test critical values to estimate the maximal IV relative bias is misleading in this case as it is based on the Cragg-Donald F-statistic, which assumes i.i.d. errors.

[2] For (2.2) and (2.3) to be correctly identified, the conditional independence assumption is required. For IV, I assume $Z_{it} \perp \{Punsec_{it}(d)|X_{it}\}$ for all d (all possible values of treatment). That is, the instrument is conditionally independent of potential unsecured debt in debt structure, $Punsec_{it}(d)$.

reaction is not due to confounding factors but to the effect of policy change.[1]

2.2.2 The Asset-backed Commercial Paper Market Collapse of 2007

Asset-backed commercial paper is an off-balance sheet securitization instrument used by commercial banks to short-term finance long-term assets. In the summer of 2007, two German banks and BNP Paribas suspended net asset value calculations, which sharply increased the cost of overnight asset-backed commercial paper relative to the Federal Funds Rate. Commercial banks exposed to the collapse were also suppliers to the non-financial sector (Acharya and Schnabl [2010]). Although non-financial corporate firms do not have access to this form of financing, the collapse generated a downturn in the non-financial corporate commercial paper market, which caused a temporary shortage (Brunnermeier [2009], Ivashina and Scharfstein [2010]).

Non-financial corporate commercial paper is short-term unsecured debt; thus, it does not require the pledge of collateral. According to Colla et al. [2013], the 90^{th} percentile of the commercial paper distribution is zero, suggesting that less than 10% of U.S. public firms use commercial paper for financing. Moreover, they also rely on (unsecured) public debt for long-term financing, as evidenced by Rauh and Sufi [2010]. Therefore, firms relying on commercial paper are "unconstrained" according to the traditional ex-ante definitions of financial constraints in Farre-Mensa and Ljungqvist [2015]. When non-financial corporate commercial paper becomes unavailable or restricted to firms, this represents a direct shock to unsecured debt holdings for exposed firms.[2]

Defining the treatment group solely as a function of whether they had a commercial paper program prior to the shock is unlikely to adequately reflect financial constraints in terms of restricted access to unsecured debt markets. Moreover, the empirical specification may be subject to a selection bias, as it is difficult to

[1] I discuss possible threats to the exclusion restriction in the Results section.

[2] As Ivashina and Scharfstein [2010] acknowledge "*Unsecured commercial paper holders refused to roll over their debt*".

justify that firm characteristics for treatment and control groups are as good as randomly assigned. Therefore, the conditional independence assumption would not be satisfied. I address this concern in the following manner. I define the *treatment group* as firms satisfying two conditions in pre-treatment years: i) having a commercial paper program and ii) issuing secured debt. Although firms' reliance on secured or unsecured debt depends on firm characteristics, whether firms issued secured in the three fiscal years before the collapse is exogenous to those firms' performance after the ABCP collapse. Therefore, there will be a differential effect of the shock according to whether or not firms had a commercial paper program and such differential effect is heterogeneous according to whether firms were facing some degree of restricted access to the unsecured debt market. I focus in the dynamics of firms that although rely on commercial paper, have a mixed debt structure and are not 100% unsecured debt financed. This is important, as the behavior of the *best* firms, which do not face restricted access to the unsecured debt market, should imply substituting toward unsecured public debt *if needed*.[1]

2.2.2.1 Empirical Design: Effect of Debt Structure on Investment

I perform DID estimation to quantify ABCP's effect on the share of unsecured debt over total debt for firms in the treatment group. To alleviate concerns regarding other sources of firm heterogeneity underlying the observed relations, I choose treatment and control groups with similar firm characteristics in terms of investment determinants, with the only difference being their pre-treatment degree of financial constraints faced, measured by their access to unsecured debt markets. The treatment and control groups display no ex-ante significant differ-

[1]The following excerpt from the SEC's 10-K filings provides indirect evidence to sustain the argument:

> Ingersoll Rand Inc., fiscal year 2008: *"The credit markets, including the commercial paper markets in the United States, have recently experienced adverse conditions. Although* ***we have not been materially impacted*** *by these conditions, continuing volatility in the credit markets may increase costs associated with issuing commercial paper or other debt instruments due to increased spreads over relevant interest rate benchmarks."*

The financial statements in the SEC filings allow to determine that the *"other debt instruments" were unsecured debentures in fiscal year 2008.*

ences in profitability, investment opportunities, retained earnings, or net worth between. This implies that treatment assignment is independent conditional on observed covariates, minimizing the possible existence of a selection bias.

Then, I use treatment-induced exogenous variation in unsecured debt in debt structure to establish a causal relation with investment. I follow the same empirical design as for JGTRRA. The causal diagram with the associated empirical tests are summarized in Figure 2.2. The structural equation for capital expenditures over total assets ($Capex_{it}$) is as follows:

$$Capex_{it} = \gamma_t + \theta_i + \rho Punsec_{it} + X_{it}^{'}\beta_c + \varphi_{it} \tag{2.4}$$

$$Punsec_{it} = \gamma_t + \theta_i + \psi Z_{it} + X_{it}^{'}\beta_p + \eta_{it} \tag{2.5}$$

where $Punsec_{it}$ is unsecured over total debt or the variable that we want to instrument and $Z_{it} = (D_i * Post_t)$ is the source of exogenous variation from ABCP. D_i are firms with a commercial paper conduit that are issuing secured debt in the pre-treatment years and $Post_t$ takes a value of 1 in the post-treatment years. X_{it} contains all observable firm characteristics that are relevant for investment, including; retained earnings over total assets, tangibility, size, profitability, and market-to-book. θ_i and γ_t capture firm and year fixed effects, respectively. I include firm and year fixed effects instead of D_i and $Post_t$, to limit the role of firm unobservable confounding factors and recession-driven estimated coefficients. Finally, errors are clustered at the firm-level, the source of variation.

I am interested in the sign and the statistical and quantitative significance of ρ. I expect $\rho > 0$, implying that as firms increase the proportion of unsecured debt in their debt structure, they are able to sustain larger investment projects. Moreover, ψ should be highly statistically significant to satisfy instrument relevance. As my data is clustered at the firm level, I use the Kleibergen-Paap rk Wald F-statistic to test whether instrument relevance is satisfied.[1]

[1] I also require $Z_{it} \perp \{Capex_{it}(d)|X_{it}\}$ for all d (the possible values of treatment status), implying that the instrument is conditionally independent of potential investment, $Capex_{it}$.

Although this is a well-identified supply shock, the fact that the shock is contemporaneous to the financial crisis poses concerns on confounding factors affecting firms' responses. Two main concerns can be highlighted. First, as opposed to the JGTRAA, the substitution pattern for ABCP is not clear. Firms can substitute toward other liquidity management instruments as hoarded cash or credit lines (Acharya et al. [2013], Berrospide and Meisenzahl [2015], Ivashina and Scharfstein [2010]) or, they can instead overcome the shortage of short-term unsecured debt by issuing bank debt or bonds (Adrian et al. [2012]).[1] Second, although ABCP takes place in 2007, the recession and expectations of further deterioration of economic conditions after Lehman Brothers' collapse in September 2008, may also affect the demand for credit by firms.

The first concern becomes relevant if firms substituted toward hoarded cash in order to overcome the liquidity shock, as reliance on credit line drawdowns is already reflected in the definition of debt structure used throughout the paper. Acharya et al. [2013] state that the trade-off between cash and credit lines is maximized when aggregate uncertainty is high and for firms that are financially constrained. That is, firms in the control group. Evidence in Berrospide and Meisenzahl [2015] suggests that only large and investment grade firms drewdown on credit lines for precautionary reasons, namely, firms in the treatment group. Therefore, lower cash holdings to finance investment could be behind the observed responses and this poses a threat on the exclusion restriction. However, by means of DID on cash holdings' reaction as a result from ABCP I rule out

[1] The following two excerpts from the SEC's 10-K filings acknowledge these two possibilities:

> Carterpillar Inc., fiscal year 2007: *"If our access to the commercial paper market is adversely affected due to a change in market conditions, 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 could be higher than the cost of commercial paper borrowings."*
>
> Gannet Company Inc., fiscal year 2008: *"During September 2008, liquidity in the commercial paper market was highly constrained [...] The company anticipates reducing the level of borrowings under its revolving credit facilities over time with cashflows from operations and will look to strategically refinance amounts borrowed with the issuance of* ***longer-term debt.****"*

a statistically significant heterogeneous response between treatment and control groups. The second concern, is easier to justify. Demand effects as a result from the expectation of a recession after the collapse of ABCP would imply that firms financially constrained (control group) are able to overcome the financial crisis with a reduction in investment which is lower than that of firms financially unconstrained (treatment group). However, there is an extensive literature validating that differences between firms financially constrained and unconstrained are the main driver of the cyclicality observed, as in Bernanke et al. [1996]. That is, if demand effects were confounding my results, then, it would go against me finding that a reduction in unsecured debt in debt structure leads to a decrease in investment.

I perform some robustness and falsification tests to rule out that there are confounding factors affecting the relation between debt structure and investment. First, I analyze the response of firms with a commercial paper conduit and unconstrained according to traditional ex-ante definitions for financial constraints in Farre-Mensa and Ljungqvist [2015]. Firms with a commercial paper conduit that are not facing restricted access to public debt markets should not be subject to a significant decrease in investment compared to the control group. Additionally, I test whether substitution toward secured debt issues reduces investment when considering a demand-for-credit perspective. I redefine the treatment group in the JGTRRA identification strategy to capture restricted access to unsecured debt markets, namely, firms in the fourth quartile of the individual investors' share ownership distribution that issued secured in the pre-treatment years. I should observe a significant decrease in investment compared to the control group. I conclude that the effect of debt structure on investment is robust.[1]

2.2.3 Empirical Design: Substitution Patterns

I also analyze the substitution patterns toward secured debt issues that emerge from policy change for both treatment groups, in JGTRRA and in ABCP. Building on DeAngelo et al. [2006] we learn that firms in the treatment group for

[1] I discuss possible threats to the exclusion restriction further in the Results section.

JGTRRA are, on average, in the capital infusion stage and decide to initiate dividends as a result from the tax reform. On the other hand, Rauh and Sufi [2010] and Colla et al. [2013] evidence that firms in the treatment group in ABCP are the "best" firms in the economy. Therefore, according to the traditional ex-ante financial constraints definitions, firms in the treatment group in JGTRRA will be closer to being financially constrained, while firms in the treatment group for ABCP will be considered unconstrained.

Analyzing the substitution patterns of both groups is important as different types of debt instruments have different maturities (Diamond [1993]), priorities (Barclay and Smith [1995], Brunnermeier and Oehmke [2013], sensitivity to information (Gomes and Phillips [2012], Denis and Mihov [2003]) and claims over the assets of the firm. Moreover, we need to make sure that the observed response in debt structure in both identification strategies is driven by a substitution effect instead of an income effect.

I implement the following specification for the different debt types standardized by total assets ($\frac{DebtType}{Assets}_{it}$) for JGTRAA:

$$\left(\frac{DebtType}{Assets}\right)_{it} = \alpha + \alpha_1 D_i^{jgtrra} + \alpha_2 Post_t^{jgtrra} + \psi\left(D_i^{jgtrra} * Post_t^{jgtrra}\right) + X_{it}'\beta + \eta_{it} \tag{2.6}$$

where $\frac{DebtType}{Assets}_{it}$ is i) secured debt, ii) senior secured loans, iii) senior secured bonds or iv) unsecured debt standardized by total assets. D_i^{jgtrra} is firms in the fourth quartile of individual investors' ownership of shares, and $Post_t^{jgtrra}$ is a dummy variable taking the value of one in post-treatment years of JGTRRA. $\left(D_i^{jgtrra} * Post_t^{jgtrra}\right)$ is the source of exogenous variation. X_{it} considers the relevant covariates in capital structure regressions as in Rajan and Zingales [1995] including tangibility, size, profitability and market-to-book.

In order to analyze substitution patterns for ABCP, I implement the following

specification for the different debt types standardized by total assets ($\frac{DebtType}{Assets}_{it}$):

$$\left(\frac{DebtType}{Assets}\right)_{it} = \gamma_t + \theta_i + \psi\left(D_i^{abcp} * Post_t^{abcp}\right) + X_{it}'\beta + \eta_{it} \tag{2.7}$$

where $\frac{DebtType}{Assets}_{it}$ is i) secured debt, ii) senior secured loans, iii) senior secured bonds or iv) senior unsecured bonds standardized by total assets. D_i^{abcp} is firms with a commercial paper conduit that issued secured the in pre-treatment years and $Post_t^{abcp}$ is post-treatment years of ABCP. $\left(D_i^{abcp} * Post_t^{abcp}\right)$ is the source of exogenous variation. X_{it} considers the relevant covariates in capital structure regressions as in Rajan and Zingales [1995] including tangibility, size, profitability and market-to-book. However, it also contains the log of total debt, in order to control for effects related to the contraction of credit supply in the 2007 financial crisis. γ_t and θ_i are year and firm fixed effects respectively.

2.2.4 Joint Identification Strategy: Disentangling the Effects on Investment

In this section, I address the fact that not only are debt structure choice and investment endogenous, but also that retention and payout policy are jointly determined. As a result, estimated coefficients that consider each identification strategy alone could still be biased and inconsistent. Therefore, I analyze the effect of unsecured debt on investment and retained earnings when both regressors are assumed to be endogenous and, thus, correlated with the error term.

The research analyzing the effect of collateral or internal funds on firms' investment decisions have two limitations. First, if debt structure is a variable that determines firms' investment decisions, models will be poorly specified. Additionally, they will be subject to an omitted variable bias, with the sign of the bias depending on the correlation between debt structure and the remaining covariates in the investment regression.[1] Second, only instrumenting retained earnings and

[1]For instance, provided that size is positively correlated with unsecured debt in debt structure, the exclusion of debt structure from the investment regression generates understated estimated coefficients for size.

unsecured debt does not overcome all the endogeneity issues present in the investment regression. An ideal experiment would allow collateral availability to be instrumented as well. To mitigate this concern, I build an estimation of collateral actually pledged in secured debt contracts in SEC financial statements using a text-search algorithm. The effect of measurement error in the specification should be lower in comparison with collateral availability or tangibility.

2.2.4.1 Empirical Design

I start with the following specification for investment ($Capex_{it}$):

$$Capex_{it} = \gamma_t + \theta_i + \beta_1 Rete_{it} + \beta_2 Punsec_{it} + X_{it}^{'}\alpha + \epsilon_{it} \tag{2.8}$$

where $Rete_{it}$ and $Punsec_{it}$ are the two endogenous variables that I want to instrument: retained earnings over total assets and unsecured debt over total debt. Equation (2.8) describes the investment revealed by alternative retained earnings in an experiment that holds debt structure fixed. This model likewise describes causal effects of changing firms' debt structures in an experiment that holds retained earnings fixed. In other words, (2.8) is a model for investment indexed against two jointly manipulable treatments. Following Angrist et al. [2015], the first-stage equations in an IV set-up would be:

$$Rete_{it} = \gamma_t + \theta_i + \mu_{11} Z_{it}^{div} + \mu_{12} Z_{it}^{cp} + X_{it}^{'}\alpha_1 + \epsilon_{1it} \tag{2.9}$$

$$Punsec_{it} = \gamma_t + \theta_i + \mu_{21} Z_{it}^{div} + \mu_{22} Z_{it}^{cp} + X_{it}^{'}\alpha_2 + \epsilon_{2it} \tag{2.10}$$

where $Z_{it}^{div} = (D1_i * Post1_t)$ is the effect of JGTRRA. $D1_i$ is the firms in the fourth quartile of the individual investors' share ownership distribution, and $Post1_t$ is a dummy variable taking the value of one for post-treatment years (2003-2005). $Z_{it}^{cp} = (D2_i * Post2_t)$ is the effect of ABCP, where $D2_i$ are firms with a commercial paper conduit issuing secured and $Post2_t$ is a dummy variable taking the value of one in post-treatment years. γ_t stands for year fixed effects, and θ_i is firm fixed effects. X_{it} includes all observable firm characteristics relevant to investment: tangibility or collateral pledged, size, profitability, and market-to-book. Standard errors are clustered at the source of variation, at a firm level as

in Petersen [2009].

However, the following two assumptions allow me to simplify the first-stage equations (2.9) and (2.10):

Assumption 1: $Rete_{it}(d) \perp Z_{it}^{cp}$, potential retained earnings are statistically independent of the effect of the shock in the ABCP identification strategy, for all possible realizations of treatment status, d.

Assumption 2: $Punsec_{it}(d) \perp Z_{it}^{div}$, potential debt structure is statistically independent of the effect of policy in the JGTRRA identification strategy, for all possible realizations of treatment status, d.[1]

If these two assumptions are satisfied, (2.9) and (2.10) boil down to:

$$Rete_{it} = \gamma_t + \theta_i + \mu_{11} Z_{it}^{div} + X_{it}^{'} \alpha_1 + \epsilon_{1it} \tag{2.11}$$

$$Punsec_{it} = \gamma_t + \theta_i + \mu_{22} Z_{it}^{cp} + X_{it}^{'} \alpha_2 + \epsilon_{2it} \tag{2.12}$$

Note that $\mu_{11} < 0$, if JGTRRA leads to a reduction in retained earnings for firms in the fourth quartile of individual investors' share ownership. Additionally, $\mu_{22} < 0$ if ABCP results in a reduction in the share of unsecured debt over total debt for those substituting toward secured debt issues when the supply of commercial paper becomes limited. Finally, by plugging (2.11) and (2.12) into (2.8), I derive the reduced-form causal effect equation, which I estimate through ordinary least squares (OLS):

$$Capex_{it} = \gamma_t + \theta_i + \omega_1 Z_{it}^{div} + \omega_2 Z_{it}^{cp} + X_{it}^{'} \alpha^* + \eta_{it} \tag{2.13}$$

where $\omega_1 = \beta_1 \mu_{11}$ is the policy change's effect through retained earnings on investment, holding the debt structure channel fixed. $\omega_2 = \beta_2 \mu_{22}$ is the policy change's effect through debt structure on investment, holding retained earnings

[1] I provide suggestive evidence showing that these two assumptions are empirically accepted. See Table 1 in the Appendix B4. for results of DID on retained earnings from ABCP and results of DID on unsecured debt in debt structure from JGTRRA. None are statistically significant.

channel fixed. Therefore, the causal effects of interest, β_1 and β_2, will be proportional to the OLS-estimated reduced-form coefficients, ω_1 and ω_2. The hypothesis being tested is $\omega_1 < 0$ and $\omega_2 < 0$, whether debt structure and retained earnings have a direct causal effect on investment, while controlling for collateral actually pledged.

2.3 Sample Construction

To construct the sample, I start with U.S. firms traded on AMEX, NASDAQ, and NYSE, and covered by Standard&Poor's (S&P) database Compustat, from 2000 to 2010. I remove all firm-year observations which are not from the manufacturing sector (SIC codes 2000-3999). I further remove firm-year observations with missing, negative or zero i) total assets and ii) property, plant and equipment. Finally, I winsorize all key firm characteristics at the 1^{st} and 99^{th} percentiles (*initial sample*).

Total debt secured is defined 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. Collateral availability is proxied by tangibility, retained earnings is standardized by total assets following DeAngelo et al. [2006] and in constructing the rest of firm characteristics, namely, profitability and market-to-book, I use definitions as in Lemmon et al. [2008]. I then merge the Compustat sample with Capital IQ in order to construct debt structure-specific variables. Following Colla et al. [2013], I remove firm-year observations for which the difference between total debt as reported in Compustat and the sum of debt types as reported in Capital IQ exceeds 10% of total debt. From the resulting sample I define: i) senior secured loans, ii) senior secured bonds and iii) senior unsecured bonds, all standardized by total assets.

In order to construct the sample for the JGTRRA identification strategy, I drop all firm-year observations not included in 2000-05. I follow Bertrand et al. [2004] in order to construct the pre- and post-treatment periods, using a pooled sample

from 2000-02 as a general pre-treatment period and allowing post-treatment years to include i) 2003, ii) 2003-04 and iii) 2003-05 so as to test whether the effect of policy change vanishes within a year or lasts longer. Then, I merge the sample with Reuter's ThomsonOne firm ownership structure data at the beginning of calendar year 2003, as I only need the pre-treatment individual investors' share ownership distribution.[1]

I construct a variable *Ind Inv* which assigns the number of shares under *"Individual Investor"* in Reuter's ThomsonOne for each firm and compute the percentage of individual investors' ownership over the total number of shares in Compustat. Finally, I construct a dummy variable which takes the value of one for those firms in the fourth quartile of the individual investors' share distribution, the *treatment group*. Then, I generate a firm-year code with all the existing observations and I merge it with CRSP Daily Data in order to have concrete data on dividend announcement dates, dividend types and dividends per share. I build two dummy variables: one for increases in dividends per share and one for initiations in dividends per share adjusted for stock splits.

I set the attrition rate of the experiment artificially to zero, as I require at least one observation per firm in pre- and post-treatment periods, such that the effect of treatment is consistently estimated. The reason why I do this is because Compustat stops providing firm-level data when firms file in Chapter 11, reorganization, and I want to avoid attrition caused by the 2001 recession. However, this sample correction only rules out 10 firms. Finally, I merge the text-search results for secured debt and unsecured debt with a covenant restricting dividend payouts.[2] The final sample comprises 5,074 firm-year observations.

In order to construct the sample for the ABCP identification strategy, I drop all firm-year observations not included in 2005-10 (based on Bertrand et al. [2004]),

[1] Table 2 in the Appendix B4. has the ThomsonOne data pre- and post-merge sample comparison for JGTRRA as some observations are lost in the merging process. However, there are no significant differences across samples.

[2] I construct these variables in order to use them for a robustness check. See Appendix B2. for a description on how do I build text-search variables.

the pre-treatment period consisting of a pooled sample from 2005-2007 and allowing post-treatment years to include i) 2008, ii) 2008-09 and 2008-2010 in order to test whether the effect of shock vanishes within a year or lasts longer. As before, I require at least one observation per firm in pre- and post-treatment periods, so as to avoid attrition caused by the 2007 financial crisis and firms filing in Chapter 11, reorganization, or Chapter 7, liquidation. The final sample comprises 5,291 firm-year observations.

To conclude, for the joint identification's sample I take the *initial sample* (2000-10) and merge it with Reuter's ThomsonOne firm ownership structure data at the beginning of calendar year 2003 in order to have data on individual investors' share ownership distribution. Finally, I require at least one firm-year observation per firm in pre- and post-treatment periods and I merge text-search dummies for the sources of collateral pledged by each firms, so as to build the collateral absorption index. The construction of the rest of the sample is analogous to the individual identification strategy definitions. The final sample comprises 14,463 firm-year observations. Appendix B1. provides a detailed description of the variables used in the analysis and their construction, while Appendix B3. explains in detail how the collateral absorption index has been built.

Panel a) in Table 2.1 shows summary statistics for JGTRRA (2000-2005). Firms exhibit an average (median) preference for unsecured debt both in terms of debt structure, 67% (86%) and in terms of capital structure, where 16% (13%) is unsecured and 7% (1%) is secured. In Panel b) summary statistics for ABCP are shown (2005-2010). There are no significant differences with respect to Panel a), except for the fact that both average and median unsecured debt reliance have decreased slightly. On the other hand, Figures 2.3 and 2.4 show evidence on the effect of JGTRRA and the ABCP, respectively. Figure 2.3 shows average initiations/increases in dividends per share for treatment and control groups in the pre- and post-treatment years. It shows that while firms in the treatment group increased dividend initiations/increases by 46%, the control group only increased by 19%. On the other hand, Figure 2.4 shows asset-backed commercial paper outstanding from 2002 to 2015, where we can observe the sharp contraction

experienced in August 2007 as a result from the collapse.

2.4 Results

In this section, I first explain the nature of the relation between retained earnings and unsecured debt in debt structure by means of JGTRRA. Then, I analyze how investment responds to changes in debt structure, when debt structure is assumed to be an endogenous variable in the ABCP set-up. I also shed light on the substitution patterns toward secured debt issues that emerge for treatment groups under JGTRRA and ABCP. Finally, I allow for both, retained earnings and unsecured debt in debt structure to be endogenous. I compute the reduced-form causal effect on investment when both variables are "instrumented".

2.4.1 Effect from Retained Earnings to Debt Structure, JGTRRA

Table 2.2 shows DID estimation results for the effect of policy change on retained earnings over total assets as a result from JGTRRA. Columns (1)-(2), (3)-(4) and (5)-(6) show estimated coefficients for the different post-treatment periods defined: 2003, 2003-04 and 2003-05, respectively. There is a differential effect of the reduction in the tax rate for dividends according to individual investors' share ownership on retained earnings over total total assets.[1]

The average causal effect is negative, statistically significant and the effect of policy change decays as additional post-treatment fiscal years are included. From -17.5% in 2003 in column (2) to -10.2% in 2003-05 in column (6). A different timing on the reaction to JGTRRA between treatment and control group explains the observed differences, rather than a selection issue due to a violation of the

[1]Figure 1 in the Appendix B4. shows that the parallel trends assumption is indeed satisfied for retained earnings over total assets, while Table 3 in the Appendix B4. shows pre-treatment summary statistics for treatment and control groups in JGTRRA to rule out the existence of a possible selection bias.

conditional independence assumption.[1] Firms in the treatment group reacted to a lower tax rate on dividends by increasing dividends, both in the intensive and extensive margins. More precisely, as compared to the control group, firms in the treatment group reduced 10.2 percentage points more retained earnings over total assets.[2]

Shareholders of firms belonging to the treatment group face a trade-off in terms of JGTRRA. On one hand, they can declare the dividend at the risk of deteriorating the financial condition which might cause restricted access to unsecured debt markets. On the other hand, they can retain earnings today so as to earn the long-term capital gain on the increased value of the firm. Consistent with life-cycle theories, dividends tend to be paid by mature firms that are profitable with low growth prospects, while non-payers tend to be younger firms with higher investment opportunities and larger cash holdings (Fama and French [2001]). However, as DeAngelo et al. [2006] suggest, the preference for retention vs. payout evolves over time and eventually, firms will decide to initiate dividend payouts as earnings accumulate and investment opportunities decline. The tax reform increases individual shareholders' willingness to initiate dividend payouts even if the firm might suffer the consequences in the short-term.

DID estimation results in Table 2.2 are also the first-stage results on the IV estimation. Results suggest that the tax reform provides an orthogonal instrument. However, the concern regarding the weakness of the instrument remains. The fact that the standard errors are clustered at a firm level, relaxes the i.i.d as-

[1] One possible limitation of the procedure in Table 2.2 is that additional weight is attached to those firm-year observations that resist in the sample from 2003 to 2005. Namely, the observed decay could be due to a selection problem arising from sample construction or to a different behavior between treatment and control groups in post-treatment years. In unreported results I re-run the analysis considering post-treatment years i) 2003, ii) 2004 and iii) 2005. Results validate that the decay responds to a different timing in the reaction between treatment and control groups. Dividend initiators started already in year 2003 (in line with evidence in Brav et al. [2005], while firms in the control group reacted slower.

[2] Table 4 in the Appendix B4. shows the response of the extensive margin, a dummy for dividend payers. The point estimates suggest that the most relevant activity took place in terms of initiations, not in terms of increases in dividend payouts for firms in the treatment group. No statistical significance is achieved when considering both, initiations and increases. This is consistent with evidence reported in Brown et al. [2007] and Chetty and Saez [2005].

sumption on the error term. As a result, judging whether instrument relevance is satisfied with the usual rule of thumb does not suffice (Bound et al. [1995], Stock et al. [2002]).[1] Neither does using critical values of the Cragg-Donald eigenvalue statistic in Stock and Yogo [2005]. So as to address these concerns, I look at the Kleibergen-Paap rk Wald test statistic, which allows for non-i.i.d. errors.

Table 2.3 shows 2-stage least squares results (2SLS) for unsecured debt holdings in debt structure when retained earnings, assumed to be endogenous, is instrumented with treatment-induced variation from JGTRRA. Columns (1)-(2) show the comparison of OLS and 2SLS results for post-treatment year 2003 in the just-identified case, while (3)-(4) compare OLS and 2SLS show those for post-treatment years 2003-04 for the over-identified case.[2] Below the estimated coefficients in Table 2.3, the results for the Kleibergen-Paap test in which instrument relevance is satisfied are reported: 13.27 for the just-identified case reported in column (2) and 13.69 for the over-identified case in column (4). In the over-identification case, the p-value for the Sargan test is shown and it is equal to 0.17, implying that the null hypothesis of valid over-identifying restriction is accepted.

The estimated coefficients are positive and statistically significant. A one unit increase in retained earnings generates an increase in unsecured debt over total debt in the range of 7-8% according to IV estimates in columns (2) and (4), for years 2003 and 2003-04 respectively. Results are also quantitatively relevant: a 1 standard deviation increase in retained earnings causes unsecured debt in debt structure to increase by 0.2 ($= \frac{6.6}{100}\frac{1.2}{0.4}$ from column (4)) standard deviation units. Note that, in the case of collateral availability, proxied by tangibility, a 1 standard deviation increase in collateral availability reduces unsecured debt in debt

[1] If the error term in the regression is correlated within groups, but not correlated across groups, then the consequences for IV estimation are similar to that of heteroskedasticity: the IV coefficient estimates are consistent, but their standard errors and the usual forms of the diagnostic tests are not.

[2] Results in column (4) include the post-treatment dummy and the dummy for the treatment group along with the interaction as instruments for retained earnings (over-identified case). D_i and $Post_t$ in equation (2.3). The effect of the tax cut for 2003-05 is statistically significant as evidenced by results in Table 2.2, but not significant enough to satisfy instrument relevance in an IV set-up.

structure by 0.1 ($= \frac{26}{100}\frac{0.2}{0.4}$ in column (4)) standard deviation units.[1] Therefore, retained earnings affects debt structure choice at last as much as collateral availability does.

These results yield implications related to the existing literature. First, they show that unsecured debt is not limited to S&P100 firms, but firms assumed to be financially constrained with respect to ex-ante definitions in Farre-Mensa and Ljungqvist [2015], are also willing and able to borrow on an unsecured basis if their creditworthiness is sufficiently high. Therefore, low-tangibility is by no means a necessary and sufficient condition to have limited access to external financing. Second, results are consistent with both, the pecking-order hypothesis (Myers [1984], Myers and Majluf [1984]) and trade-off theories (Myers [1984], Hennessy and Whited [2005]) of capital structure. For the former, firms exhibit a preference for internal funds not only because the cost of internal financing is lower, but because it allows them to access unsecured debt markets. Secured debt is last in line.[2] For the latter, as the probability of defaulting is lower for firms with higher creditworthiness, the present value of the tax benefits from holding debt are maximized as the present value of bankruptcy costs are likely to be very low (abstracting from all other market imperfections).

The instrument has to operate through a single known causal channel. That is, treatment-induced variation *only* affects retained earnings, which ultimately generates a causal effect on unsecured debt in debt structure. I identify two possible channels that would threat the exclusion restriction. Namely, the lack of investment opportunities as a result from the 2001 recession and retained earnings responding for reasons different from the tax reform. First, firms may be decreasing unsecured debt holdings in debt structure as a result from lower investment opportunities (as in Giambona and Golec [2012]) not because of lower

[1] In order to compute the economic relevance of the results I rely on summary statistics for the sample 2000-04, which are not provided in Table 2.1. Mean, median and standard deviation for retained earnings over total assets are -0.22, 0.14 and 1.17. Mean, median and standard deviation for tangibility are 0.26, 0.23 and 0.17. Mean, median and standard deviation for unsecured debt over total debt are 0.66, 0.85 and 0.37.

[2] The problem with the standard version of the pecking-order hypothesis still remains as firms use equity issues frequently (Frank and Goyal [2007]).

creditworthiness. Moreover, a strand in the literature on payout policy states that firms may payout excess cash when they lack investment opportunities. I argue that firms in the treatment group are of the high-growth/low-profitability (Fama and French [2001]), which tend to retain more. These firms will initiate dividend payouts as a result from the lower tax rate, consistent with the life-cycle hypothesis in DeAngelo et al. [2006]. Payout initiation depends on the costs and benefits of retention and the trade-off evolves over time as profits accumulate. This hypothesis is aligned with the agency problem in Jensen [1986]. Firms in the treatment group initiate dividend payouts because they want to avoid managers from investing in low-return projects. This ensures that managers will have to access capital markets in order to fund the needs for new projects, which is a way to discipline managers. Moreover, the stock price reaction to dividend initiations is associated with abnormal returns of 3.7% and thus, it is difficult to argue that firms in the treatment group initiate dividend payouts because of the lack of investment opportunities (Bhattacharya [1979]).

Finally, in order to provide further suggestive evidence that the exclusion restriction is satisfied, I implement DID estimation for the effect of JGTRRA on unsecured debt in debt structure, tangibility and investment. These results are shown in Table 1 in the Appendix B4. and show that the change in policy did not directly affect debt structure.[1] Moreover, collateral availability was not affected by the policy change. Namely, I provide indirect evidence to rule out that individual ownership or the average treatment effect correlate with debt structure for other reasons than their effect on retained earnings.

2.4.2 Effect from Debt Structure to Investment, ABCP

Table 2.4 shows DID estimation results for the effect of the shock on unsecured debt in debt structure as a result from ABCP on the treatment group. Columns (1)-(2), (3)-(4) and (5)-(6) show estimated coefficients for the different post-treatment periods defined: 2008, 2008-09 and 2008-10, respectively. There is

[1] Unreported results also validate that investment opportunities, profitability and size did not respond to the tax reform.

a differential effect of ABCP according to whether firms had a commercial paper conduit and this effect is heterogeneous according to whether or not firms were issuing secured debt or not in the pre-treatment years. We are focusing on the response of those assumed to be facing some degree of restricted access to the unsecured bond market among the unconstrained.[1]

The average causal effect is negative and statistically significant. The supply shock generates a decrease in a range of 6-7% in unsecured debt in debt structure for firms in the treatment group (columns (1)-(6)). When an unsecured debt instrument becomes unavailable or access is restricted, firms unable to substitute toward other unsecured debt sources as credit lines or medium term notes, decrease the loading of unsecured debt in debt structure as they are forced to substitute toward secured debt issues. Moreover, estimated coefficients do not significantly vary when considering different post-treatment periods 2008 (columns(1)-(2)), 2008-09 (columns(3)-(4)) and 2008-10 (columns(5)-(6)). This could be interpreted as evidence suggesting that the pre-Lehman collapse (liquidity shock) and the post-Lehman collapse (demand effects from the financial crisis) considerations may not be driving the results in this set-up. The reason behind this result could be the unconstrained nature of those firms relying on commercial paper. Interestingly, when comparing specifications without and with controls, the existence of a selection bias seems unlikely. The additional explanatory power provided by the controls or the differences in estimated coefficients are not statistically significantly different.

Then, we can analyze the effect of shock-induced variation in debt structure on investment. Table 2.5 shows OLS and 2SLS estimation results for investment when unsecured debt in debt structure, is assumed to be endogenous and therefore, correlated with the error term in equation (2.4). Columns (1)-(2) show the results for post-treatment year 2008, while (3)-(4) and (5)-(6) show those for post-treatment years 2008-09 and 2008-10, respectively. The estimated coeffi-

[1]Figure 2 in the Appendix B4. shows that the parallel trends assumption is satisfied for unsecured debt in debt structure, while Table 3 in the Appendix B4. shows pre-treatment summary statistics for treatment and control groups in ABCP to rule out the existence of a possible selection bias.

cients for 2SLS are positive and statistically significant, implying that a one unit increase in unsecured debt in debt structure generates an increase in capital expenditures over total assets of 0.6-0.7%. Firms with a higher loading of unsecured debt in their debt structure are able to sustain a larger size for their investment projects and this is independent of their collateral availability. Results are also quantitatively relevant: a 1 standard deviation increase in unsecured debt in debt structure, generates an increase of 0.06 ($= \frac{0.6}{100}\frac{0.38}{0.04}$ from column (6)) standard deviation units on capital expenditures over total assets.[1] Note that, 2SLS results for post-treatment periods 2008 in column (2) and 2008-09 in column (4) are not valid to derive causal statements about the relation of interest as the instrument relevance is not satisfied according to the Keibergen-Paap rk Wald F-statistic.

This result suggests that the attention devoted by the literature to how collateral promotes investment may have been misplaced, as in the context of the identification strategy, the pledge of collateral leads to lower investment. Moreover, by focusing on how firms in the treatment group reacted to ABCP, we can conclude that there is a credit channel operating, through the use of unsecured debt, that can have real effects on investment.

I claim that treatment-induced variation through unsecured debt in debt structure is the *only* channel affecting capital expenditures as a function of treatment status. However, I identify and discuss one possible channel that could threat the exclusion restriction: the *collateral channel*. Real estate prices decreased sharply after August 2007 and according to Chaney et al. [2012] this is important, as the average U.S. corporation invests $0.06 out of each additional $1 of real estate collateral. Therefore, the fact that firms had the market value of their collateral shrunk, might have generated the reduction in investment. There are two reasons why this is unlikely to be the case. First, firms with a commercial paper conduit tend to have at least an A credit rating. As Rauh and Sufi [2010] show, these firms do not rely on secured debt extensively.[2] Thus, the reduction in investment

[1] So as to guarantee that the variance-covariance matrix is full-rank given clustered standard errors and singleton dummies in the form of firm and year fixed effects, I use the Frisch-Waugh-Lowell Theorem to partial out fixed effects included in the specification.

[2] Check Figure 1 in Rauh and Sufi [2010] for further evidence.

cannot be generated by the reduction in the market value of their collateral, as the usual dependence on secured debt is not large. Second, several authors (Cerqueiro et al. [2014], Liberti and Mian [2010], Degryse et al. [2014]) show that firms pledge other sources of collateral beyond property, plant and equipment such as; accounts receivable, inventories or intangible assets. Therefore, it is unlikely that decreases in collateral availability/valuation are responsible for the observed response in investment for the treatment group as firms can also pledge other sources of collateral in addition to property, plant and equipment.

In a similar fashion as in JGTRRA, we can test through DID estimation whether the change in policy affected other firm characteristics beyond unsecured debt holdings, such that we can rule out that the effect from ABCP goes through some other channel other than debt structure. Table 1 in the Appendix B4. shows the suggestive evidence in support of the exclusion restriction. Retained earnings, tangibility or capital expenditures are not affected by the effect ABCP.[1]

2.4.3 Substitution Patterns

Table 2.6 shows the results for DID estimation from JGTRRA when firms face restricted access to unsecured debt due to a deteriorated financial condition for post-treatment period 2003-05.[2] I analyze the response of secured debt over total assets (column (1)), senior secured loans over total assets (column (2)), senior secured bonds over total assets (column (3)) and unsecured debt over total assets (column (4)). Results are aligned with the substitution hypothesis; while secured debt over total assets significantly increased for firms in the treatment group, 1.9% more (column (2)), unsecured debt over total assets does not yield a statistically significant response (column (8)). More important is what type of secured debt increased the most as a result from the substitution effect. Although senior secured bonds increased, the senior secured loans increased almost twice as much as senior secured bonds (0.6% (column (4)) vs. 1.1% (column (6)) more) for firms

[1] Unreported results show that investment opportunities, profitability or size do not significantly react for firms in the treatment group either.

[2] The pre-treatment year only considers fiscal years 2002 for the purpose of the present discussion, as Capital IQ data is only consistent from 2002 onward.

in the treatment group.

Lower creditworthiness reduces repayment capacity in the eyes of unsecured (bank) creditors and puts upward pressure on spreads. This in turn, may restrict access to the unsecured debt market and forces substitution toward secured debt issues by firms in the treatment group. When there is substitution, different financial constraints become more relevant. In the context of JGTRRA, limited contract enforceability becomes more relevant. New creditors require the pledge of collateral to enforce repayment. The type of secured debt instrument toward which firms substitute in turn depends on the degree of information asymmetries faced. While informationally-opaque firms increase senior secured bank debt issues by 1.2% more, more transparent firms substitute toward senior secured bonds instead by 0.6% more than the control group. The conclusions are consistent with evidence reported in Rauh and Sufi [2010] as firms with lower credit quality tend to borrow secured bank debt, provided that lower credit quality is correlated with earnings retained in the capital structure.

Table 2.7 shows the results for DID estimation from ABCP when firms face restricted access to unsecured debt due to a shortage in supply for post-treatment period 2008-2010. I analyze the response of secured debt over total assets (column (1)), senior secured bonds over total assets (column (2)), senior secured loans over total assets (column (3)) and senior unsecured bonds over total assets (column (4)). As we can observe, firms substitute from unsecured bonds (-2% in column (8)) to bank debt. More precisely, they substitute toward senior secured loans (0.9% in column (6)). However, when analyzing the substitution patterns for those firms that were relying on commercial paper *only* before ABCP, which is reflected by variable *Commercial Paper 2008-10* in Table 2.7, the patterns of substitution are just the opposite. We observe that firms that did not face restricted access to the unsecured bond market, increased senior unsecured bond issues significantly, 3.7% in column (8), and decreased senior secured loans by 1.4% more in column (6).

The temporary shortage in unsecured commercial paper forces firms in the treat-

ment group to substitute toward other unsecured debt sources of financing as senior unsecured bonds. Firms with a commercial paper program increased senior unsecured bond holdings as a result from the supply shock by 3.7% more than the control group. However, some firms may face restricted access to the bond market and thus, they are forced to substitute toward bank debt instead. As asymmetric information becomes more relevant when firms switch markets, creditors require the pledge of collateral to enforce repayment. More precisely, firms reduced senior unsecured bond holdings by 2.2% and increased senior secured bank debt by 0.9% more than the control group. These results are consistent with evidence in Ivashina and Scharfstein [2010] and Berrospide and Meisenzahl [2015] that credit line drawdowns increased during the financial crisis. Moreover, it also explains the shift in the composition of credit between loans and bonds evidenced in Adrian et al. [2012].

2.4.4 Disentangling the Effect on Investment

I assume now that both, unsecured debt over total debt and retained earnings over total assets are endogenous in the investment regressions (as it is the case in practice). I am interested on the sign and statistical significance of the estimated coefficients for retained earnings over total assets, β_1, and for unsecured debt in debt structure, β_2 in equation (2.13), as the estimated coefficient is proportional to the to the causal effect on investment that could be derived from an IV set-up. Tables 2.8 and 2.6 show the results for collateral availability proxied by tangibility (columns (2), (5) and (8)) and for an estimation of collateral actually pledged over total assets (columns (3), (6) and (9)).[1]

When we take away the endogeneity present in both variables and assuming additive constant treatment effects, in an experiment that holds unsecured debt over total debt fixed, retained earnings does not have a reduced-form causal effect on investment (columns (1)-(6)). This is independent of the choice of collateral availability or pledged. On the other hand, when holding retained earnings fixed,

[1]See Appendix B3. for further details on the collateral absorption index and Table 5 in the Appendix B4. for the summary statistics of the joint identification strategy.

the estimated coefficients gather the reduced-form causal effect over investment of changing debt structure. Namely, the effect on investment of reducing unsecured debt in debt structure: -1.4% in column (3), -0.8% in column (6) and -0.6% in column (9) for post-treatment years in ABCP 2008, 2008-09 and 2008-10, respectively. We observe that when using collateral availability proxied by tangibility the effect of policy change over investment is negative, -0.483 (column (8)). On the other hand, when using collateral actually pledged instead, we observe that the effect does not vary significantly, -0.577 (column (9)).

Results point out two implications. First, using collateral availability or pledged does not change the effect that unsecured debt holdings in debt structure have on investment. Second and more important, it suggests that collateral pledged and retained earnings may have an indirect effect only on investment, though the determination of secured and unsecured debt holdings in debt structure.

2.5 Threats to Validity: Robustness, Placebo and Falsification Tests

In this section I explore the plausibility of alternative explanations to the observed responses in the different variables of interest in JGTRRA and ABCP. Additionally, I perform some falsification tests.

2.5.1 Robustness: Investment's Response, JGTRRA

I test whether firms that substitute toward secured debt issues as a result from lower retained earnings, decrease investment as a result. I use two baseline characteristics in order to define the treatment group. First, firms in the fourth quartile of the individual investors' share ownership distribution. Second, firms issuing secured debt at pre-treatment years. That is, the effect of the JGTRRA varies according to individual investors' share ownership and the effect is heterogeneous according to whether or not firms were issuing secured debt before the tax-cut. The second baseline characteristics allows to capture restricted access to the unsecured debt market. Table 1 in Robustness Checks in Appendix B4. shows

that firms that substitute toward secured debt issues have to reduce the size of their investment projects as a result, -0.8% in column (6). However, there is no effect on investment when considering the ownership structure as the treatment group alone, estimated coefficient for *Q4 Individual Investors in 2003-05*. This result is consistent with Yagan [2015], showing that the JGTRRA of 2003 did not have an impact on investment. Namely, only firms that decreased unsecured debt holdings due to substitution toward secured debt issues, reduced the size of their investment projects.

2.5.2 Response in Retained Earnings is driven by Other Factors in JGTRRA

Restricted Retained Earnings: I run DID estimation on the effect of JGTRRA in the treatment group with restricted retained earnings. These are retained earnings that are limited due to covenants or restrictions gathered in financial contracts. The main idea is to check whether excluded retained earnings responded to the policy change. If they do, it would prove that there is something else beyond the tax-cut which is affecting retained earnings. Therefore, the identification strategy would still be subject to the endogeneity critique. Table 2 in Robustness Checks in Appendix B4. shows these results and rules out this hypothesis.

Covenants Limiting Dividend Payouts: I run a triple DID estimation on the effect of JGTRRA in the treatment group on retained earnings. The first baseline characteristic is firms in the fourth quartile of individual investors' ownership of share distribution, whereas the second baseline characteristic is firms with a covenant in secured or unsecured debt contracts limiting dividend payouts. That is, the effect of the JGTRRA varies according to individual investors' ownership and the effect is heterogeneous according to whether firms had a covenant limiting dividend payouts. Table 2 in Robustness Checks in Appendix B4. shows these results and the effect is positive, which is line with the fact that these firms can only retain whatever they generate. Moreover, it rules out the hypothesis that retained earnings reacted for other factors different from the dividend tax

cut.

Falsification Test (2005-10): I run DID estimation for the effect of JGTRRA on retained earnings over total assets but with a different sample selection, pre-treatment fiscal years being 2005-07 and post-treatment years 2008-10. The main idea is to test whether retained earnings over total assets respond significantly when there is no event that exogenously affects retention/payout policy. Table 3 in Robustness Checks in Appendix B4. shows these results and rules out this hypothesis.

2.5.3 Point Estimates in ABCP for the Effect of Debt Structure on Investment are driven the Demand Effects

Unconstrained Firms' Response: I run DID estimation for the causal effect of ABCP on capital expenditures for those financially unconstrained according to ex-ante definitions in Farre-Mensa and Ljungqvist [2015]. The main idea is that commercial paper program holders are likely to be unconstrained firms but the reversal may not be true. Not all firm considered unconstrained have a commercial paper conduit. Given this, if we find no statistically significant response on investment, it would imply that the results are not driven by the recession but to the fact that those affected by ABCP were affected in terms of debt structure. Table 4 in Robustness Checks in Appendix B4. shows these results using size as a measure for being financial constrained and rules out the hypothesis, while Table 1 in Appendix B4. shows that investment did not significantly respond for these firms as a result from ABCP.[1]

[1] In unreported results I also use the Kaplan&Zingales Index, the Size&Age Index in Hadlock and Pierce [2010], a dividend payer dummy and a S&P Long-term Bond Rating. They yield the same conclusion.

2.6 Discussion

I address the traditional question in corporate finance of how firms' financing decisions affect investment policy. However, I innovate by linking financial constraints to debt structure choice and firms facing restricted access to the unsecured debt market. More precisely, by means of two identification strategies to avoid endogeneity concerns, I shed light on the role of unsecured debt in debt structure in generating an effect on investment in the presence of financial constraints. This paper exploits the *Jobs and Growth Tax Relief Reconciliation Act* of 2003, which reduced the tax rate for dividends and long-term capital gains, as an exogenous demand shock affecting firms' creditworthiness. A lower repayment capacity in connection with unsecured debt allows analyzing the response of debt structure and investment as a result. Then, by means of the *Asset-backed Commercial Paper Market Collapse* of 2007, I explore the effect on investment of a reduction in unsecured debt in firms' debt structure due to a temporary shortage in short-term unsecured commercial paper.

I derive two main results. First, results suggest a positive causal mechanism from firms' creditworthiness to the share of unsecured debt over total debt. The accumulation of retained earnings increases firms' repayment capacity in the eyes of creditors, especially for unsecured creditors. This in turn, allows them to use more unsecured debt sources of financing, which is consistent with evidence reported in Rauh and Sufi [2010]. This is important because it highlights that firms may not necessarily render financially constrained when the valuation of their collateral drops or have limited collateral to pledge to secure debt financing. Additionally, the preference for holding unsecured debt sources of financing in debt structure suggests that even if firms have available collateral to pledge, firms prefer not to do it.

Second, I show that as firms increase their holdings of unsecured debt in debt structure, they are able to finance larger investment projects. Moreover, the effect is quantitatively relevant: a one standard deviation increase in unsecured debt in debt structure leads to an increase of 0.06 standard deviation units in

investment. Although the income effect is interesting to analyze, I focus on the substitution effect arising from the positive relation between unsecured debt and investment. I show that when firms face restricted access to unsecured sources of debt due to i) a deterioration of the financial condition or to ii) a shortage of an unsecured debt instrument, they substitute toward secured debt issues. As a result, firms are forced to reduce the size of their investment projects. I argue that the cost-effectiveness of unsecured debt and the a different intensity of the different financial constraints faced is behind this result. Therefore, as opposed to the traditional literature on the so-called *collateral channel* suggests, this paper shows that the pledge of collateral can also have a dampening effect on firms' investment. Moreover, the empirical strategy allows identifying a balance sheet channel and a credit channel through which financial constraints can impact investment through debt structure choice.

The main contribution of the paper is to show that a departure from the debt homogeneity assumption by allowing unsecured debt to play a role, is able to generate a sizable effect on investment. Additionally, it contributes by showing that restricted access to the unsecured debt market provides a useful benchmark to assess the effect of financial constraints. This result may be relevant in terms of business cycle dynamics. Therefore, it should be further explored to shed light on the specific mechanism that generates the reduction in investment from relying more on secured debt sources of financing. Real effects of debt structure heterogeneity in this paper along with the conclusions in a recent paper by Azariadis et al. [2015] suggest that collateral constraints may not be binding. The authors show that unsecured debt has a role in generating variation in output over the business cycle that is larger than that of secured debt. Relaxing the assumption that all financial contracts available are secured may generate dynamics on aggregate investment and over the business cycle that are worth being studied further.

Table 2.1: **Summary Statistics, JGTRRA 2000-2005 and ABCP 2005-2010:** This table contains summary statistics for key firm characteristics from U.S. public manufacturing firms (SIC codes 2000-3999) from Compustat. Panel a) contains summary statistics for JGTRRA (2000-2005), where the treatment group is defined as firms in the fourth quartile of the individual investors' share ownership distribution (Reuter's ThomsonOne data), while Panel b) contains summary statistics for ABCP (2005-2010), where the treatment group is defined as firms with a commercial paper conduit issuing secured (Capital IQ data). Dividend payout data is from CRSP's daily files.

	Panel a) (2000-2005)			Panel b) (2005-2010)		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Individual Investors Shares	0.15	0.03	0.25	n/a	n/a	n/a
Increase/Initiate Dividends	0.19	-	0.39	n/a	n/a	n/a
Commercial Paper Program	n/a	n/a	n/a	0.31	-	0.46
Unsecured (Total Debt)	0.67	0.86	0.37	0.65	0.82	0.38
Unsecured (Total Assets)	0.16	0.13	0.15	0.14	0.11	0.14
Secured (Total Assets)	0.07	0.01	0.10	0.07	0.01	0.11
Retained Earnings	- 0.25	0.14	1.24	- 0.34	0.15	1.54
Net Worth (Book)	0.70	0.71	0.21	0.70	0.72	0.21
Capital Expenditures	0.04	0.03	0.04	0.04	0.03	0.04
Log (Size)	5.62	5.51	1.97	6.01	6.07	2.05
Profitability	0.06	0.10	0.17	0.07	0.11	0.17
Mkt-to-book	1.59	1.14	1.27	1.46	1.13	1.06
Tangibility	0.26	0.23	0.17	0.24	0.20	0.16
# Observations	5,074			5,291		

Notes: n/a stands for not applicable.

Table 2.2: **Retained Earnings' reaction to JGTRRA of 2003, First-Stage IV:** This table contains regression results for the average treatment effect, ATE_{it}, on retained earnings over total assets (the dependent variable) as a result from the policy change for the treatment group (2000-2005). Retained earnings is multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. Columns (1)-(2), (3)-(4) and (5)-(6) show results for post-treatment years 2003, 2003-04 and 2003-05, respectively. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Dependent Variable: Retained Earnings over Total Assets					
Post-treat	2003		2003-04		2003-05	
Pre-treat			2000-02			
	(1)	(2)	(3)	(4)	(5)	(6)
ATE 2003	-17.51***	-17.49***				
	(5.013)	(4.606)				
ATE 2003-04			-16.20***	-11.88***		
			(4.769)	(4.423)		
ATE 2003-05					-14.32**	-10.17*
					(5.979)	(5.516)
Post 2003	-8.038***	-2.969				
	(2.076)	(2.035)				
Post 2003-04			-6.930***	-8.831***		
			(2.534)	(2.478)		
Post 2003-05					-9.221**	-13.41***
					(3.819)	(3.694)
Q4	-44.16***	11.53**	-40.46***	12.81**	-41.75***	16.18***
	(7.773)	(5.693)	(7.615)	(5.658)	(7.767)	(6.189)
Tangibility		8.363		12.37		15.70
		(15.62)		(14.83)		(16.41)
Log (Size)		11.80***		10.41***		10.86***
		(2.913)		(3.022)		(3.238)
Mkt-to-book		-16.82***		-16.21***		-15.59***
		(3.524)		(3.301)		(3.237)
Profitability		370.0***		378.3***		415.9***
		(25.90)		(22.86)		(25.68)
Constant	62.89***	-51.44*	62.80***	-47.71**	67.17***	-55.82**
	(22.48)	(29.87)	(17.70)	(23.63)	(16.75)	(22.65)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm
R-squared	0.101	0.419	0.089	0.381	0.086	0.372
# Observations	3,215	3,210	4,260	4,247	5,067	5,052

Table 2.3: **IV Estimation, Effect of Retained Earnings on Debt structure:** This table contains OLS and 2SLS estimation results of the causal effect from retained earnings to unsecured debt over total debt (dependent variable) (2000-2005). Retained earnings is instrumented ($Z_{it} = (Post * Q4)_{it}$) with the average treatment effect from JGTRRA of 2003 on the treatment group in Table 2.2. Unsecured debt is multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. Columns (1)-(2) compare OLS and 2SLS in the just-identified case for post-treatment year 2003, while columns (3)-(4) show the over-identified case for post-treatment years 2003-04. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Dependent Variable: Unsecured Debt over Total Debt			
Post-treat	2003		2003-04	
Pre-treat			2000-02	
	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)
RetEarnings	6.743**	8.105**	5.345**	6.568*
	(2.647)	(4.011)	(2.419)	(3.841)
Tangibility	-27.95***	-27.07***	-25.87***	-25.96***
	(5.662)	(5.670)	(5.301)	(5.310)
Log (Size)	8.318***	8.277***	8.326***	8.240***
	(0.446)	(0.495)	(0.424)	(0.477)
Mkt-to-book	-0.655	-0.162	-0.834	-0.374
	(0.569)	(0.578)	(0.544)	(0.556)
Profitability	9.273	8.552	8.349	8.454
	(6.303)	(6.297)	(5.927)	(5.965)
Constant	26.54***	19.36***	25.60***	19.32***
	(3.421)	(3.084)	(3.242)	(2.985)
KP-stat 1^{st} stage	n/a	13.27	n/a	13.69
Just Identified	n/a	Yes	n/a	No
Sargan-Hansen	n/a	n/a	n/a	0.17
Clustered SE	Firm	Firm	Firm	Firm
Firm&Year Dummy	Yes	Yes	Yes	Yes
R-squared	0.211	0.195	0.207	0.194
# Observations	3,215	3,215	4,260	4,260

Notes:
KP-stat is the Kleibergen-Paap rk Wald F-statistic, allowing for non i.i.d. errors.

Table 2.4: **Unsecured debt in Debt Structure's reaction to ABCP Market Collapse of 2007, First-Stage IV:** This table contains regression results for the average treatment effect, ATE_{it}, on the share of unsecured debt over total debt (the dependent variable) as a result from the supply shock for the treatment group (2005-2010). Unsecured debt is multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009] and regressions include firm and year fixed effects. Columns (1)-(2), (3)-(4) and (5)-(6) show results for post-treatment years 2008, 2008-09 and 2008-10, respectively. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Dependent Variable: Unsecured over Total Debt					
Post-treat	2008		2008-09		2008-10	
Pre-treat			2005-07			
	(1)	(2)	(3)	(4)	(5)	(6)
ATE 2008	-6.504**	-6.774***				
	(2.523)	(2.512)				
ATE 2008-09			-5.603***	-5.732***		
			(1.865)	(1.885)		
ATE 2008-10					-6.364***	-6.388***
					(1.635)	(1.659)
RetEarnings		-0.0293		-0.555		-0.495
		(1.124)		(0.737)		(0.685)
Tangibility		-10.60		-14.54		-16.52
		(14.54)		(12.97)		(11.21)
Log (Size)		-2.772		-0.409		1.601
		(3.269)		(2.614)		(2.243)
Mkt-to-book		-0.831		-0.588		-0.412
		(0.947)		(0.783)		(0.705)
Profitability		6.887		8.918		6.919
		(9.480)		(6.829)		(6.449)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.828	0.829	0.789	0.790	0.761	0.762
# Observations	3,243	3,238	4,504	4,491	5,291	5,275

Table 2.5: **IV Estimation, Effect of Debt Structure on Investment:** This table contains OLS and 2SLS estimation results of the causal effect from the share of unsecured debt over total debt to capital expenditures over total assets (dependent variable) (2005-2010). Debt structure is instrumented ($Z_{it} = (Post * CPSec)_{it}$) with the average treatment effect from ABCP market collapse of 2007 on the treatment group in Table 2.4. Capital expenditures are multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). 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. Columns (1)-(2), (3)-(4) and (5)-(6) show the just-identified results for post-treatment years 2008, 2008-09 and 2008-10, respectively. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Dependent Variable: Capital Expenditures over Total Assets					
Post-treat	2008		2008-09		2008-10	
Pre-treat			2005-07			
	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Unsecured	-0.380	0.741***	-0.457**	0.608***	-0.335*	0.598***
	(0.275)	(0.202)	(0.220)	(0.173)	(0.190)	(0.163)
RetEarnings	-0.0729	-0.0823	0.165	-0.0755	0.218**	-0.0581
	(0.135)	(0.0548)	(0.103)	(0.0464)	(0.0873)	(0.0429)
Tangibility	24.66***	16.24***	18.70***	14.58***	17.87***	14.13***
	(1.177)	(0.388)	(0.955)	(0.322)	(0.830)	(0.297)
Log (Size)	1.326***	0.0335	0.744***	0.0336	0.600***	0.0334
	(0.255)	(0.0463)	(0.198)	(0.0381)	(0.167)	(0.0354)
Mkt-to-book	0.286***	0.584***	0.321***	0.636***	0.407***	0.642***
	(0.0755)	(0.0528)	(0.0674)	(0.0455)	(0.0610)	(0.0430)
Profitability	-0.798	2.438***	0.356	2.810***	0.530	2.815***
	(0.750)	(0.463)	(0.577)	(0.396)	(0.507)	(0.369)
KP-stat 1^{st} stage	n/a	7.27	n/a	9.29	n/a	14.83
Just Identified	n/a	Yes	n/a	Yes	n/a	Yes
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm
Year&Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.775	0.371	0.714	0.337	0.697	0.324
# Observations	3,237	3,237	4,488	4,488	5,271	5,271

Notes:
I partial out fixed effects by means of the Frisch-Waugh-Lovell Theorem.
KP-stat is the Kleibergen-Paap rk Wald F-statistic, allowing for non i.i.d. errors.

Table 2.6: **Substitution Pattern JGTRRA: Lower Creditworthiness (firms' side):** This table contains regression results for the average treatment effect, ATE_{it}, on debt types over total assets (the dependent variable) as a result from the policy change for the treatment group (2000-2005). Debt types are multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Dependent Variable: Debt Type over Total Debt							
	Secured Debt		Sr Secured Bonds		Sr Secured Loans		Unsecured Debt	
Post-treat	2003-05							
Pre-treat	2002							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ATE 2003-05	1.665***	1.888***	0.495*	0.636**	1.147**	1.145**	-1.857**	-0.614
	(0.575)	(0.569)	(0.258)	(0.262)	(0.475)	(0.476)	(0.817)	(0.825)
Post 2003-05	0.966***	1.512***	0.319**	0.490***	0.420*	0.770***	5.910***	5.026***
	(0.267)	(0.277)	(0.132)	(0.138)	(0.224)	(0.236)	(0.575)	(0.578)
Q4	3.059***	0.00961	0.526*	-0.382	2.320***	0.431	-4.104***	0.857
	(0.557)	(0.602)	(0.290)	(0.311)	(0.472)	(0.503)	(0.786)	(0.909)
Tangibility		10.69***		6.177***		3.626**		0.997
		(1.993)		(1.267)		(1.646)		(2.483)
Log (Size)		-1.310***		-0.271**		-0.991***		3.064***
		(0.184)		(0.108)		(0.146)		(0.254)
Mkt-to-book		-0.804***		-0.130		-0.580***		-0.797***
		(0.152)		(0.0903)		(0.119)		(0.269)
Profitability		-2.928**		-3.578***		2.413**		-10.59***
		(1.472)		(0.936)		(1.124)		(2.593)
Constant	5.764**	11.51***	2.343	2.769	3.636	8.524***	2.154	-12.22***
	(2.833)	(3.112)	(1.562)	(1.980)	(3.047)	(2.688)	(2.146)	(2.389)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
R-squared	0.103	0.163	0.048	0.089	0.084	0.121	0.117	0.202
# Observations	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471

Table 2.7: **Substitution Pattern ABCP: Supply Shortage (capital markets' side):** This table contains regression results for the average treatment effect, ATE_{it}, on debt types over total assets (the dependent variable) as a result from the shock for the treatment group (2005-2010). Debt types are multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). 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 1%, 5% and 10% levels, respectively.

	Dependent Variable: Debt Type over Total Assets							
	Secured Debt		Sr Secured Bonds		Sr Secured Loans		Sr Unsec Bonds	
Post-treat					2008-10			
Pre-treat					2005-07			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ATE 2008-10	0.833	0.286	-0.431	-0.491	1.310**	0.882*	-1.847	-2.242*
	(1.011)	(1.002)	(0.728)	(0.725)	(0.522)	(0.517)	(1.262)	(1.192)
CommPaper 2008-10	-0.346	-0.0981	1.440	1.518	-1.538***	-1.389***	3.843***	3.718***
	(2.372)	(2.290)	(2.193)	(2.164)	(0.477)	(0.492)	(1.047)	(0.959)
RetEarnings		-0.831*		-0.712		-0.229		0.0693
		(0.448)		(0.443)		(0.175)		(0.213)
Tangibility		4.445		-0.268		2.700		-5.755
		(6.304)		(4.717)		(3.723)		(4.935)
Log (Size)		-2.649***		-0.876		-1.268		-0.820
		(0.988)		(0.606)		(0.797)		(0.828)
Mkt-to-book		-0.265		-0.0561		-0.0864		0.262
		(0.258)		(0.149)		(0.219)		(0.320)
Profitability		-0.837		-0.370		1.110		-4.022*
		(2.995)		(2.338)		(1.848)		(2.389)
Log (Total Debt)		2.903***		0.564***		2.138***		2.000***
		(0.318)		(0.155)		(0.274)		(0.312)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.691	0.721	0.584	0.597	0.729	0.750	0.778	0.792
# Observations	3,649	3,632	3,649	3,632	3,649	3,632	3,649	3,632

Table 2.8: **Joint Identification Strategy: Disentangling the Effect of Debt Structure, Retained Earnings and Collateral Pledged on Investment:** This table contains regression results for investment's response when both unsecured debt over total debt and retained earnings are assumed to be endogenous. Unsecured debt over total debt is replaced by $Z_{it}^{cp} = (Post * CPSec)_{it}$ from ABCP, while retained earnings is replaced with $Z_{it}^{div} = (Post * Q4)_{it}$ from JGTRRA. Capital expenditures are multiplied by 100. Results are for U.S. public manufacturing firms (SIC codes 2000-3999) from 2000 to 2010. The estimation for *Collateral Pledged* is performed by means of a text-search algorithm that looks for the sources of collateral pledged in each secured contract in the SEC's 10-K filings. 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 1%, 5% and 10% levels, respectively.

	Dependent Variable: Capital Expenditures over Total Assets								
Post-treat	2003-05 & 2008			2003-05 & 2008-09			2003-05 & 2008-10		
Pre-treat				2000-02 & 2005-07					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ATE 2008 (Unsec)	-1.437***	-1.429***	-1.390***						
	(0.325)	(0.320)	(0.326)						
ATE 2008-09 (Unsec)				-0.749***	-0.707***	-0.761***			
				(0.252)	(0.247)	(0.256)			
ATE 2008-10 (Unsec)							-0.581**	-0.483**	-0.577**
							(0.244)	(0.232)	(0.248)
ATE 2003-05 (RE)	-0.0891	-0.125	-0.0897	-0.0862	-0.123	-0.0863	-0.0852	-0.123	-0.0855
	(0.184)	(0.181)	(0.182)	(0.184)	(0.181)	(0.182)	(0.184)	(0.181)	(0.182)
Tangibility		18.14***			18.13***			18.13***	
		(1.234)			(1.237)			(1.237)	
Pledged			-0.292			-0.303			-0.298
			(0.341)			(0.342)			(0.342)

Table 2.9: **Joint Identification Strategy: Disentangling the Effect of Debt Structure, Retained Earnings and Collateral Pledged on Investment:** Table 2.8 Continued

	Dependent Variable: Capital Expenditures over Total Assets								
Post-treat	2003-05 & 2008			2003-05 & 2008-09			2003-05 & 2008-10		
Pre-treat	2000-02 & 2005-07								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ATE 2008 (Unsec)	-1.437***	-1.429***	-1.390***						
	(0.325)	(0.320)	(0.326)						
ATE 2008-09 (Unsec)				-0.749***	-0.707***	-0.761***			
				(0.252)	(0.247)	(0.256)			
ATE 2008-10 (Unsec)							-0.581**	-0.483**	-0.577**
							(0.244)	(0.232)	(0.248)
ATE 2003-05 (RE)	-0.0891	-0.125	-0.0897	-0.0862	-0.123	-0.0863	-0.0852	-0.123	-0.0855
	(0.184)	(0.181)	(0.182)	(0.184)	(0.181)	(0.182)	(0.184)	(0.181)	(0.182)
Log (Size)		0.648***	0.181		0.648***	0.181		0.648***	0.180
		(0.152)	(0.161)		(0.153)	(0.162)		(0.153)	(0.162)
Mkt-to-book		0.427***	0.267***		0.427***	0.267***		0.426***	0.267***
		(0.0614)	(0.0723)		(0.0615)	(0.0723)		(0.0614)	(0.0722)
Profitability		1.138**	0.399		1.138**	0.402		1.139**	0.405
		(0.511)	(0.571)		(0.511)	(0.571)		(0.511)	(0.571)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.588	0.630	0.595	0.588	0.629	0.595	0.588	0.629	0.594
# Observations	14,463	14,463	14,044	14,463	14,463	14,044	14,463	14,463	14,044

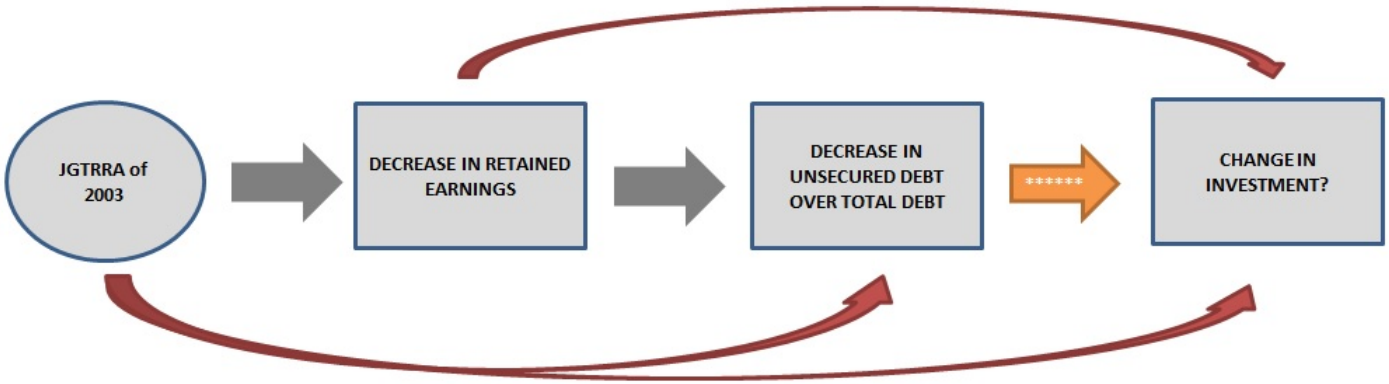


Figure 2.1: **Summary of Identification Strategy JGTRRA:** Jobs and Growth Tax Relief Reconciliation Act of 2003.

Goal: Showing that an increase in unsecured debt in debt structure increases investment (orange arrow). The *Jobs and Growth Tax Relief Reconciliation Act* of 2003 reduces the tax rate on dividends and capital gains, which affects retained earnings over total assets (DID estimation). The reduction in retained earnings, as the financial condition of the firm deteriorates, leads firms to a substitution toward secured debt issues (IV estimation). The substitution toward secured debt issues forces firms to reduce the size of their investment projects and thus, debt structure heterogeneity has real effects over investment (Triple DID estimation). I estimate a reduced-form causal effect as we cannot rule out retained earnings may directly affect investment (Kaplan and Zingales [1997]). I rule out the following lines of causation to support the *exclusion restriction* (red arrows).

1. The tax-cut does not directly affect debt structure (DID estimation).
2. Tangibility, the key determinant for secured debt issues/holdings, does not change as a result from the tax-cut (DID estimation).
3. The tax-cut does not directly affect capital expenditures (DID estimation).

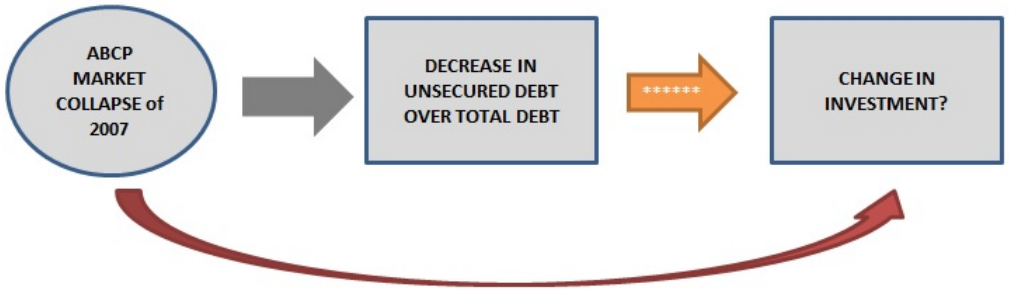


Figure 2.2: **Summary of Identification Strategy ABCP:** Asset-backed Commercial Paper Market Collapse of 2007.

Goal: Showing that an increase in unsecured debt in debt structure increases investment (orange arrow). The *Asset-backed Commercial Paper Market Collapse* of 2007 causes a downturn in the market for non-financial corporate commercial paper market. The effect of the shock reduces unsecured debt in debt structure for those relying on commercial paper and unable to substitute toward other unsecured financial debt sources (DID estimation). The substitution toward secured debt issues forces firms to reduce the size of their investment (IV estimation). I rule out the following lines of causation to support the *exclusion restriction* (red arrow).

1. The collapse does not directly affect investment (DID estimation). Results in Yagan [2015] are also consistent with this result.
2. Tangibility, retained earnings, market-to-book, profitability and size are not directly affected by the shock (DID estimation).

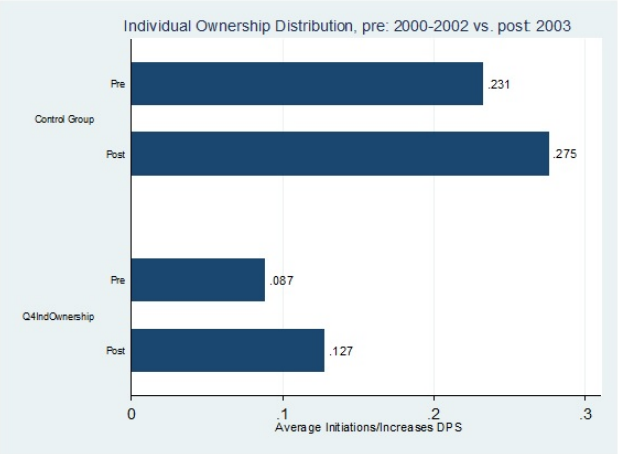


Figure 2.3: **Average Initiations/Increases in dividends per share for Treatment and Control Groups in pre- and post-treatment periods, 2000-2003.** Initiations and increases in dividends per share adjusted for stock splits are from CRSP Daily files. The treatment group is defined as the fourth quartile of the individual share ownership distribution using ThomsonOne institutional ownership data, while the control group is formed with the remaining firm-year observations. The pre-treatment period is 2000-2002 and the post-treatment year is 2003.

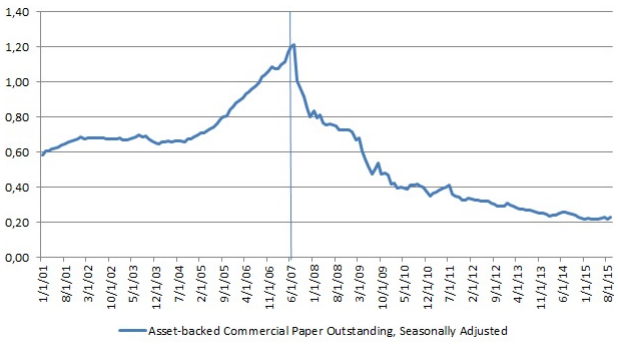


Figure 2.4: **Asset-backed Commercial Paper Outstanding, 2002-2015.** *Source:* Federal Reserve Bank of Saint Louis.

Chapter 3

HOW CHEAPER HEDGING AFFECTS THE VOLATILITY OF CASHFLOWS

3.1 Introduction

Research on risk management is scant but suggests that derivatives are often used to improve the efficiency of liquidity management and to alleviate the underinvestment problem (Froot et al. [1993]). However, firms are exposed to both aggregate and idiosyncratic sources of risk. One strand of the literature suggests that hedging through derivatives helps reducing risk in general (Guay [1999]). Another strand considers that risk averse managers are thought to hedge the aggregate component of their exposure to firms' cashflow risk by trading in financial markets. However, they cannot hedge their firm specific risk (Acharya and Bisin [2009]). As a result, they have incentives to avoid firm-specific projects in favor of projects containing more aggregate risk and thus, hedging can increase firms' exposure to risk.[1]

Therefore, it becomes a matter of debate how access to hedging instruments

[1]This chapter is part of the joint work with Christian Brownlees (UPF), Murillo Campello (Cornell University and NBER) and Filippo Ippolito (UPF).

changes helps reducing risk factors associated with the various corporate policies. In this paper we use a novel approach to this traditional question in corporate finance in order to shed light on how hedging affects risk exposure of firms and whether the exposure varies over time with firms adjusting their risk composition of the various corporate policy decisions. We investigate how organized capital markets can innovate by creating insurance products to smooth out risk sharing and the real investment process by means of a difference-in-differences approach. More precisely, we study how the introduction of input derivatives (better access to hedging instruments), affects the volatility of stock returns and the real implications of hedging.

The CME (Chicago Mercantile Exchange) and other exchanges have been introducing futures, options and other derivatives that are written on very specific underlying assets, to meet the demand for hedging of different industries over the last 20 years. The introduction of a derivative on a specific input allows firms to reduce the risk associated with volatility in input prices. Each asset underlying a derivative carries an aggregate and a specific component. Part of input price volatility arises from volatility in the market, because of the correlation between input prices and the state of the economy (aggregate risk). The rest is non-systematic in that it affects only specific firms or a specific sector (idiosyncratic risk). The exposure to overall risk and to the two types of risks should change after the adoption of input hedging, proportionally to the percentage of revenues/costs associated with the input and the relative exposure of the price of the input to the market.[1]

Exempli gratia, as demand for pork-belly based products increases, the need for hedging pork-belly input costs also goes up. This gives the CME an incentive to introduce an ad-hoc derivative on pork-belly. The introduction of pork-belly futures affects pork production by guaranteeing more predictable sales or cost of goods sold in the future. To the extent that the business risk-profile changes with the hedging inception, volatility of stock returns, investment or R&D decisions

[1]For simplicity, we focus the discussion on inputs, the use of these derivatives to hedge sales or inventories is analogous.

of firms can change as a result.

In order to address the endogeneity concerns in the relation of interest, we exploit a panel of shocks to different firms at different points in time. The timing of the introduction of a new derivative is not fully expected (Mayhew and Mihov [2004]). The underlying assumption in terms of the exogeneity requirement of the shock is that industry participants do not really have a command over when the CME will introduce the derivative, as they do not really know the costs and benefits associated with the products and their introduction. Therefore, the introduction represents a shock to the cost of hedging for a subset of firms relying on that input (treatment group).

We identify these firms by means of a text-search algorithm looking for input/output exposure over the SEC's EDGAR company filings archive. Control firms are closely related or same industry but not subject to the innovation (control group). Provided that wedges across firms in the same industry may arise for reasons such as size, location, or other exogenous characteristics, we choose treatment and control groups "as good as" randomly assigned. That is, both groups share similar firm characteristics with the only difference being their degree of exposure to the input. We exploit this quasi-random variation in exposure to the input for identification in a difference-in-differences set-up.

However, two further concerns arise in terms of identification. First, the focus on accounting variables reduces the strength of the identification strategy because of the endogeneity arising from capital structure and investment decisions that take place contemporaneous to the hedging decision. Second, even if the first concern is addressed, confounding factors can be driving the observed results specially in terms of aggregate uncertainty.

We overcome these limitations by focusing on high-frequency data and focusing on stock returns data ($r_{i,t}$). The underlying assumption is that if the price of the stock reflects the present value of the cashflows that the firm is expected to generate into the future, then, the effect on the volatility of cashflows should be

consistent with that in the volatility of stock returns.[1] Moreover, we standardize the returns by fitting a garch(1,1) model to the volatilities of stock returns ($Z_{i,t} = \frac{r_{i,t}}{\sigma_{it}^{garch}}$). The choice of the standardized measure against the volatility per se corresponds to the fact that volatility is time-variant and has a pattern and thus, may lead to spurious correlation.

If the garch(1,1) specification is correct, the standardized returns should have no mean or variance dynamics ($Z_{i,t} \approx N(0,1)$).[2] Therefore, this standardized measure allows us to control not only for the effect of aggregate uncertainty but to establish the grounds for the causal relation of interest. Provided that our standardized measure cannot be predicted, a statistically significant estimated coefficient for firms in the treatment group as compared to the control group in a difference-in-differences set-up as a result from the introduction of an input derivative implies that there is something in the context of our identification strategy that makes average idiosyncratic volatility vary (the hedging inception).

We derive two main results. First, we find evidence of a negative effect for introductions. The introduction of an input derivative, to the extent that it allows firms to reduce exposure to the volatility in input prices, reduces the standardized returns as compared to the counterfactual. More precisely, the introduction of the butter derivative reduces the idiosyncratic volatility by 0.4% for firms with exposure to butter price fluctuations during the first week. The effect is both statistically and economically relevant. Moreover, results indicate that beyond the psychological or information-related reaction of the volatility of stock returns in the short-term, a negative and statistically significant sign is found as far as month 6 after the introduction (fundamentals horizon). The idiosyncratic volatility reduces by 0.2% for firms in the treatment group.

On a second step, we analyze whether firms increase the risk profile of their business mix over the long-term after the hedging inception. There is a vast lit-

[1] Appendix C1. builds this intuition by means of the Campbell-Shiller decomposition for stock returns (Campbell and Shiller [1988]) into two components. One coming from the variation in cashflows and another one coming from the risk premium.

[2] This approach is similar in spirit to the Breusch-Pagan test (Breusch and Pagan [1979]).

erature in banking suggesting that financial intermediaries engaging in hedging activities, increase their exposure to risk over the longer term. That is, they find evidence of risk-shifting behavior for financial intermediaries. We test a similar hypothesis for firms. We switch to accounting data for this purpose and analyze the response of cashflows and the respective volatility as a result from the hedging inception in a difference-in-differences set-up for a three-year post-treatment period. Results show a flip in the sign. Although firms in the context of our identification strategy seem to reduce the idiosyncratic volatility component in the short-term, when considering a longer time dimension, the volatility of stock returns increases as compared to the control group. That is, firms seem to take on more risk in their investment decisions as a result from the hedging inception over the long-term.

We also analyze the response of accounting variables for robustness. Hedging the volatility of input prices improves the cost structure of firms by reducing the cost of goods sold-to-sales margin. Thus, it increases cashflows and reduces their volatility. As a result from the hedging inception firms in the treatment group increase cashflows by 3% and reduce the volatility of cashflows by 0.9% more than the counterfactual. Additionally, we show that hedging through derivatives has real effects on investment, by increasing capital expenditures over total assets by 1.5% more than firms in the control group. Finally, we perform a reversal-of-treatment. We analyze how the delisting of input derivatives affects the variables of interest. We find that the effect is symmetric to that of input derivative introductions in terms of the effect on the idiosyncratic volatility component. However, we find no statistically significant effect on real variables.

Our paper relates to the literature examining the relation between hedging and risk (Guay [1999]) and how hedging bears real implications for firms, leading to higher investment as in Cornaggia [2013], Gilje and Taillard [2015] or Berrospide et al. [2010]) and thus, mitigating the underinvestment friction of Froot et al. [1993]. We contribute to the existing literature by providing a strong identification strategy consisting of a panel of shocks to different firms at different points in time.

3.2 Identification Strategy

The CME and other exchanges have been introducing futures, options and other derivatives that are written on very specific underlying assets, to meet the demand for hedging of different industries over the last 20 years. These exchanges are member-owned organizations and member profits are an increasing function of the demand for trading. Thus, anticipated trading volume should be a key determinant in the exchanges' choice of which derivatives to introduce. As Jennings and Starks [1986] point out, exchanges select listing candidates based on attributes like industry participant interest, trading activity and price volatility of these commodities. Additionally, one would predict that exchanges would prefer to introduce derivatives in response to a permanent shift in volatility, or perhaps even anticipating a future increase in volatility in the prices of those commodities.

The introduction of a derivative on a specific input allows firms reducing the risk associated with volatility in input prices. Each asset underlying a derivative carries an aggregate and a specific component. Part of input price volatility arises from volatility in the market, because of the correlation between input prices and the state of the economy (aggregate risk). The rest is non-systematic in that it affects only specific firms or a specific sector (idiosyncratic risk). The exposure to overall risk and to the two types of risks should change after the adoption of input hedging, proportionally to the percentage of revenues/costs associated with the input and the relative exposure of the price of the input to the market.

We argue that the introduction of these derivatives on specific commodities is the ideal experimental set-up in order to analyze the relation between hedging and risk. The hedging inception allows firms exposed to this commodity price risk to hedge part of the volatility of their cashflows and thus, it represents a shock to the cost of hedging for a subset of firms (treatment group). Firms subject to the innovation are chosen by means of a text-search algorithm. This algorithm looks over the company filings in the SEC's EDGAR filing archive for those firms that are exposed to commodity price risk for each specific event. That is, when the introduction of the butter derivative by the CME is analyzed, we look for those

companies that rely on butter in their production process or as a final product. On the other hand, we choose firms in substitute or related industries as a control group, which allows satisfying the conditional independence assumption. To the extent that these firms are similar but not subject to the innovation, it offers an ideal experiment to test the relation of interest. Moreover, it allows us to exploit a panel of shocks to different firms at different points in time.

We recognize that derivative introduction occurs endogenously as the result of decisions made by exchanges and regulators and thus, if exchanges introduce derivatives in response to or in anticipation of changing volatility, selection bias may introduce a spurious relation between the hedging inception and the observed volatility response. Additionally, endogeneity arising from capital structure and investment decisions of firms that take place contemporaneous to the hedging decision may also lead to confounding evidence on the relation of interest. Nevertheless, we address these concerns regarding the exogeneity assumption in two different manners. First, we focus on high-frequency data instead of accounting data by looking at the reaction of stock returns. Second, we correct for possible spurious correlation between hedging inception and volatility by standardizing the returns with the volatility implied by a garch (1,1) model.

Existing research on the relation between hedging and firm value or investment with a proper identification strategy focuses on the reaction of accounting variables (Berrospide et al. [2010], Gilje and Taillard [2015]. To some extent, the analysis of low-frequency data reduces the strength of the identification strategy because of the corporate policy decision taken contemporaneous to the risk management decisions. Therefore, the derived causality relations are subject to confounding factors that may lead to misinterpretation of the relations of interest. In order to analyze the relation between hedging and risk, we should observe the response of the volatility of cashflows as result from the introduction of the derivative if we focus on accounting data. We overcome the concerns regarding the endogeneity in corporate policy decisions by looking at the response of the volatility of stock returns instead. The underlying assumption is that if the price of the stock reflects the present value of the cashflows that the firm is expected

to generate into the future, then, the effect on the volatility of cashflows should be consistent with that in the volatility of stock returns.

On the other hand, we acknowledge that the introduction of derivatives is somehow endogenous, but endogenous to slow-trending forces. The exact introduction date for these derivatives is not fully expected and thus, the exogeneity assumptions should be satisfied. To overcome these concerns further we focus on the reaction of standardized returns instead of the volatility of stock returns. This choice responds to the fact that volatility is time-variant and it has a patterns that can lead to spurious correlation. We standardize the returns by fitting a garch(1,1) model to the volatilities of stock returns ($Z_{i,t} = \frac{r_{i,t}}{\sigma_{it}^{garch}}$). If the specification is correct, the standardized returns should have no mean or variance dynamics ($Z_{i,t} \approx N(0,1)$) and thus, we should not be able to find any series that can predict the standardized returns.

3.2.1 Empirical Strategy: Fitting a Garch(1,1)

Assume stock returns are distributed $R_{i,t} \approx N(0, \sigma_{i,t})$, where $\sigma_{i,t}$ is time-varying. That is, the homocedasticity assumption is not satisfied. We fit a garch(1,1) model for the volatility of stock returns for firm i in day t. Meaning:

$$\sigma_{i,t} = \alpha_0 + \alpha_1 \sigma_{i,t-1} + \beta_1 \epsilon_{i,t-1} \tag{3.1}$$

where $\sigma_{i,t}$ is the volatility of stock returns. Define the standardized returns, $Z_{i,t} = \frac{R_{i,t}}{\sigma_{i,t}^{garch}}$, using the implied volatility from a Garch(1,1) model, $\sigma_{i,t}^{garch}$. By construction, $\frac{R_{i,t}}{\sigma_{i,t}^{garch}}$ should not have mean or variance dynamics ($R_{i,t} \approx N(0,1)$) and thus, $E\left[\left(\frac{R_{i,t}}{\sigma_{i,t}^{garch}}\right)^2\right] = 1$. Then, provided that garch assumptions are satisfied, we should not be able to find any predictor which explains $\left(\frac{R_{i,t}}{\sigma_{i,t}^{garch}}\right)^2 = Z_{it}^2$. We build on Breusch and Pagan [1979] by running the following auxiliary regression:

$$Z_{i,t}^2 = \alpha + \beta X_{i,t-1} + \epsilon_{i,t} \tag{3.2}$$

The interpretation for this auxiliary regression is that we should not be able to find any predictor $X_{i,t-1}$ which explains the standardized returns $Z^2_{i,t}$.

3.2.2 Empirical Strategy: Daily Standardized Returns

The above procedure is consistent with the difference-in-differences identification strategy in this paper. We implement the following specification for firm i in day t in a difference-in-differences set-up for the standardized returns squared, $Z^2_{i,t}$:

$$Z^2_{i,t} = \gamma_t + \theta_i + \omega \left(Exposure * Post\right)_{i,t} + \varepsilon_{i,t} \tag{3.3}$$

where $Exposure_i$ takes the value of 1 for firms relying on the input/output before the introduction (delisting) of the derivative by the corresponding exchange, $Post - Treat_t$ take the value of one for the period after the introduction (delisting) of the derivative and the interaction, $\left(Exposure * Post\right)_{i,t}$, is the source of variation exploited in the context of our identification strategy. γ_t and θ_i are day and firm fixed-effects respectively, which allow controlling for unobserved heterogeneity across firms and time. We further cluster the standard errors in all specifications at the source of variation, at a firm level.

The hypothesis being tested is regarding the sign and quantitative relevance of the estimated coefficient on ω. If ω is negative (positive) resulting from the introduction (delisting) of the derivative, then, it means that there is something in the context of our identification strategy that is making average volatility go down (up). Further note that we should not be able to find any predictor for $Z^2_{i,t}$ if garch assumptions are satified and thus, it implies that as a result from the introduction (delisting) of the derivative instrument, average volatility for the firms in the treatment group goes down as compared to the counterfactual.

We define four different measures for the standardized returns for robustness:

- *Definition 1:* $Z^2_{i,t} = \left(\frac{R_{i,t}}{\sigma^{garch}_{i,t}}\right)^2$
- *Definition 2:* $log(Z^2_{i,t})$: $Z^2_{i,t}$ may take very large values and all in $\Re^+$. By applying a logarithmic transformation we can avoid the effect of outliers.

- *Definition 3:* $ZC^2_{i,t} = \left(\frac{R_{i,t}}{\sigma^{cons}_{i,t}}\right)^2$ where $\sigma^{cons}_{i,t}$ is the garch implied volatility set constant after the introduction date. The standardized returns measure is incorporating information about the derivative introduction/delisting. This is absorbed by the GARCH estimation procedure and the definition is more restrictive and may also generate more volatility in the responses. We use a constant prediction after the introduction of the derivative. That is, we standardize by last prediction after the introduction of the derivative and keep the value for volatility constant after the introduction.

- *Definition 4:* $log(ZC^2_{i,t})$

3.2.3 Empirical Strategy: Accounting Variables

We implement the following specification for firm i in year t in a difference-in-differences set-up for the accounting variables, $Real_{i,t}$:

$$Real_{i,t} = \gamma_t + \theta_i + \omega \left(Exposure * Post\right)_{i,t} + \varepsilon_{i,t} \tag{3.4}$$

where $Real_{i,t}$ includes capital expenditures standardized by total assets (capex), cashflows standardized by total assets and the volatilities of invesment and cashflows. $Exposure_i$ takes the value of 1 for firms relying on the input/output before the introduction (delisting) of the derivative by the corresponding exchange, $Post - Treat_t$ take the value of one for the period after the introduction (delisting) of the derivative and the interaction, $\left(Exposure * Post\right)_{i,t}$, is the source of variation exploited in the context of our identification strategy. γ_t and θ_i are year and firm fixed-effects respectively, which allow controlling for unobserved heterogeneity across firms and time. We further cluster the standard errors in all specifications at the source of variation, at a firm level. The hypothesis being tested is regarding the sign and quantitative relevance of the estimated coefficient on ω.

3.3 Sample Construction

To construct the sample, we start with U.S. firms traded on the AMEX, NASDAQ, and NYSE, and covered by S&P's annual and quarterly database Compustat for accounting variables and from daily CRSP for stock prices data, from 1994 to 2013. We use a text-search algorithm searching for keywords in every 10-K, 10-KT, 10-K405, 10KSB, and 10KSB40 available in SEC's EDGAR system to generate specific data requirements related to treatment and control groups. More precisely, we generate the following dummy variables: i) dummy for sectors/firms exposed to the introduction of derivative (treatment group) and ii) dummy for substitutes to treatment group, not exposed to the policy change (control group). We merge these dummies with the previous databases.

In order to generate the exposure variables, first, we focus on the treatment group. Using the butter derivative introduction as an example, we look for "butter" in the company filings. When the keyword is identified, we read the surrounding text in order to rule out possible false positives. We assign the value of one to the dummy variable, when the use of butter by the firm is guaranteed. Then, we focus on firms belonging to the control group. We text-search for "margarine" and "ghee" in the company filings and assign the value of one when a hit is found. We further include sectors that could represent substitutes for butter including dairy (sic codes 2020-2029), bakeries (sic codes 2050-2059) and fats/oils (sic codes 2070-2079). Appendix C2. contains a detailed explanation of how treatment and control groups for each specific event have been constructed. We remove all firm-day/year observations which are not included in treatment or in the control groups for each specific event.

- *Daily stock price data from CRSP:* We construct the arithmetic returns of the stock by means of the closing price for every day, $R_{i,t} = \frac{P_t - P_{t-1}}{P_{t-1}}$. We define the pre-treatment period as 22 days before the exact date for the introduction (delisting) of the derivative by the corresponding exchange. Then, we define the different post-treatment periods to be analyzed. It is a time grid consisting of weeks 1-4 (every 5 days) and months 1-6 (every 22 days). We drop the remaining firm-day observations. As a final

step, we require at least one observation in pre- and post-treatment period. This avoids atrition in the natural experiment which corrects for possible selection biases when computing the average treatment effects.

- *Quarterly/Annual accounting data from Compustat:* We first focus on building the volatility of cashflows and investment using the quarterly data sample. We compute the volatility of the previous 15 quarters. Once we have these volatilities available, we merge them with the annual data sample. We then remove i) firm-years with missing, negative or zero values for total assets and ii) firm-years with missing, negative or zero values for net property, plant and equipment. Finally, we winsorize all key firm characteristics at the 1^{st} and 99^{th} percentiles. Appendix C3. provides a detailed description of the variables used in the analysis and their construction.

3.4 Results

3.4.1 Introduction of Butter Derivative

The CME introduced the butter derivative on September 05, 1996. As previously discussed, exchanges may introduce new derivatives when the expectation of higher price volatility on commodities is high. Figure 3.1 shows the evolution of the price of butter (per pound) from 1975 to 2015 for the U.S. Although the evolution of the price of butter looks relatively stable from 1975 to the beginning of the 90's, there is an important increase in the volatility of the price of butter from the 90's on. This period of increasing volatility coincides with the introduction of the butter derivative by the CME (consistent with evidence in Mayhew and Mihov [2004]). Higher volatility in the price of butter puts upward pressure on the volatility of cashflows for firms that rely on butter as an input for production or as a final good for sale.

The first step in our identification strategy is showing that firm characteristics of our treatment and control groups for the butter introduction are similar such that the conditional independence assumption is satisfied and treatment is "as good as"' randomly assigned.

Table 3.1 presents pre-treatment summary statistics for treatment and control groups for the introduction of butter identification strategy in September 05, 1996. Columns (1)-(3) show mean, median and standard deviation for the treatment group, while column (4)-(6) show them for control group. The last column, column (7), shows the results for the differences in means between treatment and control groups. The comparison suggests that these firms are similar in all dimensions: size, leverage, investment, acquisitions or the fraction of firms defined as financially constrained as in Almeida et al. [2004]. Both groups differ in the volatility of stock returns, the outcome variable in our identification strategy.

We move forward by analyzing the effect of the derivative introduction on the volatility of stock returns using daily data from CRSP. Table 3.2 shows difference-in-differences results for the average treatment effect of the introduction of the butter derivative by the CME for the four definitions of standardized returns squared defined: $Z^2_{i,t}$, $log(Z^2)_{i,t}$, $CZ^2_{i,t}$, $log(CZ^2)_{i,t}$. CZ is constructed by fixing the garch implied volatility constant at the date of the derivative introduction (09/05/1996). The upper panel shows the estimated coefficients and standard errors for the first four weeks (ATE weeks 1-4), while the bottom panel shows the same information for the first six months after the introduction of the butter derivative (ATE months 1-6). The weekly results are intended to capture the psychological component of reaction of the volatility of stock returns and the monthly results are intended to capture the fundamental component.

The analysis of the weekly grid allows concluding that the introduction of the butter derivative reduced the volatility of stock returns for firms in the treatment group as compared to the counterfactual. More precisely, the first week after the introduction the idiosyncratic volatility component was reduced for firms with exposure to butter by 0.4% more than the control group. Moreover, the effect is both statistically and economically relevant across all four definitions for standardized returns in week 1. In the following weeks after the introduction (weeks 2-4) the effect washes out. Figure 3.2 shows precisely this pattern, the impulse response function for the average treatment effect of the introduction of the but-

ter derivative for the weekly grid.

By looking at the bottom panel of Table 3.2 we can conclude that the effect of the butter derivative introduction extends over time. Although the average treatment effect is negative as expected when increasing the time dimension, the statistical significance of estimated coefficients is lower. By focusing on the statistically significant results, we can conclude that beyond the initial psychological component, a fundamental component also arise. More precisely, in the first six months after the introduction the idiosyncratic volatility component was reduced for firms with exposure to butter between 0.2-0.3% more than the control group. Figure 3.3 shows the impulse response function for the average treatment effect of the introduction of the butter derivative for the monthly grid.

We now focus the analysis on the reaction of accounting variables. Table 3.3 shows difference-in-differences results for the average treatment effect of the introduction of the butter derivative by the CME for accounting variables including capex, cashflows, cost of goods sold (cogs) over sales, earnings before interest, taxes, depreciation and amortization (ebitda) over sales and the volatilities of stock returns, capital expenditures and cashflows. The pre-treatment period being considered is 1993-1995, while the post-treatment defined contains 1996-1998.

The analysis of the sign and magnitude of estimated coefficients for the cost of goods sold over sales, ebitda over sales and cashflows as a result of the introduction of the butter derivative are all consistent. To the extent that the hedging inception allows the firm to hedge against changes in the prices of inputs used in their production process, the cost structure of firms in the treatment group improves as compared to the control group. This reduces the cost of goods sold over sales margin and increases the ebitda over sales margin. Firms in the treatment group increase cashflows by 3% more than the control group. More importantly, the introduction of the butter derivative and the reduction in the risk-profile of the firm allows firms in the treatment group to increase investment by 2% more than the control group. That is, hedging has real effects on investment. Cornaggia [2013] and Gilje and Taillard [2015] also show that hedging bears real

implications for firms. Berrospide et al. [2010] show that hedging allows a firm to insulate its capital expenditure from variation in operating cash flow, which mitigates the underinvestment friction of Froot et al. [1993].

However, by analyzing the average treatment effect for the volatilities of stock returns, cashflows and investment additional insight in terms of the relation between hedging and risk can be derived. The introduction of the butter derivative reduces the volatility of cashflows by 0.9%, but increases the volatility of stock returns by 7% for firms in the treatment group. That is, we observe a flip in the sign of the relation between hedging and risk when a longer time horizon is considered. These result may provide suggestive evidence to conclude that the hedging inception reduces the volatility of stock returns in the short-run as it reduces the cashflow volatility to which the firm is exposed but the firm engages in riskier investment projects in the longer term.

3.4.2 Reversal of Treatment, Effect of Delistings

We now perform a reversal of treatment. Some of the commodity derivatives introduced by the exchanges end up being delisted because of the lack of trading volume. This scenario allows us to evaluate the effect of the delisting of input derivatives on the various corporate policy decisions of firms. To the extent that firms hedging the volatility of input prices are no longer able to do so, we would like to test how the volatility of cashflows and investment decisions are affected. The effect may not necessarily be symmetrical or have the same magnitude as in the case of input derivative introductions.

Table 3.4 shows difference-in-differences results for the average treatment effect of the delisting of the butter derivative by the CME for the four definitions of standardized returns squared defined: $Z^2_{i,t}$, $log(Z^2)_{i,t}$, $CZ^2_{i,t}$, $log(CZ^2)_{i,t}$. The upper panel show the estimated coefficients and standard errors for the first four weeks (ATE weeks 1-4), while the bottom panel shows the same information for the first six months after the delisting of the butter derivative (ATE months 1-6).

The analysis of the weekly grid allows concluding that the reversal of treatment is symmetric in terms of the standardized returns. That is, the delisting of the butter derivative increases the idiosyncratic volatility component of the firm. More precisely, the first week after the delisting, the idiosyncratic volatility component increased for firms with exposure to butter by 0.9% more than the control group. Moreover, the effect is both statistically and economically relevant. Therefore, the effect of delistings for firms with exposure to input price volatility is larger in magnitude than in the case of introductions. The treatment effect is also significant in week 4, however, the effect washes out up to 0.5%. Figure 3.4 shows the impulse response function for the average treatment effect of the delisting of the butter derivative for the weekly grid. The weekly average treatment effect analysis allows concluding that delistings have a relevant effect on the psychological horizon.

On the other hand, by looking at the bottom panel of Table 3.4 we can conclude that the effect of the delisting of the butter derivative only extends up to the second month after the delisting. That is, these results might suggest that although the delisting of derivatives affects the idiosyncratic volatility, the effect washes out when the time horizon increases. More precisely, in the first two months after the delisting, the idiosyncratic volatility component increased for firms with exposure to butter by 0.4% more than the control group on average. However, estimated coefficients become negative after month two. Figure 3.5 shows the impulse response function for the average treatment effect of the delisting of the butter derivative for the monthly grid.

Provided that delistings do not seem to affect fundamentals, we now analyze the average treatments a result from the delisting of the butter derivative for accounting variables. Table 3.5 shows difference-in-differences results for the average treatment effect of the delisting of the butter derivative by the CME for accounting variables including capex, cashflows, cost of goods sold over sales, ebitda over sales and the volatilities of stock returns, capex and cashflows. The pre-treatment period being considered is 2007-2009, while the post-treatment defined contains 2010-2012.

The analysis of the sign and magnitude of estimated coefficients for the cost of goods sold over sales and cashflows as a result of the delisting of the butter derivative are consistent with the symmetry hypothesis. To the extent that the hedging termination no longer allows the firm to hedge against changes in the prices of inputs used in their production process, the cost structure of firms in the treatment group worsens as compared to the control group. This increases the cost of goods sold over sales margin and thus, firms in the treatment group decrease cashflows by 11% more than the control group. However, the delisting of the butter derivative does not seem to generate real effects on investment, as the effect is not statistically significant.

On the other hand, the analysis of the average treatment effect for the volatilities of stock returns, cashflows and investment provide additional insight in terms of the relation between hedging and risk. The delisting of the butter derivative does not seem to have a fundamental component in terms of the volatility of stock returns. This is consistent with results derived previously in which there was no statistically significant effect on the idiosyncratic volatility component after month two. In contrast, the volatility of firms' cashflows decreases by 1% more than that of the control group. This result might be suggesting that hedging was ineffective for some firms belonging to the treatment group. A hedge is defined as ineffective by the accouting rule sfas. 133 when the correlation between the derivative and the item being hedged does not lie in the 85-125% threshold.[1] An ineffective hedge hedges part of the volatility of cashflows generated by the variation in input prices, but generates additional volatility because the correlation is not perfect. Therefore, the hedging termination may generate a different effect than expected if hedges were ineffective.

Finally, the volatility of investment and investment growth decreases as a result of the delisting and effect is both statistically and economically relevant. If the hedging inception provides incentives to take up more risk in terms of their investment decisions, as evidenced by results from the analysis of the butter intro-

[1]See sfas. 133 for further information on how the correlation coefficient is constructed.

duction, then, the delisting should reverse those incentives. That is, the volatility of investment growth reduces by 2.5% more for firms in the treatment group.

To sum up, we derive symmetric results when the effect of introduction and delisting on input derivatives are considered. The hedging inception (termination) reduces (increases) the idiosyncratic volatility component of firms in the psychological horizon (1-4 weeks). However, the magnitude of the effect is larger for terminations. Additionally, while the introduction of input derivatives affects fundamentals, we do not find a similar effect for the delisting of input derivatives (1-6 months). Moreover, when accounting variables are considered in a longer time horizon (3 years), only the cost structure effects are symmetric. That is, the hedging inception (termination) improves (worsens) the cost structure of firms and thus, the level of cashflows increases (decreases). However, the effect on the the volatility of cashflows and the volatility of stock returns is asymmetric and the delisting of input derivatives does not have real effects on investment.

3.5 Discussion

In this paper we try to shed light on a traditional question in corporate, how hedging and risk are related. In order to address the endogeneity concerns in the relation of interest we exploit a novel and strong identification strategy consisting of a panel of shocks to different firms at different times. More precisely, we use the introduction and delisting of input derivatives of different exchanges for identification. To the extent that input derivatives allow firms to hedge the price volatility component of their cashflows, it represents a shock to cost of hedging for a subset of firms and an ideal set-up to analyze how firms that are exposed to this innovation react and adjust their corporate policy decisions. Moreover, we use high-frequency data in the analysis so as to avoid confounding factors which are contemporaneous to the risk management decisions (capital structure or investment decisions) and we focus on the reaction of the volatility of stock returns.

For each specific event, we define a treatment and control group so as to analyze the effect of the innovation on each outcome variable through a difference-in-

differences estimation set-up. Firms with exposure to variation in the price of a specific input are chosen with a text-search algorithm that looks for firms relying on the input in the SEC's EDGAR filing archive. Similarly, we choose firms in the control group in substitute sectors to that of treatment. That is, firms are similar but not subject to the innovation.

We derive to main results. First, we show that hedging allows firms to reduce the idiosyncratic risk component of their cashflows in the short-run. However, they also seem to take on more risk in their investment decisions when a longer term is considered. This is consistent with evidence in Acharya and Bisin [2009]. According to the authors, firms are not able to hedge the idiosyncratic components and thus, they are willing to invest in projects that contain more aggregate risk. According to our results, firms seem able to hedge the idiosyncratic component of their cashflows (through exchange-traded derivatives), however, they substitute towards investment projects with higher risk when the part of the idiosyncratic component of their cashflows volatility is off-set. Second, we also find that hedging bears real implications for firms. We find that an increase in investment as a result from the hedging inception. However, we also acknowledge that this effect is not symmetric. The delisting of input derivatives does not seem to have real implications.

There are several extensions of the present work that we are addressing. First, we have more introduction and delisting cases that we are analyzing. In terms of introductions, we are extending the work to include the introduction of palm oil, benzene, soybeans, whey, ethanol and porkbellies. In terms of delisting, we are extending the work to include the delisting of benzene and ethanol. This will allow us to have a panel of shocks for robustness and to see the heterogeneity in the magnitude the effect for each event. Moreover, it can allow us to set-up a joint identification strategy, both for introduction and delisting of input derivatives, so as to analyze the average treatment effect of input derivatives as opposed to the individual effects.

Additionally, we have a novel database constructed through a text-search al-

gorithm in which we have detailed information about i) types of risk faced by firms (commodity price, interest rate and foreign exchange), ii) derivatives used by firms (options, futures, swaps and forwards) and iii) hedging types (cash-flow, fair value, net investment, effective and ineffective hedges). All these three databases can be combined together in order to analyze the degree of responsiveness to the shocks depending on specific variables in combination with our strong identification strategy. This makes the analysis even more credible, for example, we could show that the results may vary to the extent to which the new hedging product increased the portion of hedging that became more effective. Or we could analyze the extent to which liquidity management varies with the input derivative inception. With such a strong identification strategy we can go back to the existing literature and ask a series of questions relating to collateral usage for derivatives, hedging effectiveness, but more importantly to real variables like investment, employment or M&A activity.

Table 3.1: **Summary Statistics for Introduction of Butter Derivative by CME (09/05/1996):** This table contains summary statistics for key firm characteristics from treatment and control groups from Compustat. Columns (1)-(3) contain mean, median and standard deviation for the treatment group, which is defined as firms with exposure to butter in their production, while Columns (4)-(6) contain mean, median and standard deviation for the control group, which is defined as firms in substitute sectors to the treatment group. Column (7) shows the result of the difference in means test between the two groups.

	Treatment Group			Control Group			
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	p(tg-cg)≠ 0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
sd (returns)	0,16	0,12	0,12	0,22	0,19	0,12	0,00
sd (capex)	0,02	0,02	0,02	0,03	0,02	0,02	0,30
sd (cashflows)	0,01	0,01	0,02	0,02	0,01	0,02	0,33
Size	5,53	5,60	2,40	4,85	5,05	2,51	0,04
Cogs-to-Sales	0,67	0,65	0,14	0,71	0,71	0,15	0,04
Ebitda-to-Sales	0,10	0,11	0,09	0,07	0,09	0,09	0,03
Cashflows	0,07	0,08	0,08	0,04	0,06	0,09	0,01
Acquisitions	0,03	-	0,06	0,02	-	0,06	0,26
Leverage (book)	0,30	0,26	0,22	0,32	0,28	0,31	0,37
Mkt-to-book	1,53	1,29	0,87	1,34	1,19	0,84	0,09
R&D-to-Sales	0,04	-	0,29	0,06	-	0,54	0,36
Capex	0,06	0,05	0,04	0,07	0,06	0,05	0,33
Cash Holdings	0,06	0,02	0,12	0,06	0,03	0,10	0,40
Tangibility	0,33	0,31	0,16	0,38	0,41	0,22	0,06
Const Divs	0,38	-	0,49	0,44	-	0,50	0,25
Const Size	0,13	-	0,33	0,18	-	0,39	0,19
Const K&Z	0,33	-	0,47	0,36	-	0,48	0,37
Const SA	0,47	-	0,50	0,43	-	0,50	0,32
	192			87			

Table 3.2: **Difference-in-differences estimation results for the introduction of butter derivative, Standardized returns:** This table contains regression results for the average treatment effect, $ATE_{i,t}$, on the four definitions for the standardized returns used in the analysis (CRSP daily data): $Z^2_{i,t}$, $log(Z^2)_{i,t}$, $CZ^2_{i,t}$, $log(CZ^2)_{i,t}$. CZ is constructed by fixing the garch implied volatility constant at the date of the derivative introduction (09/05/1996). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Z^2	CZ^2	$log(Z^2)$	$log(CZ^2)$
ATE week 1	-0.282*	-0.302	-0.387**	-0.406**
	(0.159)	(0.189)	(0.188)	(0.205)
ATE week 2	0.0503	-0.0188	-0.0587	-0.147
	(0.125)	(0.189)	(0.154)	(0.178)
ATE week 3	-0.0189	0.0127	-0.190	-0.248
	(0.141)	(0.172)	(0.151)	(0.183)
ATE week 4	0.0484	0.133	-0.123	-0.0412
	(0.141)	(0.136)	(0.171)	(0.189)
# Observations	3,443	3,437	3,431	3,425
ATE month 1	-0.0438	-0.0293	-0.187*	-0.205
	(0.0828)	(0.125)	(0.104)	(0.134)
ATE month 2	-0.0101	-0.0572	-0.0984	-0.163
	(0.0924)	(0.163)	(0.105)	(0.165)
ATE month 3	-0.0960	-0.291*	-0.123	-0.242
	(0.0759)	(0.168)	(0.0998)	(0.162)
ATE month 4	-0.0507	-0.203	-0.0503	-0.219
	(0.0887)	(0.194)	(0.0952)	(0.148)
ATE month 5	-0.0346	-0.180	-0.141	-0.275*
	(0.0919)	(0.178)	(0.103)	(0.166)
ATE month 6	-0.179*	-0.190	-0.154	-0.235
	(0.101)	(0.144)	(0.127)	(0.158)
# Observations	4,574	4,557	4,574	4,557
Clustered SE	Firm	Firm	Firm	Firm
Firm&Day FE	Yes	Yes	Yes	Yes

Table 3.3: **Difference-in-differences estimation results for the introduction of butter derivative, Accounting Variables:** This table contains regression results for the average treatment effect, $ATE_{i,t}$, on capex, cashflows, cost of goods sold to sales, ebitda to sales and the volatilities of returns, capex and cashflows (Compustat annual data). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Post-treatment period	1996-98						
Pre-treatment period	1993-95						
	Dependent variable:						
	Capex	Cashflow	Cogs	Ebitda	sd (returns)	sd (capex)	sd (cashflow)
ATE 1996-1998	0.0153*	0.0343*	-0.0163	0.0364	0.0764**	12.52*	-0.00924*
	(0.00884)	(0.0188)	(0.0158)	(0.0289)	(0.0292)	(6.729)	(0.00550)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Partial FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Observations	555	556	557	558	556	556	556

Table 3.4: **Difference-in-differences estimation results for the delisting of butter derivative, Standardized returns:** This table contains regression results for the average treatment effect, $ATE_{i,t}$, on the four definitions for the standardized returns used in the analysis (CRSP daily data): $Z^2_{i,t}$, $log(Z^2)_{i,t}$, $CZ^2_{i,t}$, $log(CZ^2)_{i,t}$. CZ is constructed by fixing the garch implied volatility constant at the date of the derivative delisting (12/20/2010). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Z^2	CZ^2	$log(Z^2)$	$log(CZ^2)$
ATE week 1	0.0532	0.0945	0.904***	0.909***
	(0.158)	(0.117)	(0.282)	(0.289)
ATE week 2	-0.0414	0.00422	-0.0109	0.0526
	(0.0949)	(0.0977)	(0.259)	(0.264)
ATE week 3	-0.242	-0.253	0.156	0.0442
	(0.188)	(0.236)	(0.217)	(0.265)
ATE week 4	0.0521	0.0886	0.544**	0.488*
	(0.154)	(0.146)	(0.273)	(0.294)
# Observations	5,940	5,935	5,930	5,925
ATE month 1	-0.0518	-0.0227	0.387***	0.359**
	(0.0793)	(0.0945)	(0.125)	(0.163)
ATE month 2	-0.0456	-0.0317	0.482***	0.426*
	(0.0680)	(0.0888)	(0.179)	(0.232)
ATE month 3	-0.117*	-0.175	0.128	0.0867
	(0.0625)	(0.127)	(0.171)	(0.204)
ATE month 4	-0.0548	-0.0734	-0.00509	-0.0457
	(0.0655)	(0.117)	(0.199)	(0.260)
ATE month 5	-0.117	-0.222	0.0643	-0.0711
	(0.0849)	(0.145)	(0.174)	(0.200)
ATE month 6	0.0234	-0.0879	0.0226	-0.172
	(0.0712)	(0.125)	(0.135)	(0.152)
# Observations	7,440	7,418	7,396	7,374
Clustered SE	Firm	Firm	Firm	Firm
Firm&Day FE	Yes	Yes	Yes	Yes

Table 3.5: **Difference-in-differences estimation results for the delisting of butter derivative, Accounting Variables:** This table contains regression results for the average treatment effect, $ATE_{i,t}$, on capex, cashflows, cost of goods sold to sales, ebitda to sales and the volatilities of returns, capex and cashflows (Compustat annual data). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Post-treatment period	2010-12							
Pre-treatment period	2007-09							
	Dependent variable:							
	Capex	Cashflow	Cogs	Ebitda	sd (returns)	sd (capex g)	sd (capex)	sd (cashflow)
ATE 2010-12	-0.00216	-0.112*	0.203*	-0.226	0.0866	-0.0256**	-5.966*	-0.0102**
	(0.00615)	(0.0672)	(0.120)	(0.396)	(0.0769)	(0.0114)	(3.355)	(0.00498)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Partial FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Observations	621	620	610	610	622	623	624	625

Figure 3.1: **Evolution of Price of Butter:** This figure shows the evolution of the cost of butter, in dollars per pound, of U.S.

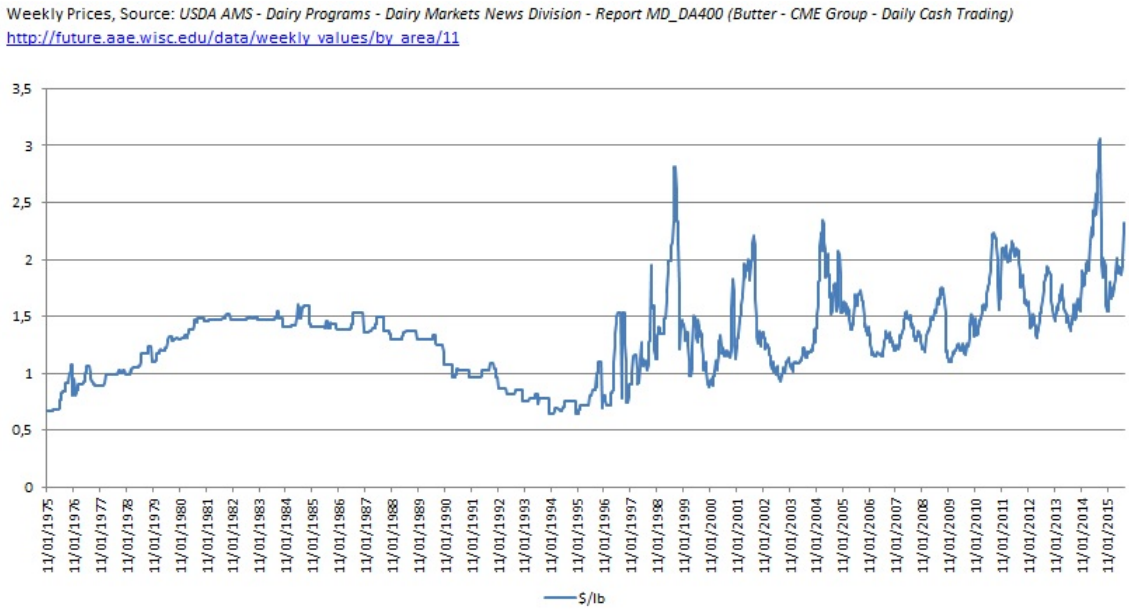


Figure 3.2: **Impulse Response Function ATE (weekly), Butter derivative introduction:** This figure shows the estimated average treatment effect coefficient on the standardized returns and its log for the introduction of the butter derivative for firms in the treatment group using a weekly grid, weeks 1-4.

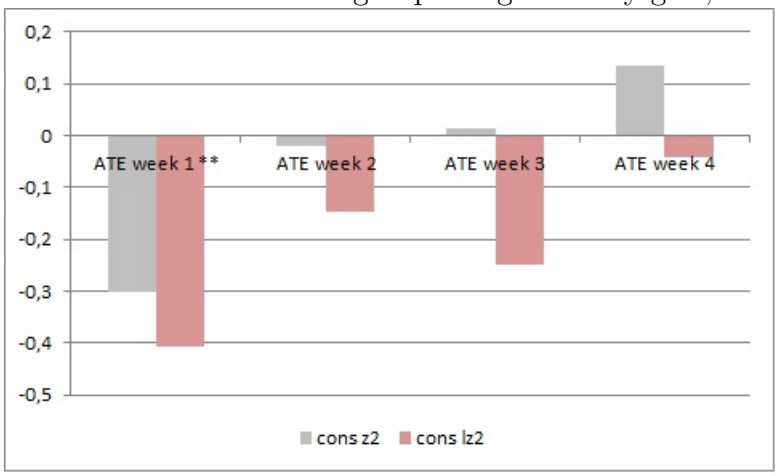


Figure 3.3: **Impulse Response Function ATE (monthly), Butter derivative introduction:** This figure shows the estimated average treatment effect coefficient on the standardized returns and its log for the introduction of the butter derivative for firms in the treatment group using a monthly grid, months 1-6.

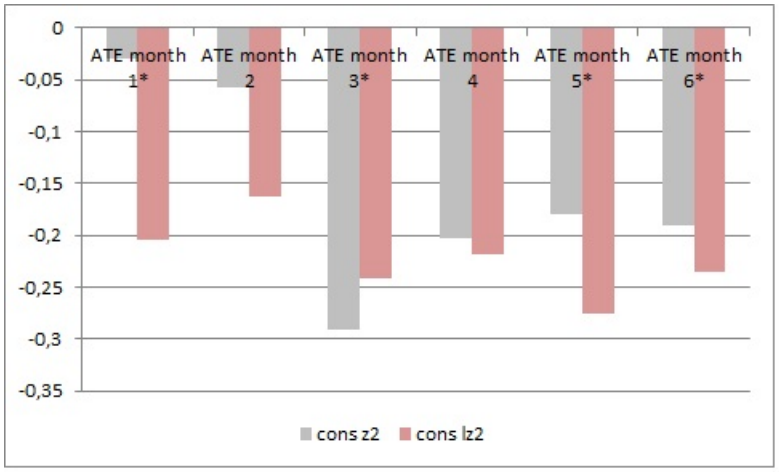


Figure 3.4: **Impulse Response Function ATE (weekly), Butter derivative delisting:** This figure shows the estimated average treatment effect coefficient on the standardized returns and its log for the delisting of the butter derivative for firms in the treatment group using a weekly grid, weeks 1-4.

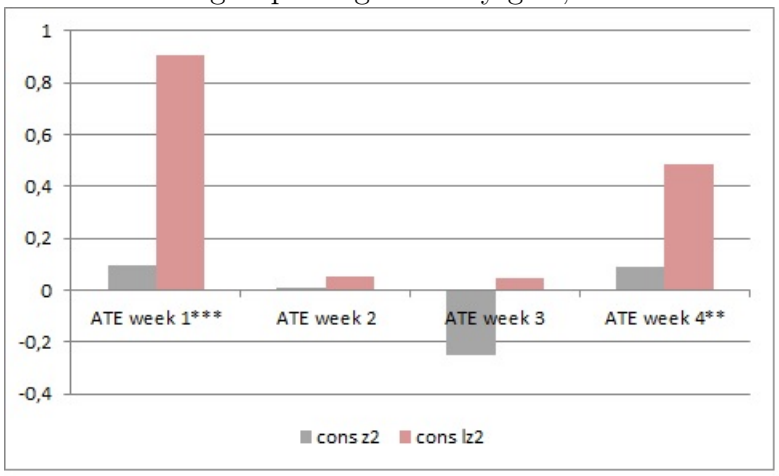
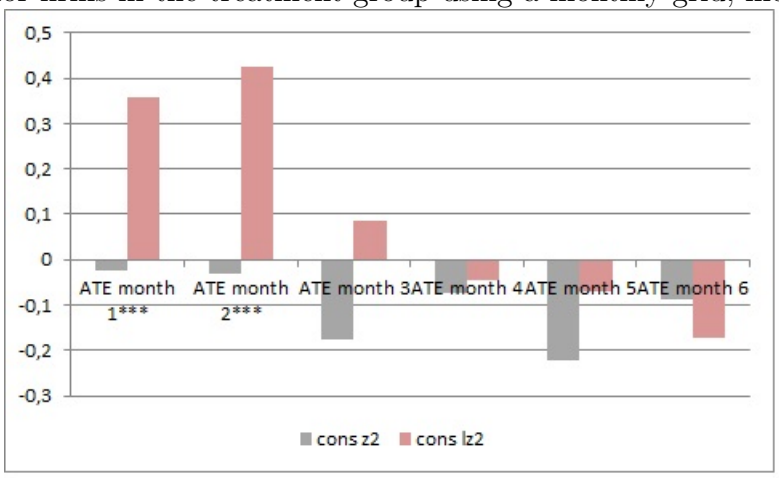


Figure 3.5: **Impulse Response Function ATE (monthly), Butter derivative delisting:** This figure shows the estimated average treatment effect coefficient on the standardized returns and its log for the delisting of the butter derivative for firms in the treatment group using a monthly grid, months 1-6.



Appendix A: "The (un)secured debt puzzle: evidence from U.S. public manufacturing firms, 1994-2010"

Appendix A1. The Priority Structure of Corporate Liabilities

Barclay and Smith (1995) study the priority structure of corporate liabilities by analyzing the variation in the use of capital leases, secured debt, ordinary debt, subordinated debt and stock, both preferred and common. LoPucki (2003) studies reorganizations of U.S. public firms and considers the existence of a classification for unsecured creditors upon default.[1] Moreover, he highlights an exception for secured debt having priority over unsecured debt: deficiency claims of secured debt. Deficiency claims arise when (upon default), the liquidation value of collateral is lower than debt principal due, which allows for an important classification within secured debt to arise: recourse and non-recourse secured debt.

The essential difference between recourse and non-recourse debt is to what extent the creditor can go after the assets of the borrower if he fails to repay debt. In both indentures, the secured creditor is allowed to seize any assets that were

[1] Senior Unsecured, Unsecured, Senior Subordinate, Junior Subordinate, Preferred Stock and Common Stock.

used as collateral to secure the contract. However, the difference comes when the liquidation value of collateral is below debt due by the borrower. In the case of recourse debt, the lender can go after the borrower's other assets or sue to have debt repayment, while for non-recourse debt, secured creditors must absorb the difference, which will be considered as a secured deficiency claim and will become part of the unsecured claims pool.[1]

Then, under chapter 7 or 11 deficiency claims of secured and senior unsecured claims will share the same priority[2]. Finally, there is another type of claim which lies after all secured claims have been satisfied, but before secured deficiency claims and senior unsecured claims have been satisfied, these are:"Bankruptcy Priority Claims" or Trade Credit.[3] The complete priority structure of corporate liabilities:

1. Derivatives
2. Capital Leases
3. Senior Secured
4. Junior Secured or Second-lien Debt
5. Bankruptcy Priority Claims or Trade Credit (Unsecured)
6. Senior Unsecured and Deficiency Claims
7. Junior Unsecured
8. Subordinated
9. Preferred Stocks

[1]In practice, the secured creditor has two options: (i) 1111(b) election, implies treating the entire claim as secured and therefore, receiving less than debt due and (ii) no 1111(b) election, implies considering the existing liquidation value of collateral as secured and the rest of the principal as unsecured.

[2]LoPucki (2003).

[3]U.S.C. 507. The following items can be included into this category: obligations with relatives, administrative expenses, employee benefit plans, claims of individuals with principal below $1800, governmental units (taxes), federal depository institutions regulatory agencies, injuries and post-petition unsecured claims.

Appendix A2. Excerpts from SEC Filings on Collateral Requirements of Secured Contracts

This excerpt has been taken from Advanced Micro Devices' 10-K SEC filing in fiscal year 2009, on a **Senior Secured Term Loan Facility:**

> *"On November 1, 2006, Spansion LLC[1] entered into a new senior secured term loan facility with a certain domestic financial institution, as administrative agent, and the lenders party thereto, in the aggregate amount of $500 million... executed a pledge and security agreement pursuant to which the administrative agent received a first priority security interest in (a) all present and future capital stock of each of the Company's present and future direct and indirect subsidiaries,... (b) all present and future debt of each loan party, but excluding certain intercompany debt to a foreign subsidiary, (c) all present and future other property and assets of each loan party, but excluding intellectual property and any equipment subject to a lien securing a capitalized lease permitted by the credit agreement for the senior secured term loan facility, and (d) all proceeds and products of the property and assets described above. The net book value of the pledged assets as of December 31, 2006 was approximately $663.5 million."*

This excerpt has been taken from Mattson Technology Inc's 10-K SEC filing in fiscal year 2012, on a **Secured Revolving Credit Facility:**

> *"Mattson Technology, Inc. ...entered into a three-year revolving credit facility for $25 million with Silicon Valley Bank, part of SVB Financial Group. The agreement is guaranteed by Mattson International, Inc., a wholly-owned subsidiary of the Company, and is*

[1] Once AMD took control of the company in 2003, it was renamed Spansion LLC in June 2004 and officially spun off as an independent maker of flash memory chips in December 2005.

secured by substantially all of the Companys and Mattson International, Inc.s assets."

This excerpt has been taken from AK Steel Holding Corporation 8-K SEC filing in fiscal year 2013, on **Senior Secured Notes:**

"...successfully priced a private offering of $30.0 million aggregate principal amount of its 8.750% senior secured notes due 2018 , which were offered as an add-on to its outstanding $350.0 million aggregate principal amount of 8.750% senior secured notes due 2018. The add-on notes will be fully and unconditionally guaranteed on a senior basis by AK Holding and will be secured by substantially all real property, plant and equipment of AK Steel and proceeds thereof."

This excerpt has been taken from Alon USA Energy, Inc.'s 10-K SEC filing in fiscal year 2010, on several **different secured debt contracts:**

"The Alon Energy Term Loan is secured by a second lien on cash, accounts receivable and inventory and a first lien on most of our remaining assets.... We have a $240.0 million revolving credit facility... The Alon USA LP Credit Facility is secured by (i) a first lien on our cash, accounts receivables, inventories and related assets and (ii) a second lien on our fixed assets and other specified property,... The Paramount Credit Facility is primarily secured by (i) a first lien on cash, accounts receivables, inventories and related assets and (ii) a second lien on Alon Holdings' fixed assets and other specified property. In October 2009, Alon Refining Krotz Springs, Inc. issued 13.50% senior secured notes in aggregate principal amount of $216.5 million in a private offering. In February 2010, ARKS exchanged $216.5 million of Senior Secured Notes for an equivalent amount of Senior Secured Notes registered under the Securities Act of 1933. ...The terms of the Senior Secured Notes are governed by an indenture and the obligations under the Indenture are secured by a first priority lien on ARKS' property, plant

and equipment and a second priority lien on ARKS' cash, accounts receivable and inventory."

Appendix A3. Compustat Variable Description

- **Total Debt**: Debt in current liabilities (item 34) + Long-term debt (item 9).
- **Percentage of Debt Unsecured in Debt Structure:** Total Debt minus Mortgages and Other Secured Debt (item 241) over Total Debt.
- **Percentage of Debt Unsecured in Capital Structure:** Total Debt minus Mortgages and Other Secured Debt (item 241) over Total Assets (item 6).
- **Percentage of Debt Secured in Capital Structure:** Mortgages and Other Secured Debt (item 241) over Total Assets (item 6).
- **MV Equity:** Stock price (item 199) Common shares used to calculate earnings per share (item 54).
- **Financial Strength (book value):** Equity (item 6 - item 181) over Equity plus Total Debt (item 6 - item 181 + item 9). Equity is computed as Total Assets minus Total Liabilities.
- **Financial Strength (market value):** 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).
- **Dummy Rated:** Dummy variable, takes value 1 if the firm-year observation has a S&P Long-term Bond Rating (item 280).
- **Dummy Dividend Payer:** Dummy variable, takes value 1 if the firm-year observation has a positive value for common dividends (item 21).
- **Dummy Trade Credit:** Dummy variable, takes value 1 if the firm-year observation has trade payable above trade receivables (item 70 - 151).
- **Net Trade Credit Borrowing Days:** Days outstanding in Accounts Payable (item 70) minus days outstanding in Accounts Receivable (item 151).

Appendix A4. 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 attributes (firm characteristics) come from the previous manufacturing Compustat sample. I merge the LPC Dealscan data on debt contracts and interest rates with the previous Compustat Manufacturing firms' sample from 1994-2010, to gather the firm characteristics the borrower had at the date of origination of the debt contract.

Appendix B: "How does access to the unsecured debt market affect investment?"

Appendix B1. Variable Description

Compustat

- **Total Debt**: Debt in current liabilities (item 34) + Long-term debt (item 9).
- **Percentage of Debt Unsecured in Debt Structure:** Total Debt minus Mortgages and Other Secured Debt (item 241) over Total Debt.
- **Percentage of Debt Unsecured in Capital Structure:** Total Debt minus Mortgages and Other Secured Debt (item 241) over Total Assets (item 6).
- **Percentage of Debt Secured in Capital Structure:** Mortgages and Other Secured Debt (item 241) over Total Assets (item 6).
- **Retained Earnings:** Retained Earnings (item 36) over Total Assets (item 6).
- **MV Equity:** Stock price (item 199) times Common shares used to calculate earnings per share (item 54).

- **Net Worth, Book:** Equity (item 6 - item 181) over Equity plus Total Debt (item 6 - item 181 + item 9). Equity is computed as Total Assets minus Total Liabilities.
- **Net Worth, Market:** MV Equity over MV Equity plus Total Debt.
- **Tangibility or Collateral Availability:** Property, Plant and Equipment, Net (item 8) over Total Assets (item 6).
- **Investment:** Capital Expenditures (item 128) 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).
- **Dummy Rated:** Dummy variable, takes the value of one if the firm-year observation has a S&P Long-term Bond Rating (item 280).
- **Dummy Dividend Payer:** Dummy variable, takes the value of one if the firm-year observation has a positive value for common dividends (item 21).

Capital IQ:

- **Sr Secured Bonds and Notes:** SR SEC BONDS NOTES over Total assets (item 6).
- **Sr Unsecured Bonds and Notes:** SR UNSEC BONDS NOTES over Total assets (item 6).
- **Sr Secured Loans:** SR SEC LOANS over Total assets (item 6).
- **Commercial Paper Outstanding:** CP.

Thomson One:

- **Individual Investors:** Number of shares in hands of individual investors.

CRSP Daily Files:

- **Dummy Initiate/Increase Dividends:** Dummy variable, takes the value of one if the firm-year observation has initiated/increased dividends per share adjusted for stock splits, CRSP data.

Appendix B2. Text-search Algorithm Description

I use a text-search algorithm searching for keywords in every 10-K, 10-KT, 10-K405, 10KSB, and 10KSB40 available in SEC's EDGAR system to generate specific data requirements. More precisely, I generate the following dummy variables: covenants restricting dividend payouts in secured contracts and covenants restricting dividend payouts in unsecured contracts.

For each specific text-search:

- **Covenants for Dividends in Secured Contracts:** I look for "covenant" in combination with "secured" or "security interest". When the keywords are identified, I further search for the keyword "dividend" excluding those hits that contain "no/not".

- **Covenants for Dividends in Unsecured Contracts:** I look for "covenant" in combination with "unsecured". When the keywords are identified, I further search for the keyword "dividend" excluding those hits that contain "no/not".

When a hit is found, I read the surrounding text and to rule out false positives. If a firm-year's filing has no reference of my keywords, or contains such keywords but the surrounding text suggests that the firm does not use/have that financial contract or limitation, I treat that firm-year as nonuser. Finally, I match the dummy variable generated by the text-search algorithm with my sample.

Appendix B3. Collateral Absorption Index

Looking for the sources of collateral pledged for secured debt contracts is relatively easy, as firms disclose this information in a relatively standardized manner.

- **Collateral Financial Debt Contracts:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keywords "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" excluding those hits that contain "no/not".

- **Tangible Assets as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keywords "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keywords "propert", "plant", "equipment", "land", "machine", "real estate", "capital stock", "fixture","tangible asset" and "fixed asset" excluding those hits that contain "no/not".

- **Intangible Assets as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keywords "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keywords "patent", "trademark", "royalt", "intellectual propert" and "intangible asset" excluding those hits that contain "no/not".

- **Receivable Assets as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keyword "receivable" excluding those hits that contain "no/not".

- **Inventories as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial pa-

per","credit" and "borrow" in combination with keyword "inventor" excluding those hits that contain "no/not".

- **Cash and Marketable Securities as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keywords "cash" and "marketable securit" excluding those hits that contain "no/not".

- **Cashflows as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keywords "cash flow" excluding those hits that contain "no/not".

- **Stocks as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keywords "stock" and "share" excluding those hits that contain "no/not" or "capital".

- **All Assets as Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keywords "all asset","all of the asset","all of the"+"ANY TEXT"+"company's/firm's" and "all the asset" excluding those hits that contain "no/not".

- **First-priority Lien Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keyword "first" and "lien" and "security interest", excluding those hits that contain "no/not".

- **Second-priority Lien Collateral:** I look for "secured by" and "collateral". When the keywords are identified, I further search for the keyword "loan", "bond", "note", "facilit", "revol", "credit line", "line of credit", "commercial paper","credit" and "borrow" in combination with keyword "second" and "lien" and "security interest", excluding those hits that contain "no/not".

Example 1: The following excerpt is from AMD's 10-K, fiscal year 2008:

> *On November 1, 2006, Spansion LLC entered into a new senior secured term loan facility with a certain domestic financial institution, as administrative agent, and the lenders party thereto, in the aggregate amount of $500 million... In connection with the senior secured term loan facility, the Company and each of Spansion LLC, STI, Spansion International and Cerium, collectively referred to as the loan parties, executed a pledge and security agreement pursuant to which the administrative agent received a* ***first priority security interest in (a) all present and future capital stock of each of the Company's present and future direct and indirect subsidiaries,... (b) all present and future debt of each loan party, but excluding certain intercompany debt to a foreign subsidiary, (c) all present and future other property and assets of each loan party, but excluding intellectual property and any equipment subject to a lien securing a capitalized lease permitted by the credit agreement for the senior secured term loan facility, and (d) all proceeds and products of the property and assets described above.*** *The net book value of the pledged assets as of December 31, 2006 was approximately $663.5 million."*

There are several things to consider:

- All hits for a specific source of collateral that is surrounded by the words *excluding* or *excluded* are considered as a false positive.

- All hits for a specific source of collateral that is surrounded by the words *leas* or *leasing* are considered as a false positive.

Then, given the above example, the text-search algorithm generates the following dummy variables:

- Dummy Tangible Assets=1
- Dummy Intangible Assets=0
- Dummy All Assets=1
- Dummy First priority lien=1
- Dummy Second priority lien=1
- Rest of sources of collateral would be set=0

Example 2: The following excerpt is from AK Steel Inc. 10-K, fiscal year 2013:

> *"AK Steel Holding Corporation announced today that its subsidiary, AK Steel Corporation, has successfully priced a private offering of $30.0 million aggregate principal amount of its 8.750% senior secured notes due 2018 , which were offered as an add-on to its outstanding $350.0 million aggregate principal amount of 8.750% senior secured notes due 2018. The add-on notes will be fully and unconditionally guaranteed on a senior basis by AK Holding and will be* ***secured by substantially all real property, plant and equipment of AK Steel and proceeds thereof****. "*

Given the above example, the text-search algorithm generates the following dummy variables:

- Dummy Tangible Assets=1
- Rest of sources of collateral would be set=0

Example 3: The following excerpt is from Alon USA Energy Inc. 10-K, fiscal year 2012:

> *"The Alon Energy Term Loan is* ***secured by a second lien on cash, accounts receivable and inventory and a first lien on most of our remaining assets.****... We have a $240.0 million revolving credit facility... The Alon USA LP Credit Facility is* ***secured by (i) a first lien on our cash, accounts receivables, inventories and related assets and (ii) a second lien on our fixed assets and other specified property,****... The Paramount Credit Facility is primarily* ***secured by (i) a first lien on cash, accounts receivables, inventories and related assets and (ii) a second lien on Alon Holdings' fixed assets and other specified property.*** *In October 2009, Alon Refining Krotz Springs, Inc. issued 13.50% senior secured notes in aggregate principal amount of $216.5 million in a private offering. In February 2010, ARKS exchanged $216.5 million of Senior Secured Notes for an equivalent amount of Senior Secured Notes registered under the Securities Act of 1933. ...The terms of the Senior Secured Notes are governed by an indenture and the obligations under the Indenture are* ***secured by a first priority lien on ARKS' property, plant and equipment and a second priority lien on ARKS' cash, accounts receivable and inventory.****"*

Then, given the above example, the text-search algorithm generates the following dummy variables:

- Dummy Tangible Assets=1
- Dummy Receivable Assets=1
- Dummy Inventory Assets=1
- Dummy Cash and Marketable=1
- Dummy First priority lien=1
- Dummy Second priority lien=1

Appendix B4. Tables and Figures

Appendix, Table 1: Exclusion Restriction, JGTRRA and ABCP: This table contains suggestive evidence to that support the exclusion restriction is not a concern. Panel a) shows DID results for the average treatment effect, ATE, on tangibility (1)-(3), debt structure (4)-(6) and investment (7-9) as a result from the policy change for the treatment group (2000-2005) in JGTRRA. Panel b) shows DID results for the average treatment effect, ATE, on retained earnings (1)-(3), tangibility (4)-(6) and collateral pledged (7-9) as a result from the shock for the treatment group (2005-2010) in ABCP. Dependent variables are multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009] and includes firm and year fixed effects. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Panel a) Exclusion Restriction JGTRRA

	Tangibility			Unsecured (Total Debt)			Capital Expenditures		
Post-treatment Years	2003	2003-04	2003-05	2003	2003-04	2003-05	2003	2003-04	2003-05
Pre-treatment Years					2000-02				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ATE 2003	0.434			0.751			-0.0179		
	(0.471)			(1.938)			(0.306)		
ATE 2003-04		0.205			0.0996			0.0191	
		(0.474)			(1.781)			(0.272)	
ATE 2003-05			0.247			0.450			-0.0121
			(0.471)			(1.765)			(0.252)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.948	0.937	0.931	0.796	0.779	0.750	0.614	0.582	0.565
Observations	3,221	4,267	5,074	3,221	4,267	5,074	3,221	4,267	5,074

Panel b) Exclusion Restriction ABCP

	Retained Earnings			Tangibility			Capital Expenditures		
Post-treatment Years	2008	2008-09	2008-10	2008	2008-09	2008-10	2008	2008-09	2008-10
Pre-treatment Years					2005-07				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ATE 2008	-6.998			0.452			-0.157		
	(9.160)			(0.545)			(0.283)		
ATE 2008-09		0.592			0.234			-0.139	
		(8.416)			(0.511)			(0.245)	
ATE 2008-10			1.803			0.220			0.0571
			(9.164)			(0.512)			(0.240)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.934	0.918	0.908	0.946	0.935	0.929	0.720	0.669	0.650
Observations	3,238	4,491	5,275	3,243	4,504	5,291	3,243	4,504	5,291

Appendix, Table 2: Pre- and Post-ThomsonOne merge Compustat Sample Comparisson, JGTRRA: This table contains summary statistics for key firm characteristics from U.S. public manufacturing firms (SIC codes 2000-3999) from 2000 to 2005, for the i) pre-ThomsonOne merge and the ii) post-ThomsonOne merge Compustat samples in JGTRRA. The *p-value* column provides results for the difference in means test.

	Pre-Merge		Post-Merge		
	Mean	Std. Dev.	Mean	Std. Dev.	
	Median		Median		p-value
% Unsecured (Total Debt)	0.66	0.37	0.67	0.37	0.28
	0.84		0.86		
% Unsecured (Total Assets)	0.16	0.15	0.16	0.15	0.36
	0.13		0.13		
% Secured (Total Assets)	0.07	0.11	0.07	0.10	0.10
	0.01		0.01		
Retained Earnings	- 0.28	1.30	- 0.25	1.24	0.14
	0.13		0.14		
Capital Expenditures	0.05	0.04	0.04	0.04	0.35
	0.03		0.03		
Log (Size)	5.54	1.96	5.62	1.97	0.04
	5.45		5.51		
Profitability	0.06	0.17	0.06	0.17	0.33
	0.10		0.10		
Mkt-to-book	1.56	1.26	1.59	1.27	0.19
	1.12		1.14		
Tangibility	0.27	0.17	0.26	0.17	0.07
	0.23		0.23		
Net Worth	0.69	0.22	0.70	0.21	0.18
	0.71		0.71		
# Observations	6,886		5,074		
% Matched			74%		

Appendix, Table 3: Pre-treatment Summary Statistics for JGTRRA of 2003 and ABCP of 2007: This table contains summary statistics for pre-treatment firm characteristics in both identification strategies. Panel a) shows summary statistics for treatment and control groups in JGTRRA. The treatment group is defined as firms in the fourth quartile of the individual investors' ownership distribution in the pre-treatment years. Panel b) shows summary statistics for treatment and control groups in ABCP. The treatment group is defined as firms with a commercial paper program that were issuing secured in the pre-treatment years. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). The *p-value* column provides results for the difference in means test.

Panel a) Pre-treatment Summary Statistics, JGTRRA

	TG: Q4 II			CG: Rest			
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	p-value
Unsecured (Total Debt)	0.55	0.56	0.37	0.76	0.97	0.34	0.00
Retained Earnings	- 0.37	0.06	1.26	0.01	0.20	0.88	0.00
Net Worth	0.69	0.71	0.22	0.68	0.68	0.21	0.12
Log (Size)	4.44	4.34	1.44	6.65	6.60	1.68	0.00
Profitability	0.02	0.09	0.20	0.09	0.12	0.14	0.00
Mkt-to-book	1.38	0.90	1.25	1.61	1.15	1.35	0.00
Tangibility	0.27	0.24	0.17	0.27	0.23	0.17	0.36
Capital Expenditures	0.05	0.03	0.04	0.05	0.04	0.04	0.05
	1,293			1,237			

Panel b) Pre-treatment Summary Statistics, ABCP

	TG: CP&Sec			CG: Rest			
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	p-value
Unsecured (Total Debt)	0.56	0.57	0.37	0.66	0.85	0.37	0.00
Retained Earnings	- 0.47	0.07	1.65	- 0.23	0.18	1.37	0.01
Net Worth	0.68	0.70	0.19	0.71	0.73	0.21	0.01
Log (Size)	5.53	5.17	2.44	6.03	6.10	1.95	0.00
Profitability	0.06	0.10	0.17	0.08	0.12	0.16	0.03
Mkt-to-book	1.71	1.30	1.26	1.69	1.33	1.13	0.36
Tangibility	0.27	0.25	0.17	0.23	0.19	0.16	0.00
Capital Expenditures	0.06	0.05	0.05	0.04	0.03	0.04	0.00
	434			2,259			

Appendix, Table 4: Dividend Payer Dummy (Extensive Margin) reaction to JGTRRA of 2003: This table contains regression results for the average treatment effect, *ATE*, on a dividend payer dummy as a result from the policy change for the treatment group (2000-2005). Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. Columns (1)-(2), (3)-(4) and (5)-(6) show results for post-treatment years 2003, 2003-04 and 2003-05, respectively. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Dependent Variable: Dividend Payers' Dummy									
Post-treat		2003			2003-04			2003-05	
Pre-treat					2000-02				
ATE 2003	0.0207	0.0366**	0.0333**						
	(0.0162)	(0.0160)	(0.0158)						
ATE 2003-4				-0.00177	0.0262	0.0232			
				(0.0166)	(0.0163)	(0.0159)			
ATE 2003-5							-0.00955	0.0167	0.0146
							(0.0173)	(0.0167)	(0.0163)
Size		0.0938***	0.0903***		0.0965***	0.0930***		0.0986***	0.0959***
		(0.00791)	(0.00800)		(0.00746)	(0.00754)		(0.00722)	(0.00724)
Mkt-to-book		-0.0164**	-0.00879		-0.0123*	-0.00573		-0.0114*	-0.00455
		(0.00703)	(0.00690)		(0.00674)	(0.00668)		(0.00659)	(0.00656)
Profitability		0.464***	0.360***		0.435***	0.350***		0.424***	0.341***
		(0.0563)	(0.0566)		(0.0511)	(0.0520)		(0.0487)	(0.0494)
Tangibility		0.336***	0.280***		0.351***	0.296***		0.341***	0.289***
		(0.0763)	(0.0794)		(0.0723)	(0.0748)		(0.0712)	(0.0734)
R-squared	0.058	0.264	0.325	0.058	0.269	0.327	0.061	0.274	0.332
Observations	3,216	3,216	3,216	4,254	4,254	4,254	5,059	5,059	5,059

Appendix, Table 5: Summary Statistics Joint Identification Strategy, JGTRRA and ABCP (2000-2010): This table contains summary statistics for firm characteristics in the joint identifications strategy (2000-2010).

	Joint ID: Sample (2000-10)		
	Mean	Median	Std. Dev.
Unsecured (Total Debt)	0.65	0.81	0.37
Retained Earnings	- 0.40	0.09	1.50
Net Worth	0.70	0.72	0.22
Tangibility	0.25	0.21	0.17
Collateral, Cash&Mktable	0.07	-	0.26
Collateral, Inventories	0.06	-	0.25
Collateral, Receivables	0.08	-	0.27
Collateral, Intangible Assets	0.04	-	0.20
Collateral, Tangible Assets	0.15	-	0.35
Collateral, Financial Debt	0.36	-	0.48
Pledged (Total Assets)	0.08	-	0.20
Log (Size)	5.58	5.49	2.04
Profitability	0.04	0.10	0.20
Mkt-to-book	1.56	1.12	1.30
Capital Expenditures	0.05	0.03	0.05
Rated	0.25	-	0.43
# Observations	14,463		

Robustness Checks, Table 1: Capital Expenditures Response to Substitution to Secured, JGTRRA: This table contains regression results for the average treatment effect, *ATE*, for capital expenditures over total assets as a result from the policy change for the treatment group (2000-2005). Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009] and the specification includes firm and year fixed effects. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Dependent Variable: Capital Expenditures over Total Assets					
	Substitution to Secured					
Post-Treat	2003		2003-04		2003-05	
Pre-treat			2000-02			
	(1)	(2)	(3)	(4)	(5)	(6)
ATE 2003	-0.627	-0.484				
	(0.661)	(0.633)				
ATE 2003-04			-0.514	-0.525		
			(0.580)	(0.553)		
ATE 2003-05					-0.783	-0.866*
					(0.533)	(0.505)
Retained Earnings		0.527*		0.308		0.276
		(0.312)		(0.329)		(0.237)
Tangibility		20.02***		20.06***		18.45***
		(3.594)		(2.953)		(2.399)
Log (Size)		1.282***		1.590***		1.165***
		(0.484)		(0.432)		(0.333)
Mkt-to-book		0.255*		0.370***		0.395***
		(0.134)		(0.136)		(0.116)
Profitability		-0.734		-0.145		0.214
		(1.810)		(1.572)		(1.286)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.615	0.647	0.582	0.623	0.566	0.605
Observations	3,221	3,210	4,267	4,247	5,074	5,052

Notes:
The double interaction, *Issue Secured 2003-**, are omitted. No statistical significant.
The double interaction, *Q4 2003-**, are omitted. No statistical significant.

Robustness Checks, Table 2: Restricted Retained Earnings and Covenants Limiting Dividends JGTRRA of 2003: This table contains regression results for the average treatment effect, *ATE*, on restricted retained earnings in columns (1)-(3) and for retained earnings for firms with a covenant limiting dividend payouts in columns (4)-(6) as a result from the policy change for the treatment group (2000-2005). Retained earnings are multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Restricted Retained Earnings			Retained Earnings Covenant Restricting DivPayouts		
Post-treat	2003	2003-04	2003-05	2003	2003-04	2003-05
Pre-treat			2000-02			
	(1)	(2)	(3)	(4)	(5)	(6)
ATE 2003	4.911			12.64		
	(3.445)			(16.62)		
ATE 2003-04		4.078			12.16	
		(3.416)			(17.25)	
ATE 2003-05			5.723			9.945
			(3.595)			(17.37)
Q4	-7.650	-8.207	-8.396	6.402	7.894	11.18*
	(7.139)	(6.232)	(5.659)	(5.736)	(5.825)	(6.595)
Log (Size)	-3.168	-3.019	-3.549*	11.91***	10.51***	10.94***
	(2.298)	(2.175)	(1.880)	(2.912)	(3.025)	(3.251)
Mkt-to-book	-3.598*	-4.488*	-3.814**	-17.03***	-16.39***	-15.74***
	(2.078)	(2.325)	(1.906)	(3.517)	(3.289)	(3.229)
Profitability	-18.52	-0.838	-4.448	368.7***	377.4***	415.2***
	(25.86)	(24.43)	(22.58)	(25.85)	(22.84)	(25.72)
Tangibility	10.00	8.059	11.56	8.381	12.43	15.67
	(11.93)	(10.57)	(10.15)	(15.63)	(14.85)	(16.46)
Constant	13.83	17.42	17.32	-48.81	-45.39*	-53.57**
	(13.93)	(12.60)	(10.59)	(29.90)	(23.76)	(22.81)
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm
R-squared	0.565	0.528	0.535	0.419	0.380	0.372
Observations	3,210	4,247	5,052	3,210	4,247	5,052

Robustness Checks, Table 3: Retained Earnings in 2005-2010: This table contains regression results for the average treatment effect, *ATE*, for retained earnings as a result from the policy change for the treatment group (2005-2010). Retained earnings are multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009]. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Retained Earnings		
Post-treat	2008	2008-09	2008-10
Pre-treat		2005-07	
	(1)	(2)	(3)
ATE 2008	-1.496		
	(7.909)		
ATE 2008-09		-8.804	
		(8.722)	
ATE 2008-10			-7.501
			(9.671)
Q4	22.66*	25.05**	27.49**
	(12.13)	(11.13)	(11.14)
Log (Size)	11.68**	11.61**	11.58**
	(5.145)	(4.740)	(4.994)
Mkt-to-book	-19.07***	-19.64***	-20.35***
	(5.924)	(5.215)	(4.944)
Profitability	657.4***	649.5***	647.8***
	(91.95)	(92.23)	(82.51)
Tangibility	3.768	2.432	10.78
	(33.46)	(33.81)	(34.89)
Constant	-138.5***	-136.6***	-140.3***
	(37.62)	(34.20)	(34.07)
Clustered SE	Firm	Firm	Firm
R-squared	0.326	0.292	0.267
Observations	2,247	3,072	3,574

Robustness Checks, Table 4: Response of Unconstrained's Capital Expenditures to ABCP: This table contains regression results for the average treatment effect, *ATE*, for capital expenditures over total assets as a result from the policy change for the treatment group (2005-2010). Capital expenditures are multiplied by 100. Data is from U.S. public manufacturing firms (SIC codes 2000-3999). The treatment group is defined as firms with a commercial paper conduit and unconstrained in terms of size in the pre-treatment years. Standard errors are clustered at the source of variation, at a firm-level as in Petersen [2009] and the specification includes firm and year fixed effects. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Capital Expenditures		
Post-treat	2008	2008-09	2008-10
Pre-treat		2005-07	
	(1)	(2)	(3)
ATE 2008	-0.279		
	(0.259)		
ATE 2008-09		-0.251	
		(0.242)	
ATE 2008-10			-0.105
			(0.231)
Retained Earnings	-0.00607	0.0851	0.120
	(0.107)	(0.0868)	(0.0780)
Tangibility	26.41***	19.31***	18.44***
	(3.297)	(2.421)	(2.118)
Log (Size)	1.298***	0.762**	0.594**
	(0.419)	(0.331)	(0.292)
Mkt-to-book	0.299**	0.340***	0.441***
	(0.124)	(0.104)	(0.104)
Profitability	-1.225	0.259	0.497
	(1.427)	(0.944)	(0.851)
Clustered SE	Firm	Firm	Firm
Firm&Year FE	Yes	Yes	Yes
R-squared	0.764	0.704	0.688
Observations	3,238	4,491	5,275

Unconditional Fully Flexible Model
Output: rete — Number of obs = 5067
Sample Period: 2000:2005 — H0: Common Pre-dynamics = 3.506
Treatment Period: 2003:2005 — p-value = .1732

	s=1	s=2	s=3	H0: q=q-1	H0: s=s-1
q=1	.0721127	.0980726	.1246704		.0713587
	(0.1688)	(0.1487)	(0.1640)		[0.9649]
q=2	.1454754	.2447981	.3447586	-.0733628	.371271
	(0.2622)	(0.3711)	(0.4999)	[0.5897]	[0.8306]
q=3	.0844915	.0618463	-.021145	.0609839	.0220842
	(0.4355)	(0.9577)	(1.7095)	[0.7731]	[0.9890]

Std. Err. in parenthesis adjusted for clusters in gvkey
p-values in brackets

Appendix, Figure 1. Parallel Trends Assumption JGTRRA: Retained Earnings, controlling for firm observables, from 2000-05. The treatment period is from 2003-05. The table reports output of stata dqd command, which tests the parallel trends assumption conditional on observed covariates. The p-value of 0.17 implies that the parallel trends assumption for the pre-treatment period is satisfied.

Unconditional Fully Flexible Model
Output: f_punsec — Number of obs = 5291
Sample Period: 2005:2010 — H0: Common Pre-dynamics = .0546
Treatment Period: 2008:2010 — p-value = .9731

	s=1	s=2	s=3	H0: q=q-1	H0: s=s-1
q=1	-.0411166	.111827	-.0038813		11.14343
	(0.0433)	(0.0406)	(0.0560)		[0.0038]
q=2	-.0501014	.0938574	-.0308357	.0089848	10.59966
	(0.0670)	(0.1015)	(0.1488)	[0.8170]	[0.0050]
q=3	-.0620847	.0579076	-.1027353	.0119833	10.61933
	(0.1229)	(0.2913)	(0.5416)	[0.8649]	[0.0049]

Std. Err. in parenthesis adjusted for clusters in gvkey
p-values in brackets

Appendix, Figure 2. Parallel Trends Assumption ABCP: Unsecured debt over Total Debt, controlling for firm observables, from 2005-10. The treatment period is from 2008-10. The table reports output of stata dqd command, which tests the parallel trends assumption conditional on observed covariates. The p-value of 0.97 implies that the parallel trends assumption for the pre-treatment period is satisfied.

Appendix C: "How cheaper hedging affects the volatility of cashflows"

Appendix C1. Campbell-Shiller Decomposition of Returns

Introduce a log-linear approximation to the present-value identity, the fact that the price is the present value of the dividends and use this approximation to discuss the sources of stock price volatility.

$$R_{t+1} = \frac{P_{t+1} + D_{t+1}}{P_t} \tag{5}$$

Rewrite as price equals the present value of discounted dividends and iterate forward.

$$P_t = \sum_{k=1}^{\infty} \frac{D_{t+k}}{R_{t,t+k}} \tag{6}$$

where $R_{t,t+k}$ is the realized return from the asset. Compute log-returns:

$$r_{t+1} = p_{t+1} - p_t + log\left(1 + exp(d_{t+1} - p_{t+1})\right) \tag{7}$$

Do a first-order Taylor approximation to the function $f(x) = log(1 + exp(x))$ around $x = \bar{d} - \bar{p}$ where it denotes the sample average value:

$$log\left(1 + exp(d_{t+1} - p_{t+1})\right) \approx \kappa + (1 - \rho)(d_{t+1} - p_{t+1}) \tag{8}$$

where $\rho = \frac{1}{1+exp(\bar{d-p})}$ and $\kappa = -log(\rho) + (1 - \rho)log\left(\frac{1}{\rho-1}\right)$. This yields:

$$r_{t+1} = \rho p_{t+1} - p_t + \kappa + (1 - \rho)d_{t+1} \tag{9}$$

Iterating forward we can obtain:

$$p_t = \frac{\kappa}{1-\rho} + \sum_{j\geq 0} \rho^j ((1-\rho) d_{t+1+j} - r_{t+1+j}) \tag{10}$$

This identity holds for any returns, prices and dividends ex-post and thus ex-ante, if you take conditional expectations of this equation. It is an accounting identity without any behavioral assumption. From the log-linearized return equation we have the following price-dividend ratio:

$$p_t - d_t = \rho(p_{t+1} - d_{t+1}) + \kappa + \Delta d_{t+1} - r_{t+1} \tag{11}$$

and iterating forward:

$$p_t - d_t = \frac{\kappa}{1-\rho} + \sum_{j\geq 0} \rho^j \left(\Delta d_{t+1+j} - r_{t+1+j}\right) \tag{12}$$

which suggests that variation in the price-dividend ratio occurs because of variation in dividend growth or discount factors. Now, in order to compute the returns innovation, apply $E_{t+1} - E_t$ to both sides:

$$r_{t+1} - E_t r_{t+1} = \rho \left(p_{t+1} - E_t p_{t+1}\right) + (1-\rho) \left(d_{t+1} - E_t d_{t+1}\right) \tag{13}$$

Using the price-dividend expression:

$$p_{t+1} - E_t p_{t+1} = (E_{t+1} - E_t) \sum_{j\geq 0} \rho^j \left(\Delta d_{t+2+j} - r_{t+2+j}\right) + d_{t+1} - E_t d_{t+1} \tag{14}$$

which implies

$$r_{t+1} - E_t r_{t+1} = \rho(E_{t+1} - E_t) \sum_{j\geq 0} \rho^j \left(\Delta d_{t+2+j} - r_{t+2+j}\right) + d_{t+1} - E_t d_{t+1} \tag{15}$$

This means that return innovations are driven by changes in dividends and discount factors, and innovations in actual dividends. We finally have the expression:

$$r_{t+1} - E_t r_{t+1} = (E_{t+1} - E_t) \sum_{s\geq 0} \rho^s \Delta d_{t+s+1} - (E_{t+1} - E_t) \sum_{s\geq 1} \rho^s r_{t+s+1} \tag{16}$$

Note that dividends are some fraction of cashflows generated by the firm every period, $d_t = \gamma_t c f_t$. An unexpected good stock return must occur because either the current dividend went up, or expectations of future dividends go up, or because expectations of future returns go down. The first term is a standard "cash flow effect" and the second is an expected return or risk premium effect: the price goes up if the risk premium or risk-free interest rate go down.

Appendix C2. Definition of Treatment and Control Groups

Butter Introduction

Introduction date: 09/05/1996

- Treatment group (TG): text-search hits for keyword *butter* over SEC 10-K filings.
- Control group (CG):
  - Text-search hits for keywords *margarine* and *ghee* over SEC 10-K filings, excluding those already in TG.
  - Dairy sector (sic codes 2020-2029), excluding those already in TG.
  - Bakery sector (sic codes 2050-2059), excluding those already in TG.
  - Fats and oils sector (sic codes 2070-2079), excluding those already in TG

Butter Delisting

Delisting date: 12/20/2010

- Treatment group (TG): text-search hits for keyword *butter* over SEC 10-K filings.
- Control group (CG):
  - Text-search hits for keywords *margarine* and *ghee* over SEC 10-K filings, excluding those already in TG.
  - Dairy sector (sic codes 2020-2029), excluding those already in TG.
  - Bakery sector (sic codes 2050-2059), excluding those already in TG.
  - Fats and oils sector (sic codes 2070-2079), excluding those already in TG

Appendix C3. Variable Description

Compustat

- **Total Debt**: Debt in current liabilities (item 34) + Long-term debt (item 9).
- **Net Worth, Book:** Equity (item 6 - item 181) over Equity plus Total Debt (item 6 - item 181 + item 9). Equity is computed as Total Assets minus Total Liabilities.
- **Tangibility or Collateral Availability:** Property, Plant and Equipment, Net (item 8) over Total Assets (item 6).

- **Investment:** Capital Expenditures (item 128) 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).
- **Dummy Rated:** Dummy variable, takes the value of one if the firm-year observation has a S&P Long-term Bond Rating (item 280).
- **Dummy Dividend Payer:** Dummy variable, takes the value of one if the firm-year observation has a positive value for common dividends (item 21).

CRSP Daily Files:

- **Stock price:** Daily closing stock prices.

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