

Dodd-Frank Act, Credit Rating Agencies and Corporate Financing and Investment Decisions

Bina Sharma, Binay K. Adhikari, Anup Agrawal,
Bruno R. Arthur and Monika K. Rabarison*

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* Sharma, Adhikari, Arthur, and Rabarison: Vackar College of Business and Entrepreneurship, University of Texas Rio Grande Valley, Edinburg, TX 78503. Sharma: bina.sharma@utrgv.edu, (432) 923-2176. Adhikari: binay.adhikari@utrgv.edu, (956) 665-3827. Agrawal: Culverhouse College of Business, University of Alabama, Tuscaloosa, AL 35487-0224, aagrwal@cba.ua.edu, (205) 348-8970. Arthur: bruno.arthur@utrgv.edu, (956) 665-3368. Rabarison: monika.rabarison@utrgv.edu, (956) 665-3338. We thank Mehran Azimi, Alex Butler, David Cicero, Soroush Ghazi, Incheol Kim, Sandy Klasa, Lei Kong, and seminar participants at the Universities of Alabama, New Orleans and Texas RGV for their helpful comments and suggestions. Agrawal acknowledges financial support from the William A. Powell, Jr. Chair in Finance and Banking.

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Abstract

We find that Dodd-Frank Act's regulations on credit rating agencies (CRAs) significantly affect some firms' financing and investment decisions. After Dodd-Frank, low-rated firms, which face steep costs of further downgrades, reduce debt issuance and investments substantially, compared to a similar group of unrated firms. Our results are not driven by supply effects or the financial crisis. They point to an unintended consequence of Dodd-Frank: Greater pressure on CRAs leads to negative spillover effects on the policies of firms worried about their credit ratings, regardless of underlying credit quality.

Keywords: Dodd-Frank Act, Credit rating, Financing, Investment

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1. Introduction

Credit ratings play an important role in market participants' decisions about lending, investing and managing credit risks. Credit ratings are also important for firms' financial decisions. For instance, Graham and Harvey's (2001) survey finds that a majority (57%) of CFOs consider credit ratings as important or very important in deciding the amount of debt financing. Various reports in the news media about firms' financial decisions also confirm this view.¹ Kisgen (2006) shows that concerns about credit rating downgrades can lead firms to change their capital structures, regardless of their credit quality. Kisgen's findings imply that firms and their stakeholders rationally respond to changes in credit ratings even if the firms' underlying credit quality does not change because credit rating downgrades or upgrades can trigger events that generate substantial costs or benefits for firms.² In fact, Manso (2013) warns that credit rating downgrades can create feedback loops that affect a firm's solvency and threaten its survival (e.g., rating → interest rates → optimal default decision → rating).

¹ For example, Kisgen (2006) cites a story in the *Wall Street Journal* (*WSJ*, 2002) about Fiat's decision to reduce debt amid its worry of possible credit rating downgrades, and another *WSJ* (2004) story about EDS's decision to issue shares to avoid a credit-rating downgrade. More recently, a story in *New York Times* (2009) reports GE's decision to cut dividends and preserve cash partly because of the concern that the main rating agencies would lower the company's credit rating.

² For example, lenders may impose stricter covenants, employees and suppliers may pull out or impose unfavorable terms, and regulators require stricter disclosure (see, e.g., Kisgen (2006)).

Despite their key role in financial markets, credit rating agencies (CRAs) sometimes make mistakes, which can have serious consequences for the financial sector (see, e.g., White (2010)). The recent financial crisis has sparked renewed interest in credit ratings and CRAs, mainly because of their role in the ratings of structured financial products. But even before that, credit ratings have been frequently criticized for being inflated, riddled with conflicts of interests and even uninformative and inaccurate (see, e.g., Jeon and Lovo (2013)).

The upshot is that even though credit ratings may be flawed, they can have tremendous implications for financial market participants. Several studies have examined how credit ratings affect public companies' values and policies, but most of them do so by using the levels of, or changes in, firms' existing credit ratings.³ However, variations in credit ratings are unlikely to be random; they are largely driven by underlying credit risks. As a result, it is challenging to separate the effect of credit ratings per se from the effect of credit risks. In this study, we exploit the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act (henceforth, Dodd-Frank) as a quasi-natural experiment which plausibly increased the risk of credit rating downgrades, irrespective of the firms' underlying qualities, to cleanly identify the causal effect of ratings on firm policies.

In response to the 2008-2009 financial crisis, the United States Congress passed Dodd-Frank in 2010 to prevent another financial crisis. CRAs came under fire and became a significant subject of Dodd-Frank because their ratings of structured financial products were believed to be an important contributor

³ Prior studies examine the effects of ratings on stock and bond prices (see, e.g., Hand, Holthausen, and Leftwich (1992); Ederington and Goh (1998); and Kisgen and Strahan (2010)), debt and equity issuance (see, e.g., Kisgen (2006, 2009)), debt structure and specialization (see, e.g., Rauh and Sufi (2010) and Colla, Ippolito, and Li (2013)), and local credit supply (see Adhikari, Cicero, and Sulaeman (2018)). Kisgen (2006) exploits the features of existing ratings to separate the effect of credit ratings from credit risk.

to the financial crisis. Many provisions of Dodd-Frank subject CRAs to much stricter regulations, as discussed in section 3.1. For example, the law makes it easier to bring private lawsuits against CRAs for issuing faulty credit ratings. It also gives the Securities and Exchange Commission (SEC) substantially greater power to impose sanctions on CRAs for potential wrongdoing, including the ability to effectively derecognize their ratings. As Dimitrov, Palia and Tang (2015; hereafter DPT) argue, these reforms were intended to improve the quality of credit ratings by encouraging CRAs to invest more in due diligence, improve their rating methods, monitor their analysts, and strengthen internal controls. However, the penalty for issuing erroneous credit ratings tends to be asymmetric because CRAs are more likely to be penalized for optimistic ratings than for pessimistic ratings (see, e.g., Goel and Thakor (2011)). Accordingly, DPT find that CRAs responded to these regulations with ‘cheap fixes’ by simply issuing lower credit ratings, possibly below the levels justified by firm fundamentals. DPT find that after Dodd-Frank, CRAs issue lower credit ratings, which are less informative and contain more false warnings of default. DPT document strong evidence of how Dodd-Frank changed the incentives and behaviors of CRAs. However, to our knowledge, prior studies have not examined whether this change in CRAs’ incentives, in turn, affects the firms rated by these agencies.

We attempt to fill this important gap in the literature. We exploit the passage of Dodd-Frank into federal law as an exogenous shock to the risk of firms’ credit rating downgrades. We examine whether this risk influences the financing and investment policies of firms most affected by them. Our identification strategy relies on the fact that, in general, below-investment grade (henceforth, low-rated) firms face much steeper costs of rating downgrades, so they are more likely to respond to an increased risk of downgrades than other firms. (We discuss this issue in more detail in section 2.) Our inferences are based on the variation in firms’ ex-ante risk of downgrades and do not depend on whether these firms are actually downgraded subsequently. We test this hypothesis against a null hypothesis that there is no difference in financing and investment decisions between these two groups of firms because credit markets understand the changing incentives of CRAs, so firms are not adversely affected by downgrades

that happen after Dodd-Frank. Using both a full sample and a sample of carefully matched firms, we find that after Dodd-Frank, low-rated firms (i.e., the treated group) issue significantly less debt than a similar group of unrated firms (i.e., the control group), which are not affected by the risk of rating downgrades.⁴ The reduction in debt issues is not offset by an increase in equity issues, forcing these firms to cut back their net investment. The economic magnitudes of these effects are substantial. Based on the full sample, the decline in total net security issues (net investments) represents an 85% (24%) reduction for low-rated firms after the shock compared to their unconditional pre-shock averages. Our results are consistent with the notion that increased concern about potential downgrades, regardless of the underlying credit quality, forced non-investment grade firms to reduce debt issuance and cut back on investments. This is an unintended consequence of Dodd-Frank.

We consider and test several alternative supply-side explanations of our main results stemming from the fact that the Dodd-Frank Act and the financial crisis that preceded it affected many aspects of the financial system apart from CRAs. These tests try to separate the effect of credit rating risks from other possible confounding effects.⁵ One alternative ‘better information’ hypothesis posits that CRAs become more careful after Dodd-Frank, issuing more informative ratings, and that results in disproportionately more downgrades for low-rated firms. Under this story, the revelation of these firms’ poorer credit quality, rather than their ratings per se, makes lenders less willing to lend to these firms. A second alternative ‘credit supply shock’ story is that Dodd-Frank affected banks’ incentives and ability to lend because it introduced regulations on banks’ asset holdings, disclosure, governance, securitization, etc. Likewise, the financial crisis affected the liquidity and demand for corporate bonds, especially speculative-grade. Therefore, our results may be driven by shocks to the supply of debt capital (bank

⁴ We find generally similar results when we use investment grade firms as an alternative control group. We discuss our choice of treatment and control firms in more detail in section 2 below.

⁵ We discuss these tests in detail in section 6.

loans and bonds), that may have affected our two groups of firms differently. A third possibility is that our treated and control firms continue to be affected differentially by the financial crisis during the post-crisis years.

We conduct several cross-sectional tests, each of which tests one or more of these supply-side stories. First, we use Kisgen's (2006) plus or minus (POM) test, which exploits the features of existing ratings to separate the effects of underlying credit risk from the risk of a rating downgrade. These POM tests reveal that Dodd-Frank's effects on debt issuance are largely driven by a demand effect, i.e., firms refrain from issuing debt to guard against the risk of a downgrade. Second, we investigate whether the risk of being downgraded is made worse by negative liquidity shocks to the junk bond market, which would support the credit supply shock story. Following Chernenko and Sunderam (2012), we measure negative liquidity shocks to the corporate junk bond market by the aggregate net outflow of funds to junk bond mutual funds. We find no significant effect of these adverse liquidity shocks on debt issuance by treatment firms. This result does not support the credit supply shock explanation of our results. Third, low-rated firms reduce both public (bond) and private (e.g., bank) debt, which indicates these firms' (demand side) decision to reduce debt. Because ratings are more important for public bonds than private debt, the information hypothesis would predict a reduction in public debt only, which is a supply-side effect. Fourth, our results remain robust after controlling for the possibility that low-rated and unrated firms may differ in their reliance on bank debt. A final test suggests that treatment firms' response to Dodd-Frank cannot be explained by their differential exposure to the lingering effects of the financial crisis compared to control firms.

We further find that treatment firms' responses to Dodd-Frank vary with the importance of debt capital to them. For instance, Dodd-Frank leads to a sharper decrease in debt issuance and investments for low-rated firms that exhibit a higher demand for debt capital before Dodd-Frank. Moreover, Dodd-Frank's effects are attenuated in the presence of institutional investors, which make firms less dependent on debt (e.g., Grennan, Michaely and Vincent (2017)).

This study contributes to several strands of the literature. First, it contributes to the literature on the effects of Dodd-Frank. Our paper is closely related to DPT (2015), who show that Dodd-Frank distorts CRAs' incentives and makes them more inclined to issue lower credit ratings, below those justified by the underlying credit risks. We offer an important extension to DPT's study by uncovering Dodd-Frank's implications for corporate policies.

Second, the paper contributes to the literature on the importance of credit ratings for firm policies. Our study is related to Tang (2009), who uses Moody's credit rating refinements as an exogenous shock to information asymmetry. Tang finds that when Moody's refined its rating scale to make it more granular, firms that experienced an increase in ratings enjoyed reduced borrowing costs and increased investments, even when their fundamentals had not changed. Our paper differs from and complements Tang (2009) in at least two ways. First, Tang examines firms' ex-post response to credit rating changes, while we examine their ex-ante response. Second, the underlying channel in Tang is more informative credit ratings, while the channel here is different CRA incentives after Dodd-Frank. Our paper is also related to Molina (2005), who estimates the effect of leverage on credit ratings, and Kisgen (2006), who uses the properties of existing ratings to identify the effect of downgrade risk on capital structure. Our novel contribution is to exploit an exogenous regulatory event that led to an increase in the ex-ante probability of being downgraded. This approach helps minimize potential simultaneity issues to help establish the causal effect of credit ratings on firm policies. Third, the paper contributes to the literature on asymmetric effects of credit rating uncertainty on investment and non-investment grade firms (see, e.g., Kisgen (2006), Jorion and Zhang (2007), and May (2010)).

Finally, this paper contributes to the literature on the unintended consequences of regulation. For example, prior studies uncover unintended effects of the SEC's short-swing rule on insider trading in takeover targets (see Agrawal and Jaffe (1995)), the Sarbanes-Oxley Act (SOX) on the demand and supply of directors (see Linck, Netter and Yang (2009)), the small firm exemption of SOX on firm size (Gao, Wu, and Zimmerman (2009)), IFRS adoption on contractual outcomes (Brüggemann, Hitz, and

Sellhorn (2013)), and Dodd-Frank Act on credit ratings (DPT (2015)). All these studies examine the effects of regulations on firms that are *directly* targeted by the rules. Our novel evidence that Dodd-Frank's rule targeting CRAs indirectly influenced the decisions of a wide swath of public companies shows that regulatory changes can have widespread spillover effects, which policymakers need to consider.

The remainder of the paper is organized as follows. In section 2, we elaborate on our choice of treatment and control groups. Section 3 summarizes the legal background, reviews the related literature and develops our hypotheses. Section 4 discusses our data and summary statistics. Section 5 discusses our empirical methodology and presents the main results. Section 6 presents the results of several tests mainly aimed at separating demand vs. supply channels. Section 7 concludes.

2. Treatment and Control Groups

Which firms are likely to be most affected by Dodd-Frank's regulations on CRAs? Although provisions of Dodd-Frank apply to all credit ratings assigned by CRAs, numerous studies have shown that changes in credit ratings affect lower-rated firms considerably more than higher-rated ones.⁶ For instance, Jorion and Zhang (2007) show that credit rating downgrades lead to large negative market reactions among firms with lower prior credit ratings and virtually no effect on higher-rated firms. May (2010)

⁶ See, e.g., Katz (1974), Griffin and Sanvicente (1982), Holthausen and Leftwich (1986), Cornell, Landsman and Shapiro (1989), Hand, Holthausen, and Leftwich (1992), Hull, Predescu and White (2004), Jorion, Liu and Shi (2005), and May (2010). The literature points to two main reasons for this non-uniform effect of credit ratings. First, non-investment grade bonds face the most significant liquidity issues, mainly because regulations prohibit many institutional investors from investing in non-investment grade bonds. Second, non-investment grade bonds also face higher regulatory scrutiny and uncertainty (see, e.g., Lemmon and Roberts (2010)).

finds a stronger market reaction to rating changes in bond markets among speculative-rated firms. Kisgen's (2006) tests reveal that ex-ante credit rating concerns affect debt issuance decisions of low-rated firms much more than those of investment-grade firms.

Rating downgrades affect some firms much more than others because the differences in default rates, and hence the cost of capital, between adjacent ratings are much larger among low-rated firms than among investment-grade firms. For instance, Hamilton and Cantor (2005) estimate a three-year cumulative default probability among Aaa, Aa, A, Baa, Ba, and B rated issuers in a stable outlook to be 0%, 0%, 0.44%, 1.24%, 4.64%, and 17.86%, respectively. Clearly, the consequence of being downgraded from Ba to B is much more severe than being downgraded from Aa to A for ex-ante default risk. Similarly, Jorion and Zhang's (2007) estimates show that the difference in default probabilities between the firms with AA+ and AA ratings is 0.3 percentage points, whereas this difference between BB+ and BB is a whopping 4.7 percentage points, or about 15 times as large. This vast skewness in default probabilities faced by firms in different rating classes is also reflected in the differences in their cost of debt. For instance, Damodaran's estimates suggest that in 2013, borrowers rated A paid a mere 15 basis points more than A+ rated borrowers in default spreads on average. On the other hand, this difference between B+ and B rated borrowers was about 100 basis points.⁷ The fact that low-rated firms face a massively steeper cost of rating downgrades makes them an ideal treatment group for this study, which focuses on the increased ex-ante risk of downgrades due to Dodd-Frank.⁸

⁷ Source: Professor Aswath Damodaran's website:

<http://www.stern.nyu.edu/~adamodar/pc/archives/bondsreads13.xls>

⁸ Note that firms rated BBB- arguably also are a candidate for our treatment group. They are in the lowest end of investment-grade rating, so presumably the consequence of a one notch downgrade to junk status is very high for them. However, we argue that compared to the decision of downgrading a firm *within*

We follow prior studies (e.g., Lemmon and Roberts (2010)) and use firms without credit ratings as the candidate control group. Because unrated firms face no risk of credit rating downgrades, they serve as the cleanest benchmark for isolating the differences that arise purely due to credit rating shocks, after controlling for other differences that are important for financing and investment decisions. For robustness, we also experiment with investment grade firms as the control group and find generally similar results.

3. Background, Related Literature, and Hypothesis Development

3.1. Dodd-Frank and regulation of CRAs

Dodd-Frank was signed into federal law by President Barak Obama on July 21, 2010, as a response to the financial crisis of 2008-2009. Dodd-Frank imposes several new regulations on banks, non-bank financial companies, and CRAs. CRAs became a primary target of Dodd-Frank because inaccurate and inflated ratings of structured financial products, especially sub-prime mortgages are believed to have been an important factor that contributed to the crisis.

Specifically, sections 931 through 939 of Title IX (Investor Protections and Improvements to the Regulations of Securities), Subtitle C (Improvements to the Regulation of Credit Rating Agencies) introduce several new rules for CRAs and nationally recognized statistical rating agencies (NRSROs).⁹

investment or junk category, CRAs are likely to face a stronger backlash for downgrading an investment grade firm to junk grade, unless it is strongly justified by its underlying credit quality. Therefore, we do not include firms rated BBB- in our main treatment group. However, including BBB- rated firms in the treatment group does not change our results qualitatively.

⁹ A NRSRO is a CRA that issues credit ratings that the SEC recognizes for certain regulatory purposes such as ease of bond issuance by firms and meeting certain financial firms' net capital requirements or reserves. See SEC (2003) and Kisgen and Strahan (2010) for more detailed descriptions of these rules.

Most of these rules became effective immediately, so they likely affected CRAs' behavior right away. These rules emphasize that because of the systemic importance of credit ratings, functions of CRAs and NRSROs are matters of 'national public interest'. Therefore, these agencies' roles should be subject to the same higher standard of public oversight, accountability, and liability as auditors, security analysts, and investment bankers.

Greater liability and regulatory penalties are arguably the two most sweeping changes brought about by Dodd-Frank concerning CRAs.¹⁰ Regarding the former, Dodd-Frank makes it much easier to bring private lawsuits against CRAs under Rule 10b-5 of the securities law for failing to conduct a reasonable investigation of securities they rate and issuing erroneous credit ratings. CRAs are subject to greater disclosure of their internal controls, rating methodologies, due-diligence, and verification of the accuracy of already assigned ratings. These provisions also instruct the SEC to establish an Office of Credit Ratings to monitor the CRAs' internal control systems and rating procedures. Section 932 gives the SEC greater power to suspend or revoke NRSRO's registration with respect to a particular class of securities for issuing inaccurate ratings.

3.2. Related literature and hypotheses

How do CRAs respond to Dodd-Frank's sweeping new rules? DPT (2015) argue that since CRAs are rarely accused of issuing pessimistic ratings, they can effectively circumvent section 932 by issuing slightly pessimistic ratings. Our study builds on DPT, who find that after Dodd-Frank, CRAs started issuing more pessimistic ratings, regardless of the borrower's underlying credit quality. Our hypotheses are also guided by Kisgen's (2006) credit rating-capital structure (CR-CS) theory and empirical evidence, as we discuss below.

The traditional trade-off theory of capital structure postulates that firms optimize their capital structures based on the tradeoff between the benefits (e.g., interest tax-shield, governance) and costs (e.g.,

¹⁰ See DPT (2015, Appendix A) for a more detailed summary of these provisions.

bankruptcy risk) of debt. The trade-off theory predicts an inverse U-shaped curve for the relation between debt ratio and firm value. On the other hand, the CR-CS theory argues that ratings convey information on firm quality beyond other publicly available information. Therefore, rating changes can trigger events that lead to discrete changes in costs or benefits for firms, partly because regulators, investors, and other stakeholders (e.g., suppliers and contractors) often depend on credit ratings to deal with a firm.

As shown by Kisgen, credit rating effects add discrete breaks in the ‘debt-ratio firm-value’ curve predicted by the traditional trade-off theory of capital structure. An important implication of the CR-CS theory is that two identical firms with similar underlying credit quality, but different credit ratings can end up with significantly different optimal debt levels. Specifically, the risk of being downgraded often makes the optimal debt level lower than that predicted by the traditional trade-off theory. Moreover, as discussed in section 2, the cost of being downgraded is generally trivial for investment grade firms,¹¹ but quite significant for low-rated firms (e.g., Jorion and Zhang (2007), May (2010), Hamilton and Cantor (2005)). Therefore, low-rated firms are much more likely to respond to an increase in downgrade risk. These arguments and findings suggest our first hypothesis:

Hypothesis 1. *Low-rated firms reduce net debt issues after the adoption of the Dodd-Frank Act to protect their credit ratings.*

However, DPT find that after Dodd-Frank, CRAs issue less informative credit ratings, which contain more false warnings of default. If borrowers and credit markets acknowledge this changing behavior of CRAs, a null hypothesis is that Dodd-Frank does not affect debt issuance decisions of these two groups of firms differently.

¹¹ Except perhaps when they are downgraded to speculative grade, which is infrequent and unlikely to happen purely to circumvent Dodd-Frank’s regulations. To deal with this issue, we follow Lemmon and Roberts (2010) and require the sample firms not to switch from investment grade to speculative grade or vice versa during the sample period.

A firm which is compelled to reduce debt financing has two main choices: either to issue equity to continue with the same level of investments or to reduce investments. For several reasons, we do not expect low-rated firms to substitute equity for debt. First, while Dodd-Frank made debt financing costlier, it is unlikely to have changed a firm's investment opportunity set. So, for the same opportunity set, higher a cost of debt likely renders some previously feasible projects infeasible (i.e., turns them from positive NPV to negative NPV). Because equity is generally more expensive than debt, substituting to equity is also unlikely to increase the feasible set of investments. Second, it has always been more difficult for low-rated firms to switch to equity financing (see, e.g., Lemmon and Roberts (2010)). This happens because, in general, bad news for bond markets is also bad news for equity markets, especially for lower-rated firms (see, e.g., Kwan (1996), and Jorion and Zhang (2007)). So, higher downgrade risk after Dodd-Frank is unlikely to have improved these firms' access to equity markets. Moreover, Kadapakkam, Meisami, and Wald (2016) show that because of a wealth transfer effect, low-rated firms are not able to issue new equity when their outstanding debt becomes riskier. These arguments and findings suggest our second hypothesis:

Hypothesis 2. *Low-rated firms reduce net investments due to the reduction in debt financing after the adoption of the Dodd-Frank Act.*

A null hypothesis is that low-rated firms do not reduce net investments because, for reasons discussed earlier, they are not forced to reduce debt issuance.

4. Data and Summary Statistics

4.1. Sample description

Our empirical strategy largely builds on Lemmon and Roberts (2010), so we follow an approach similar to theirs to select our sample and design some of our tests. We consider July 2010, when Dodd-Frank passed, as our event date. Our sample period starts in 2005 and ends in 2015 so that we have a

balanced time-frame around the passage of Dodd-Frank. We obtain S&P domestic long-term issuer credit rating from Compustat and supplement these with Moody's and Fitch's bond ratings obtained from Mergent Online database. Appendix Table A.1 presents a short description of credit ratings assigned by these three agencies. We define a firm as unrated if it does not have a credit rating from any of these agencies. Following the industry convention and prior literature, we consider credit ratings of AAA through BBB- (or equivalent) as investment grade and BB+ through C (or equivalent) as below-investment (also called non-investment or speculative) grade.¹² We drop firms assigned 'D' and 'SD' from the sample because these ratings are assigned to firms currently in default on their financial obligations.

We obtain financial and stock price information from Compustat/CRSP merged database. We exclude financial and utility firms from the sample because these industries are highly regulated. We require all firm-year observations to have a non-missing and non-zero value for total assets and total debt. We obtain institutional ownership data from Thomson Reuters institutional holding (13f) filings.

For additional analysis, we collect information on debt structure from the Capital IQ database. Capital IQ provides information on seven mutually exclusive sources of debt: commercial paper, drawn credit line, term loan, senior bonds and notes, subordinate bonds and notes, capital lease, and other debt.

Following Lemmon and Roberts (2010), we require all firm-year observations to have non-missing net long-term debt issues, net short-term debt issue, net equity issues, net investments, and market-to-book ratio. In addition, we require that (1) rated firms not to switch from investment-grade to below-investment grade, and vice versa throughout the sample period. But their ratings can vary over time

¹² Kisgen (2006) and Lemmon and Roberts (2010) use the same procedure. For more information please refer to https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_79004
https://www.standardandpoors.com/en_US/web/guest/article/-/view/sourceId/504352
<https://www.fitchratings.com/site/definitions>

within each broad group. (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after Dodd-Frank. Appendix Table A.2 provides definitions of all variables used in this study. Our final full sample consists of a total of 18,440 firm-year observations corresponding to 4,102 unique firms in the sample.

4.2. Summary statistics

Table 1 presents summary statistics for the unrated, low-rated, and investment grade firms for our final full sample as discussed in section 4.1. We winsorize all continuous variables at their 1st and 99th percentiles. Out of the total of 18,440 firm-year observations from 4,102 unique firms, 14,637 firm-years are unrated, 2,202 are rated low-rated, and 1,622 are rated investment grade. On average, unrated, low-rated and investment grade firms issue debt equal to 2%, 3% and 2% of total assets, respectively. This indicates that low-rated firms have the highest dependence on long-term debt among the three groups of firms. Most of the debt issues are of a long-term nature. Unrated firms appear to issue the most equity relative to their size (3%). Unrated firms also have the highest total net security issuance (5% of total assets) among the three groups. Interestingly, investment grade firms have net equity financing of a negative 3% of total assets because firms have more equity repurchases than equity issuance on average. Similarly, their net security issuance is -1% of total assets. These results may reflect the recent trend of stock repurchases and increased cash holdings by large established firms. Median equity, debt, and total security issuance, of each type of firm is zero, which suggests that a typical firm does not raise any new capital in a given year.

The investment activities of investment grade and unrated firms are very similar, despite the former's bigger size. Both types of firms have lower net investment than low-rated firms. Low-rated firms have the highest book leverage (39%) among the three groups. Both below-investment and investment grade firms are several times larger and more profitable than unrated firms. Low-rated and unrated firms are about 10 to 14 years younger than investment grade firms. About 6% of low-rated firms, 2% of unrated firms, and

49% of investment grade firms are in the S&P 500 index. These differences motivate our choice of control variables in analyses of the full sample and matched samples.

4.3. Univariate analysis

As discussed in section 2, we consider low-rated firms as the treatment group and unrated firms as the control group to study the impact of Dodd-Frank on the financing and investment policies of firms worried about credit ratings. We start our analysis with some simple univariate tests.

Table 2 shows that before Dodd-Frank, low-rated firms have significantly more net debt issues and net long-term debt issues than unrated firms. But the former group significantly reduces net debt and net long-term debt issuance after Dodd-Frank. As a result, the differences between these two groups significantly narrow after the shock. Similarly, low-rated firms also appear to reduce their equity issues after Dodd-Frank. Thus, they diverge further away from unrated firms. Low-rated firms' net investment also reduces significantly after Dodd-Frank. Overall, the differences between these two groups narrow considerably after Dodd-Frank.

These univariate results generally support our hypothesis. However, these tests also show significant differences between these firms' characteristics that can be important for their financing and investment activities. Moreover, our sample period overlaps with the period of the recent financial crisis, which may have uneven effects on the financing decisions of firms with different credit ratings. Our analysis in the following sections controls for these differences in firm characteristics and the potential influence of the financial crisis of 2008-09.

5. Effect of Dodd-Frank on Financing and Investment

5.1. Main specification and results

Our main sample consists of all firm-years of low-rated or unrated firms from 2005 to 2015. We use the following difference-in-differences (DiD) regression model to examine the effect of credit rating shock on firms' financing and investment activities after the enactment of Dodd-Frank:

$$\begin{aligned} \text{Financing or Investment Policy}_{it} = & \alpha + \beta_1 \text{PostDF}_t + \beta_2 \text{PostDF}_t \times \text{Treated}_i + \gamma X_{it} + \\ & \theta_i + \varepsilon_{it} \end{aligned} \tag{1}$$

The dependent variable (*Financing or Investment Policy*) measures one of net debt issuance, net long-term debt issuance, net short-term debt issuance, net equity issuance, total net security issues, or net investment. The index i indicates a firm, and t indicates a year. PostDF is an indicator variable that takes the value of 1 for the post-Dodd-Frank period (fiscal years ending after July 2010) and 0 otherwise. Treated is an indicator variable that takes the value of 1 for the low-rated, and 0 for unrated firms. Our main coefficient of interest is β_2 (coefficient of $\text{PostDF} \times \text{Treated}$), which measures the treatment effect of our DiD estimator. X_{it} includes firm-level control variables found by prior studies to influence firms' financing and investment decisions (firm size, market-to-book equity, z-score, age, operating income, tangibility, cash holdings, and S&P 500 indicator). X_{it} also includes an interaction term of Treated with a binary indicator of the recent financial crisis period (2008-2009) to disentangle the effect of the crisis from that of Dodd-Frank.¹³ All the variables are defined in Appendix Table A.2. The term θ_i indicates firm fixed effect, and ε_{it} represents the error term. The variable Treated is perfectly collinear with firm fixed-effects, and PostDF is collinear with year fixed effects, so we do not estimate them separately.

¹³ We acknowledge that this method may not fully control for the effects of the financial crisis if such effects persist in post-crisis years. In section 6.3, we introduce a variable that arguably captures firms' asymmetric and persistent exposure to financial crises following Fahlenbrach, Prilmeier and Stulz (2012). Despite a substantial drop in sample size, our results remain the same.

Table 3 reports results from our full sample. Columns (1) to (5) report results for financing activities, column (6) reports the results for book leverage, and column (7) reports results for investment activities.¹⁴ The coefficients of the interaction term ($PostDF \times Treated$) show that low-rated firms decrease their net external financing and net investment significantly after the regulatory shock to CRAs. Low-rated firms decrease their net debt issues by 2.2 percentage points, net long-term debt issues by 2.4 percentage points, and total net security issues by 2.8 percentage points after the enactment of Dodd-Frank. Similarly, they reduce net investments by 2.7 percentage points. The magnitude of the reduction in net investments is almost identical to that of net security issuance, both measured as a percentage of total assets. The decline in total net security issues (net investments) represents an 85% (24%) reduction for low-rated firms after the shock compared to their unconditional pre-shock averages.¹⁵ Therefore, the economic significance of this policy shock is substantial for low-rated firms. The effect on net equity issuance is negative but small and statistically insignificant. So, as hypothesized, these firms did not substitute debt issue with equity. Accordingly, it seems that the treated firms reduce net security issues, mostly debt, and net investment almost in the same ratio. Book leverage also remains largely unchanged plausibly because assets decrease by about the same rate as debt. These findings are consistent with Lemmon and Roberts' (2010) findings.

¹⁴ In Appendix Table A.3, we show that there is no pre-trend in our main dependent variables of interest, i.e., the treatment and control groups do not show any statistically significant difference in the trend of debt or equity issuance or investments before the passage of Dodd-Frank. So, any difference after Dodd-Frank can be plausibly interpreted as a causal effect of Dodd-Frank.

¹⁵ For low-rated firms, the mean of net security issues before Dodd-Frank in Table 2 is 3.3% of total assets. The reduction of 2.8 percentage points represents an 85% decrease. Similarly, the reduction in new debt issues is 85%, that in new LTD issues is 86% and that in net investment is 24% compared to their respective pre-Dodd-Frank means.

Control variables such as firm size, market-to-book equity, z-score, age, operating income, tangibility, and cash holdings appear to be important in determining firms financing and investment policies because they are highly significant in most of the regressions. The financial crisis seems to have a negative impact on security issue and investment in general. Moreover, the interaction *Treatment*Crisis* also obtains significant coefficients in three regressions, suggesting that it is important to control for the asymmetric effect of the crisis in the financing and investing activities of these two groups of firms to cleanly identify the effect of Dodd-Frank.

Overall, our baseline results from the full sample analysis are consistent with our hypotheses that in response to higher regulatory costs imposed on CRAs by Dodd-Frank, which incentivized CRAs to issue lower ratings, low-rated firms curtail their debt financing. Moreover, because these firms are not able to switch to feasible equity financing, they also cut their investments.

5.2. Alternative treated and control groups

As discussed in section 2, prior theoretical and empirical findings guide our decision to consider low-rated and unrated firms as treatment and control groups, respectively. In this section, we consider a few alternative analyses.

Our discussion in section 2 about the non-uniform effect of credit rating risks on investment grade vs. low-rated firms points to the possibility that investment grade firms may also serve as a potential control group. Accordingly, we experiment with analyses in which investment-grade firms serve as the control group and low-rated firms as the treatment group. We drop unrated firms from the sample and apply all the data requirements and additional criteria as before. We present the results in Appendix Table A.4. We find that many of the results are similar to, and sometimes even stronger than, those from our main analysis. After Dodd-Frank, low-rated firms issue less debt, raise less total capital, and invest less compared to investment grade firms. An important difference is that low-rated firms also issue less equity compared to investment grade firms. As a result, the difference in total security issuance is much larger

compared to that found from the main analysis. While most results are similar to those of the main analysis as expected, the significant difference in equity issuance indicates that the results may also be driven by other differences in firm quality, rather than only by the differences in credit rating risks. Therefore, we follow previous studies on credit ratings (Lemmon and Roberts (2010)) and continue our analysis in which unrated firms serve as the control group.

Because provisions of Dodd-Frank to CRAs were not confined to the ratings of low-rated firms, we also experiment with investment grade firms as an alternative treatment group and unrated firms as the control group. However, for the reasons discussed in section 2, we do not expect investment grade firms to respond to credit rating downgrade shocks as strongly as their non-investment grade counterparts do. Appendix Table A.5 presents these analyses. We drop low-rated firms from the sample and apply all the data requirements and additional criteria as before. We find no effect of Dodd-Frank on the debt issuance decisions of investment grade firms compared to unrated firms. We find a positive effect on equity issuance and a rather surprising increase in book leverage among the investment grade firms compared to unrated firms. While we do not delve into these results further, they are quite different from the results using low-rated firms as the treatment group and are not consistent with the increased concern with credit ratings. These results support our argument that investment grade firms are not affected much by the threat of future rating downgrades compared to low-rated firms.

5.3. Propensity score matching

As seen in the summary tables, our treated and control firms are quite different in several firm characteristics and performance. Dodd-Frank followed the peak of the financial crisis characterized by a drastic negative shock to the supply of credit. Plausibly, firms' exposure to these systemic credit shocks depends on their existing credit ratings and other firm characteristics such as size and expected profitability. These possibilities add to the challenge of disentangling the effects of demand vs. supply channels that underlie our main results. We argue, with some consistent results, that Dodd-Frank increased low-rated firms' worry of credit rating downgrades and reduced these firms' *demand* for debt.

However, an alternative interpretation is that because of different exposure to credit shocks, the *supply* of credit to these firms dried up.

Our main models try to account for these differences by including several important control variables in the regressions. However, it is possible that these linear specifications may be inadequate to control for potential nonlinear effects. As another way to deal with this issue, we next employ a DiD strategy on a matched sample. This strategy largely follows Lemmon and Roberts (2010).

First, we ensure that the ‘parallel trend’ assumption is satisfied. For this study, parallel trend implies that in the absence of Dodd-Frank, there would be no difference in the growth of debt issuance and investments of the unrated and low-rated rated groups (i.e., DiD estimates would be zero). We employ a propensity score matching (PSM) strategy to comply with this assumption. Our matching procedure starts with a Probit model predicting the probability of having a low-rated rating before Dodd-Frank. We include all firm-level characteristics averaged over the pre-Dodd-Frank period (January 2005 – July 2010) and industry (three-digit SIC) fixed effects in this model. We also include net long-term debt issues growth, net equity issues growth, total net security issues growth, capital expenditure growth, and market leverage growth in the model. Finally, following Lemmon and Roberts (2010), we include indicator variables for S&P 500 and NYSE listing, which serve as instrumental variables for differentiating the financing and investment decisions of unrated and rated firms as identified by previous studies. We use the nearest neighborhood of predicted probabilities to obtain a sample of matched firms. We use a caliper of 0.05 and find one control firm for each treatment firm each year without replacement. This exercise obtains a matched sample of a total of 504 firm-year observations (149 unique control firms and 115 unique treated firms).

Panel A of Table 4 reports results for pairwise comparison of matching variables. The Pre-match columns report comparison or estimates on the entire subsample prior to the matching. The Post-match columns report comparison or estimates on the matched sample after the matching. Panel B reports

parameter estimates from the Probit model, in which the dependent variable equals 1 if the firm is low-rated and 0 if it is unrated.

Pairwise comparisons and Probit results show that our treated and control firms are significantly different in important characteristics before the matching. The pseudo R^2 of 39% with a corresponding p -value close to 0% indicates that our matching variables capture a significant variation in the probability of having a below-investment rating. Importantly, in the post-match sample, none of the variables are significantly different. The magnitudes of their differences (in Panel A) and the estimated coefficients (in Panel B) decline substantially after the matching. Similarly, the pseudo R^2 declines to close to 0% with a corresponding χ^2 p -value of 99%, indicating that the matching process results in treatment and control samples which are very similar in important observable firm characteristics before Dodd-Frank. So, any difference after Dodd-Frank can be plausibly interpreted as the causal effect of credit rating shock.

Next, we estimate DiD regressions on the PSM sample using similar specifications as before. Table 5 reports the results. We find that the results from the PSM sample are very similar to our results from the full sample. These results reveal that after the policy shock to CRAs by the enactment of Dodd-Frank, low-rated firms reduce net debt issues and net long-term debt issues by about 2.6 and 2.9 percentage points and net security issues by about 3.7 percentage points. These firms also reduce net investment by about 2.7 percentage points compared to the matched sample of unrated firms. Overall, our results suggest that credit rating shock has strong implications on the financing and investment policies of low-rated firms that are vulnerable to downgrade risks.

6. Channels: Demand or Supply?

We find so far that low-rated firms avoid borrowing after Dodd-Frank. This finding is consistent with our demand-side hypothesis that these firms avoid borrowing due to concerns about downgrades following Dodd-Frank. But they are also consistent with several supply-side stories. One possibility is

that Dodd-Frank forced CRAs to invest more on due diligence and produce more informative credit ratings, which accurately reveal the poorer credit quality of speculative-grade firms to the credit market. This revelation made it harder for these firms to raise debt capital. Moreover, Dodd-Frank and the preceding financial crisis affected many aspects of the financial system apart from CRAs. For instance, Dodd-Frank also introduced regulations on banks' asset holdings, mortgage lending, disclosure, governance, and securitization, which likely affect banks' ability and incentives to lend. Likewise, the financial crisis affected the liquidity and demand for corporate bonds, especially speculative-grade bonds (see, e.g., Chernenko and Sunderam (2012)). If our treated and control firms differ in their primary source of debt capital, our results may stem from the shocks to the supply of debt capital. Another possibility is that our treatment and control groups continue to be affected differentially by the financial crisis during the post-crisis years. We refer to these explanations collectively as 'supply-side' stories. In this section, we conduct several cross-sectional analyses, each of which examines one or more of these supply-side explanations. We thus dig deeper to investigate whether the observed reduction in debt issuance by our treatment firms primarily comes from these firms' reluctance to issue debt due to worries about downgrades (i.e., a demand-side effect) or from supply-side effects.

6.1. Firms near a rating change

In this section, we evaluate our main findings against an alternative supply-based hypothesis based on a 'better information' channel. This hypothesis postulates that Dodd-Frank's provisions encourage CRAs to work harder and assign more accurate ratings that are more informative of the rated firms' underlying credit quality. And conceivably, low-rated firms may turn out to be of poorer credit quality than revealed by their prior credit ratings. Therefore, a more accurate revelation of their poorer credit quality makes the market more reluctant to lend to them. DPT find that the quality of credit ratings did not improve after Dodd-Frank; in fact, it became worse. This finding makes the 'better information' channel less plausible. In addition, we conduct the following test to evaluate this hypothesis.

We follow Kisgen (2006)'s approach for separating the effect of credit *rating* risk from credit *quality* risk. Kisgen identifies firms near credit rating upgrades [downgrades] as those with a plus [minus] modifier (POM) in their ratings (e.g., B+ [B-]) and shows that such firms worry more about further rating downgrades than firms without such a modifier (e.g., B). One reason for this behavior is that regulators usually do not differentiate between notches within a broad rating category (e.g., BB+ vs. BB vs. BB-), but differentiate across broad ratings such as A- vs. BBB+ and BB- vs. B+. Moreover, because the market tends to pool together firms of similar credit ratings, a firm at the higher end of a slightly lower rating (say, B+) likely faces a substantially higher cost of debt than a firm at the lower end of a slightly higher rating (say, BB-), even if the credit quality of the former may only be marginally worse than that of the latter. Kisgen (2006) argues that firms with POM ratings have greater incentives to protect their existing ratings than firms with non-POM ratings.¹⁶ Accordingly, he finds that the former group of firms issue less debt than the latter, even though the two groups should have similar underlying credit quality, on average.¹⁷ We examine one implication of these POM tests for our study. If we find that the sub-group of our treatment firms with POM ratings reduces debt issuances after Dodd-Frank more than the rest of the treatment group, that will support the credit rating risk channel. On the other hand, if there is no difference in debt issuances between these two sub-groups, that will favor the information hypothesis.

¹⁶ For a firm with a minus modifier, a one-notch downgrade brings them down to a lower broad rating category (e.g. B- to CCC+). For a firm with a plus modifier, a notch downgrade substantially decreases their opportunity for a rating upgrade to the next broad category (e.g. from CCC+ to B-). On the other hand, firms with unsigned credit ratings (e.g. B) are likely less concerned about each of these possibilities.

¹⁷ Consider, e.g., two groups of four firms each. In the first group, all four firms have unsigned BB ratings, while the second group has two firms with BB+ and the other two with BB- ratings. Both groups have average rating of BB.

Accordingly, we redo our main tests by dividing our treated firms into two groups: firms near broad rating upgrades or downgrades (i.e., firms with plus or minus rating: *Treated_POM*) and firms not near a rating change (*Treated_Other*). Table 6 reports the results from our analyses of the full sample in Panel A and the PSM sample in Panel B. Both panels show that within the group of low-rated firms, while the sub-group of firms with POM ratings significantly reduces net debt issues and net investments in response to Dodd-Frank, the magnitude of debt reduction by non-POM firms is much smaller and statistically insignificant.¹⁸ The non-POM treatment firms also end up with less total security issuance and less investment, but these appear to be driven by less equity issuance compared to the POM group.¹⁹

To summarize, while the inherent credit qualities of absolute rated firms (say, BB) are, on average, unlikely to be different from that of a group consisting of both plus or minus ratings (BB+ and BB-), the latter are likely much more worried about downgrades (or missing the chance of significant upgrades). In other words, POM rating should matter for firms' willingness to borrow more (demand side), but not for creditors' willingness to lend (supply side). Therefore, these results are consistent with our demand-side hypothesis that worries about future downgrades are the main cause of the observed changes in low-rated firms' financing and investment policies after Dodd-Frank.

6.2. Demand for debt capital

We expect credit rating risks to affect treatment firms with higher demand for debt capital more than those with lower demand. To test this conjecture, we divide our sample firms into firms with higher and lower leverage, based on their average book leverage in the pre-Dodd-Frank period (January 2005 to June

¹⁸ Although, we do not find strong evidence that these two coefficients are statistically different, they are always substantially different in economic magnitude in our hypothesized directions.

¹⁹ The net equity issuance is insignificant for both groups, but the magnitudes are quite different between the groups: -0.001 vs. -0.017 in the full sample, and -0.006 vs. -0.020 in the matched sample.

2010). We define high leverage firms with an indicator variable that equals 1 if the firm has above-median book leverage in the year 2009, and 0 otherwise. We define low leverage firms similarly.

Columns 1 and 2 of Table 7 report the results from our analyses of the full sample in Panel A and the PSM sample in Panel B. For brevity, we only show the regressions of net debt issue and net investments, but the results are similar for net LTD issues and net security issues. The results show that treatment firms with higher demand for debt capital before Dodd-Frank experience a sharper decrease in both debt financing and investment after Dodd-Frank. On the other hand, treated firms which exhibit lower demand for debt capital remain mostly unaffected.²⁰ These results help us establish a stronger link between firms' need for debt financing and their response to the shock to rating downgrade risks, and further alleviate the concern that this response was due to the revelation of poorer firm quality.

In another test, we redo the analyses in Table 7 by keeping only firms rated BB+ to B- in the treated sample (i.e., excluding firms rated CCC+ and below) to address the possibility that our results might have been influenced by the poorer credit quality of the firms rated CCC+ or lower. As reported in Appendix Table A.6, our results do not change.

One concern with our previous test strategy is that debt reduction by firms with higher existing leverage may simply reflect mean-reversion. So we next examine firms' demand for debt predicted by their institutional ownership levels. This analysis is motivated by a recent paper by Grennan, Michaely, and Vincent (2017), who find that firms with higher institutional ownership are less dependent on debt

²⁰ Because ratings are more important for public debt than for private debt, we repeat this analysis based on the demand for public debt instead of total debt. We divide our treatment sample into two subgroups with high and low demand for public debt based on the ratio of public debt outstanding to total assets. The results are qualitatively similar, so we do not tabulate them for brevity.

because institutional ownership substitutes for the disciplinary benefits of debt.²¹ Moreover, institutional investors may serve as an alternative source of financing. In particular, institutional investors likely monitor firms closely (see, e.g., Appel, Gormley, and Keim (2016)), so they may not rely as much on credit ratings to lend to these firms. One benefit of this approach is that institutional ownership is less endogenous than existing leverage because the former is chosen by outside actors, while the latter is chosen internally by the firm (see, e.g., Agrawal and Knoeber (1996)).

Accordingly, we divide our sample firms into higher and lower institutional ownership based on the median institutional ownership ratio of our sample firms. High (low) ownership is an indicator variable that equals 1 if the firm's institutional ownership ratio is greater (less) than the sample median, and 0 otherwise. Columns 3 and 4 of Table 7 present the results. In both the full sample and the matched sample analyses, we find that treated firms with higher institutional ownership do not significantly change debt issuance in response to the threat of rating downgrades. But treated firms with lower institutional ownership significantly cut back debt and investment in response to the shock.²² These results are consistent with the notion that institutional owners make firms less dependent on credit ratings to issue debt capital. Consequently, they are less vulnerable to credit rating risk.

6.3 Liquidity shocks to the junk bond market

We next examine whether the risk of being downgraded is made worse by negative liquidity shocks to the junk bond market. We follow Chernenko and Sunderam (2012) and Cardella, Fairhurst and Klasa (2018) and measure these shocks by the flow of funds to high-yield bond mutual funds. We use this test to further distinguish between demand-side and supply-side explanations of our finding that junk-rated firms substantially cut down debt financing after the adoption of the Dodd-Frank Act. The demand-

²¹ Prior studies find that institutional ownership serves as a powerful governance mechanism (see, e.g., Ferreira and Matos (2008); Brav, Jiang and Kim (2015); and Appel, Gormley and Keim (2016)).

²² The differences between the two interaction terms are statistically significant in the PSM sample.

side story says that these firms reduce their demand for debt issues after DFA because of concerns about further rating downgrades. If so, a negative liquidity shock to the junk bond market should be immaterial to them. On the other hand, the supply-side story says that the reduction in their debt issues is due to lenders being unwilling to lend them due to concerns about their credit quality. If so, a negative liquidity shock to this market should affect these firms more.

We obtain annual data on net flows into high-yield bond mutual funds over our sample period directly from Investment Company Institute, the trade group of the mutual fund industry. We measure a negative liquidity shock to the junk bond market (*IlliqShock*) by a dummy variable for the years with negative net flows to junk bond mutual funds. Next, we estimate regressions similar to those in Table 3 after adding a triple interaction term $PostDF*Treated*IlliqShock$ and its related interactions and main effects. The supply-side story implies that the coefficient of the triple interaction term should be negative (i.e., the coefficient of $PostDF*Treated$ should become more negative during years of negative liquidity shocks to the junk bond market), while the demand-side story implies that it should be non-negative. As shown in columns 1 and 2 of Table 8, the coefficient of this term is statistically zero in predicting both net debt issuance and net investments. These results cast further doubt on the supply-side explanation of our findings.

6.4 Persistent effect of the financial crisis and industry effects

To investigate the possibility that unrated and low-rated firms were affected differently by the crisis, we include the interaction of the indicator variable for a treated firm with the years indicating the peak of the recent financial crisis (years 2008 and 2009) in our main specification. However, this approach does not address the possibility that our treatment and control groups continue to be affected differentially by the financial crisis during the post-crisis years. To address this possibility, we follow Fahlenbrach, Prilmeier, and Stulz (2012, hereafter FPS) and calculate each firm's stock return during the recent financial crisis from July 2007 through December 2008 (*CrisisRet_07_08*) as a proxy of a firm's exposure

to financial crises. *CrisisRet_07_08* varies across firms but remains the same within a firm. FPS make a persuasive case that these ‘crisis returns’ substantially capture a firm’s persistent exposure to financial crises because they are highly correlated within a firm across different crisis periods.²³ Intuitively, in our context, a firm’s *CrisisRet_07_08* captures the market’s expectations about the cumulative effects of various aspects of the financial crisis, e.g. financing constraints, on the firm’s future policies and performance. Notably, *CrisisRet_07_08* potentially incorporates the effects of the crisis even from sources unobservable to a researcher, and it predates discussions about Dodd-Frank. A firm with a worse crisis return is likely more exposed to the adverse effects of the crisis, and this exposure likely lingers for several years.

We add the interaction of *CrisisRet_07_08* with *PostDF* in columns 3 and 4 of Table 8 to examine the possibility that our results are driven by persistent and differential exposures of unrated and low-rated firms to the effects of the crisis. For instance, if low-rated firms are more exposed to the lingering effects of the financial crisis than the unrated group, then $PostDF \times CrisisRet0708$ should subsume the observed effect of $PostDF \times Treated$. In these regressions, we also control for industry-level (defined by 3-digit SIC codes) median debt issuance, leverage and performance (ROA) to address the concern that the financial crisis may have affected a subset of industries and industry-affiliation may be correlated with credit ratings.

This exercise results in substantial loss of data because *CrisisRet_07_08* is undefined for firms that are not in the sample from July 2007 through December 2008. Despite that, we have two main results. First, there is no significant difference in both the mean and median *CrisisRet_07_08* between our

²³ FPS focus on banks, but they also find similar results with non-financial institutions (see, e.g., their Table VI).

treatment and control groups.²⁴ Second, and more importantly, the inclusion of $PostDF \times CrisisRet_{07_08}$ and industry-level performance, leverage, and debt issuance variables leave the coefficient of $PostDF \times Treated$ largely intact. These results provide further assurance that our observed treatment effect is not driven by these two groups' differential exposure to any lingering effects of the financial crisis.

6.5 Debt structure

Another possible explanation of our main results stems from the fact that Dodd-Frank introduces several regulations on bank lending and asset holding practices that affect banks' ability to lend. So the law may influence debt financing through its impact on the banking industry if the treated firms are more reliant on banks to provide capital. In this section, we analyze how Dodd-Frank affected treatment firms' debt structure, i.e., their use of various sources of debt capital. For this analysis, we use the Capital IQ database, which annually reports the breakdown of firms' outstanding debt by the type of debt. We focus on public bonds (sum of all bonds and notes), and bank loans (sum of term loans and drawn lines of credit). We calculate the annual changes in each type of debt from Capital IQ and scale the dollar changes by lagged total assets to construct our dependent variables analogous to our main debt issuance variables. We merge our debt structure dataset to the annual Compustat database. Because the data frequency in Capital IQ does not match that in Compustat, we exclude the firm-years in which the sum of all types of debt in Capital IQ exceeds total assets in Compustat, which are very likely cases of mistakes. We also require that the sum of all debt types in Capital IQ database must be non-missing at least once in the pre-Dodd-Frank period. Since many Compustat firms are not covered in Capital IQ, sample sizes drop considerably.

²⁴ The mean (median) of $CrisisRet_{07_08}$ for the unrated group is -16% (-27%) and for the low-rated group is -18% (-23%). In contrast, for investment-grade firms, the mean (median) value of this variable is 2% (0%).

Table 9 reports the results from regressions of each type of debt in a framework similar to that of Table 3, Panel A. We find that compared to unrated firms, low-rated firms significantly reduce their use of debt from both public (bonds) and private (term loan) sources by about 3.2 and 3.5 percentage points, respectively, after the credit rating shock. There is no effect in the difference in the drawn revolving credit line. Next, we examine the possibility that this relation is driven by firms' dependence on bank capital. First, using data obtained from Capital IQ database, we find that our treatment firms are, in fact, less reliant on bank capital.²⁵ The average bank debt (including term loans and drawn and committed credit lines) to total debt ratio for treatment firms before Dodd-Frank (*Pre-Bank dependence*) is 0.51, while this ratio for the control firms is 0.75. Moreover, as shown in columns 4 to 6, our results remain virtually unchanged if we add an interaction of *Pre-Bank dependence* with PostDF along with industry median of debt issuance, leverage, and performance.

Bonds and bank loans are two major sources of debt capital, so these results support our previous findings of the reduction of total debt issuance by treatment firms. Moreover, these results further bolster our demand-based credit-rating risk hypothesis over the supply-based information hypothesis. Because credit ratings are more important for public bond markets than for banks, the supply-based hypothesis would predict a decrease in debt issuance only from the bond market.

7. Conclusion

We discover an unintended spillover effect of Dodd-Frank's regulations on CRAs that incentivize them to issue lower credit ratings, and, in turn, affect the fates of firms vulnerable to the risk of rating downgrades. We build on DPT's (2015) findings that greater regulatory costs imposed by Dodd-Frank on CRAs incentivized them to issue lower credit ratings, possibly below the levels justified by the

²⁵ Sample sizes drop considerably in these tests because many Compustat firms are not in Capital IQ.

underlying credit quality of the rated firms. Prior studies find that low-rated firms face much steeper costs of rating downgrades, which suggests that they are likely to respond more strongly to Dodd-Frank to prevent downgrades. Consistent with this conjecture, we find that increased risk of being downgraded due to Dodd-Frank's rules forced low-rated firms to cut back on debt issuance to protect their existing ratings. The reduction in debt issuance is not offset by an increase in equity issues, forcing these firms to cut back on net investment. The economic magnitudes of these effects are quite large. Based on the full sample, the decline in total net security issues (net investments) represents an 85% (24%) reduction for low-rated firms after the shock compared to their unconditional pre-shock averages.

A battery of additional tests helps rule out several alternative supply-side explanations of our results. One explanation is that Dodd-Frank led to CRAs producing more informative credit ratings, which revealed these firms' poorer credit quality and led to the drying up of their supply of debt capital. Another explanation is that Dodd-Frank and the preceding financial crisis affected many aspects of the financial system apart from CRAs, which likely affect banks' ability and incentives to lend. Likewise, the financial crisis affected the liquidity and demand for corporate bonds, especially junk bonds. If our treated and control firms differ in their primary source of debt capital, our results may stem from the shocks to the supply of debt capital. Another possibility is that our treatment and control groups continue to be affected differentially by the financial crisis during the post-crisis years. Our extensive cross-sectional analyses do not provide much support to these supply-side stories. Instead, our results are consistent with Kisgen's (2006) credit-rating capital structure theory that increased risk of downgrades led to a decrease in these firms' demand for debt, regardless of their underlying credit quality.

We show that Dodd-Frank's efforts to make credit ratings more informative by putting pressure on CRAs negatively affected a broader range of firms that became vulnerable to rating downgrades. Our results point to another episode of unintended consequences of regulatory changes, even for entities not directly targeted by the regulation.

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Table 1: Summary statistics

The table presents descriptive statistics for the full sample, including unrated, below-investment grade, and investment grade firms from the annual Compustat database for the period 2005-2015. The firms are grouped by their credit ratings from S&P, Moody's, and Fitch. Investment grade firms consist of all the firms rated AAA to BBB- (or equivalent), and low-rated firms consist of all the firms with BB+ (or equivalent) and lower credit ratings. Unrated firms consist of the rest of the firms in the sample, which do not have any credit rating during the sample period. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables.

Variable	Unrated firms					Below-investment grade firms					Investment grade firms				
	Mean	Std. Dev.	25%	50%	75%	Mean	Std. Dev.	25%	50%	75%	Mean	Std. Dev.	25%	50%	75%
Net Debt Issues	0.02	0.09	-0.01	0.00	0.01	0.03	0.13	-0.03	0.00	0.05	0.02	0.08	-0.01	0.00	0.04
Net LTD Issues	0.01	0.09	-0.01	0.00	0.00	0.03	0.13	-0.03	0.00	0.05	0.02	0.08	-0.01	0.00	0.04
Net STD Issues	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Net Equity Issues	0.03	0.14	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	-0.03	0.05	-0.05	-0.01	0.00
Total Net Security Issues	0.05	0.17	-0.03	0.00	0.05	0.03	0.14	-0.04	0.00	0.06	-0.01	0.09	-0.05	-0.02	-0.01
Market Leverage	0.14	0.20	0.00	0.05	0.21	0.39	0.23	0.21	0.36	0.56	0.20	0.14	0.10	0.17	0.26
Book Leverage	0.15	0.24	0.00	0.07	0.22	0.39	0.21	0.25	0.37	0.50	0.24	0.13	0.15	0.23	0.32
Net Investment	0.08	0.12	0.14	0.04	0.10	0.11	0.14	0.03	0.06	0.13	0.09	0.10	0.03	0.06	0.11
Acquisitions	0.03	0.08	0.00	0.00	0.01	0.04	0.11	0.00	0.00	0.02	0.04	0.08	0.00	0.00	0.03
Firm Size	4.74	1.94	3.43	4.81	6.07	7.20	1.07	6.46	7.16	7.85	8.73	1.07	7.85	8.68	9.53
MtoB	1.67	1.40	0.79	1.22	2.02	1.20	0.70	0.77	1.03	1.41	1.58	0.98	0.94	1.32	1.97
Zscore	0.11	4.91	-0.07	1.48	2.49	1.36	1.40	0.77	1.36	2.08	2.08	0.97	1.46	1.98	2.59
Firm Age	18	11.38	10	15	22	22	14.84	11	17	26	32	18.26	16	27	49
Operating Income	0.04	0.24	0.01	0.09	0.16	0.12	0.13	0.08	0.12	0.16	0.16	0.08	0.11	0.15	0.19
Tangibility	0.22	0.22	0.06	0.14	0.31	0.33	0.25	0.12	0.26	0.49	0.28	0.21	0.11	0.22	0.39
Cash	0.18	0.17	0.05	0.13	0.25	0.09	0.08	0.02	0.06	0.12	0.09	0.08	0.04	0.07	0.13
S&P 500	0.02	0.13	0.00	0.00	0.00	0.06	0.25	0.00	0.00	0.00	0.49	0.50	0.00	0.00	1.00
NYSE	0.10	0.35	0.00	0.00	0.00	0.54	0.50	0.00	1.00	1.00	0.75	0.43	0.00	1.00	1.00
No. of obs.	14,637					2,202					1,622				

Table 2: Univariate analyses

The table presents mean differences in financing, investment, and other characteristics between unrated and below-investment grade firms before and after the passage of Dodd-Frank. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after Dodd-Frank. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. *** denotes statistical significance at the 1% level in two-tailed tests.

	Before Dodd-Frank				After Dodd-Frank			
	Below-investment	Unrated	Difference	<i>t</i> -statistics	Below-investment	Unrated	Difference	<i>t</i> -statistics
	(1)	(2)	(1) – (2)		(3)	(4)	(3) – (4)	
Net Debt Issues	0.026	0.009	0.017***	4.15	0.019	0.014	0.006	1.49
Net LTD Issues	0.028	0.009	0.019***	4.84	0.018	0.013	0.006	1.61
Net STD Issues	-0.002	0.000	-0.002	-1.91	0.001	0.001	0.000	0.32
Net Equity Issues	0.007	0.027	-0.020***	-3.1	-0.006	0.022	-0.028***	-5.46
Total Net Security Issues	0.033	0.036	-0.002	-0.32	0.013	0.036	-0.023***	-3.51
Market Leverage	0.405	0.127	0.278***	31.09	0.424	0.131	0.292***	35.69
Book Leverage	0.394	0.131	0.263***	29.08	0.414	0.133	0.282***	31.27
Net Investment	0.113	0.079	0.034***	6.06	0.089	0.073	0.016***	3.47
Firm Size	7.30	4.625	2.675***	32.2	7.44	4.788	2.653***	33.97
MtoB	1.136	1.678	-0.542***	-8.83	1.128	1.608	-0.480***	-8.69
Zscore	1.519	0.533	0.986***	5.14	1.395	0.127	1.268***	6.21
Operating Income	0.123	0.06	0.062***	6.71	0.118	0.062	0.057***	6.81
Tangibility	0.345	0.219	0.126***	12.53	0.344	0.216	0.128***	14.09
Cash	0.084	0.176	-0.091***	-12.28	0.091	0.187	-0.096***	-14.13
Total obs.	5,645				5,950			

Table 3: Dodd-Frank and firm policies: Results from the full sample

The table reports our baseline regression results. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after Dodd-Frank. The dependent variables are Net Debt Issues, Net LTD Issues, Net STD Issues, Net Equity Issues, Net Security Issues, Book Leverage, and Net Investments. PostDF is an indicator variable that equals 1 if the fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is unrated. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

VARIABLES	(1) Net Debt Issues	(2) Net LTD Issues	(3) Net STD Issues	(4) Net Equity Issue	(5) Total Net Security Issues	(6) Book Leverage	(7) Net Investment
PostDF	0.006* (0.003)	0.003 (0.003)	0.003*** (0.001)	-0.000 (0.005)	0.006 (0.006)	-0.007 (0.005)	0.005 (0.004)
PostDF × Treated	-0.022** (0.011)	-0.024** (0.011)	0.002 (0.001)	-0.006 (0.007)	-0.028** (0.011)	0.012 (0.014)	-0.027** (0.011)
Firm Size	0.006 (0.004)	0.005 (0.004)	0.000 (0.001)	-0.020*** (0.006)	-0.014* (0.008)	0.022*** (0.006)	0.008 (0.005)
MtoB	0.002 (0.001)	0.002 (0.001)	-0.000 (0.000)	0.015*** (0.002)	0.016*** (0.003)	-0.007*** (0.002)	0.009*** (0.001)
Zscore	0.001 (0.001)	0.001* (0.001)	-0.000** (0.000)	0.003** (0.001)	0.004** (0.002)	-0.011*** (0.002)	0.001* (0.001)
Ln(Firm Age)	-0.015* (0.008)	-0.010 (0.008)	-0.005** (0.002)	-0.030** (0.014)	-0.045*** (0.017)	0.011 (0.015)	-0.051*** (0.013)
Operating Income	-0.064*** (0.014)	-0.057*** (0.013)	-0.007** (0.003)	-0.063*** (0.021)	-0.127*** (0.027)	0.013 (0.026)	0.020* (0.011)
Tangibility	-0.023 (0.020)	-0.024 (0.020)	0.001 (0.004)	-0.068*** (0.025)	-0.091*** (0.034)	0.116*** (0.038)	0.066** (0.027)
Cash	-0.009 (0.012)	-0.001 (0.012)	-0.008*** (0.002)	0.149*** (0.023)	0.141*** (0.025)	-0.104*** (0.016)	-0.149*** (0.014)
S&P 500	0.015 (0.015)	0.014 (0.014)	0.001 (0.002)	-0.023** (0.010)	-0.008 (0.018)	-0.039** (0.016)	-0.008 (0.019)
Treated × Crisis	-0.019 (0.012)	-0.019 (0.012)	0.001 (0.002)	0.021*** (0.007)	0.002 (0.013)	0.021 (0.013)	-0.025** (0.012)
Crisis	-0.005** (0.003)	-0.006** (0.003)	0.001 (0.001)	-0.015*** (0.004)	-0.021*** (0.005)	0.004 (0.003)	-0.010*** (0.003)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,308	11,308	11,308	11,308	11,308	11,277	11,308
Adjusted R ²	0.063	0.065	0.010	0.347	0.299	0.777	0.260

Table 4: Propensity score matching (PSM) diagnostics

The table reports results from univariate analysis (Panel A) and Probit model (Panel B) before and after matching the treated and control firms. Matching is based on the variable averages over the pre-Dodd-Frank period (January 2005 - July 2010). Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in Section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after Dodd-Frank. Panel A of Table 4 reports results from pairwise comparisons of the variables on which matching is performed, except for the industry (three-digit SIC) indicator. Panel B reports parameter estimates from the Probit model. The dependent variable equals 1 if the firm is below-investment grade and zero if it is unrated. The Pre-Match column reports comparisons or estimates on the entire subsample prior to matching. The Post-Match column reports comparisons or estimates on only the matched subsample after matching. Matching is performed using a Probit model on treated and control firms falling in the common support of the estimated propensity scores with a caliper of 0.05. Robust standard errors, clustered at the industry (3-digit SIC) level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A: Pairwise comparison

	<u>Pre-match</u>				<u>Post-match</u>			
	Below-investment (1)	Unrated (2)	Difference (3) = (1) - (2)	t-statistics (4)	Below-investment (1)	Unrated (2)	Difference (3) = (1) - (2)	t-statistics (4)
Net LTD Issue Growth	-1.793	-4.539	2.746	0.28	-1.414	-0.683	-0.731	-0.21
Net Equity Issue Growth	4.573	31.129	-26.556	-0.33	5.329	31.528	-26.199	-1.04
Total Net Security Issue Growth	-2.401	0.773	-3.174	-0.39	-1.725	-1.510	-0.216	-0.14
Market Leverage Growth	0.109	6.703	-6.594	-0.89	0.064	0.044	0.021	0.35
Firm Size	7.300	4.648	2.653	32.94***	7.095	7.162	-0.067	-0.81
MtoB	1.136	1.678	-0.542	-8.83***	1.160	1.178	-0.018	-0.31
Zscore	1.519	0.533	0.986	5.14***	1.534	1.537	-0.003	-0.01
Ln(Firm Age)	2.909	2.752	0.156	5.68***	2.916	2.916	0.000	0.01
Operating Income	0.123	0.060	0.062	6.71***	0.125	0.127	-0.002	-0.22
Cash	0.084	0.176	-0.091	12.28***	0.089	0.096	-0.007	-0.89
S&P 500	0.099	0.017	0.082	11.59***	0.063	0.071	-0.008	-0.35
NYSE	0.585	0.137	0.448	26.68***	0.532	0.524	0.008	0.18
Total obs.	5645				504			

Table 4 (cont.)**Panel B: Probit regression results**

VARIABLES	(1) Pre-match	(2) Post-match
Net LTD Issues growth	-0.000 (0.000)	-0.000 (0.001)
Net Equity Issue growth	-0.000 (0.000)	-0.000 (0.001)
Total Net Security Issues growth	-0.003** (0.001)	0.000 (0.003)
CAPEX growth	-0.046 (0.054)	0.024 (0.075)
Market Leverage growth	-0.073** (0.032)	0.008 (0.043)
Firm Size	0.685*** (0.059)	-0.059 (0.102)
MtoB	-0.315*** (0.101)	-0.046 (0.134)
Zscore	-0.150*** (0.025)	0.016 (0.030)
Ln(Firm Age)	-0.120 (0.135)	0.087 (0.157)
Operating Income	1.317* (0.730)	0.082 (0.979)
Cash	-1.491** (0.745)	-0.233 (0.905)
S&P 500	0.208 (0.315)	-0.022 (0.358)
NYSE	0.418*** (0.154)	-0.014 (0.176)
Constant	-4.570*** (0.547)	0.215 (0.814)
Industry (three-digit SIC) FE	Yes	Yes
Treated (unique firms)	171	115
Control (unique firms)	1,566	149
No. of obs.	2,177	504
Pseudo R ²	0.39	0.00
χ^2 p-value	0.00	0.99

Table 5: Results from the PSM sample

The table reports regression results from the propensity score-matched sample. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after the Dodd-Frank Act. The dependent variables are Net Debt Issues, Net LTD Issues, Net STD Issues, Net Equity Issues, Net Security Issues, Book Leverage, and Net Investments. PostDF is an indicator variable that equals 1 if the fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is unrated. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

VARIABLES	(1) Net Debt Issues	(2) Net LTD Issues	(3) Net STD Issues	(4) Net Equity Issue	(5) Total Net Security Issues	(6) Book Leverage	(7) Net Investment
PostDF	0.009 (0.009)	0.008 (0.009)	0.002 (0.002)	-0.006 (0.007)	0.004 (0.009)	0.023 (0.015)	0.001 (0.009)
PostDF × Treated	-0.026* (0.014)	-0.029** (0.014)	0.003 (0.002)	-0.011 (0.008)	-0.037** (0.014)	-0.012 (0.019)	-0.027* (0.014)
Treated × Crisis	-0.014 (0.015)	-0.015 (0.015)	0.001 (0.003)	-0.001 (0.008)	-0.015 (0.015)	0.008 (0.016)	-0.020 (0.015)
Crisis	-0.005 (0.008)	-0.006 (0.008)	0.001 (0.002)	-0.005 (0.005)	-0.010 (0.008)	0.016* (0.010)	-0.009 (0.009)
Firm Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,947	1,947	1,947	1,947	1,947	1,943	1,947
Adjusted R ²	0.023	0.027	-0.041	0.225	0.146	0.834	0.266

Table 6: Firms near a rating change (POM ratings)

The table reports regression results for firms near a rating change. Panel A presents results for the full sample and Panel B reports results for the PSM sample. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after the Dodd-Frank Act. The dependent variables are Net Debt Issues, Net LTD Issues, Net STD Issues, Net Equity Issues, Net Security Issues, Book Leverage, and Net Investments. PostDF is an indicator variable that equals 1 if the fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is unrated. POM is an indicator variable that equals 1 if the firm has ‘Plus’ or ‘Minus’ sign in its rating and 0 otherwise. Other is an indicator variable that equals 1 if the firm is unrated or has no ‘Plus’ or ‘Minus’ sign in its rating and 0 otherwise. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A: Full Sample

VARIABLES	(1) Net Debt Issues	(2) Net LTD issues	(3) Net STD Issues	(4) Net Equity Issue	(5) Total Net Security Issues	(6) Book Leverage	(7) Net Investment
PostDF	0.006* (0.003)	0.003 (0.003)	0.003*** (0.001)	-0.000 (0.005)	0.006 (0.006)	-0.007 (0.005)	0.005 (0.004)
POM	0.005 (0.017)	0.009 (0.017)	-0.004 (0.003)	-0.021* (0.012)	-0.016 (0.018)	0.054** (0.023)	-0.005 (0.020)
PostDF × Treated_POM	-0.026* (0.014)	-0.029** (0.014)	0.003** (0.002)	-0.001 (0.007)	-0.026* (0.015)	-0.008 (0.017)	-0.027** (0.013)
PostDF × Treated_Other	-0.015 (0.014)	-0.015 (0.014)	-0.000 (0.003)	-0.017 (0.012)	-0.032** (0.016)	0.052** (0.021)	-0.026 (0.019)
Treated_POM × Crisis	-0.026 (0.016)	-0.028* (0.016)	0.002 (0.002)	0.026*** (0.008)	0.000 (0.017)	0.005 (0.015)	-0.028* (0.015)
Treated_Other × Crisis	-0.005 (0.019)	-0.003 (0.019)	-0.003 (0.004)	0.010 (0.013)	0.004 (0.018)	0.054*** (0.021)	-0.020 (0.020)
Crisis	-0.005** (0.003)	-0.006** (0.003)	0.001 (0.001)	-0.015*** (0.004)	-0.021*** (0.005)	0.004 (0.003)	-0.010*** (0.003)
Firm Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,308	11,308	11,308	11,308	11,308	11,277	11,308
Adjusted R ²	0.063	0.065	0.010	0.347	0.299	0.777	0.260
Test: PostDF × Treated_POM – PostDF × Treated_Other = 0							
<i>F-Statistic</i>	0.27	0.45	0.96	1.46	0.07	5.51**	0.00

Panel B: PSM Sample

VARIABLES	(1) Net Debt Issues	(2) Net LTD Issues	(3) Net STD Issues	(4) Net Equity Issue	(5) Total Net Security Issues	(6) Book Leverage	(7) Net Investment
PostDF	0.010 (0.009)	0.008 (0.009)	0.002 (0.002)	-0.006 (0.007)	0.004 (0.009)	0.023 (0.014)	0.001 (0.009)
POM	0.012 (0.019)	0.017 (0.019)	-0.005 (0.004)	-0.016 (0.014)	-0.004 (0.021)	0.067** (0.026)	0.002 (0.021)
PostDF × Treated_POM	-0.032* (0.018)	-0.036** (0.017)	0.004 (0.002)	-0.006 (0.009)	-0.038** (0.018)	-0.032 (0.022)	-0.029* (0.016)
PostDF × Treated_Other	-0.015 (0.017)	-0.015 (0.017)	0.001 (0.004)	-0.020 (0.014)	-0.035* (0.020)	0.031 (0.025)	-0.024 (0.022)
Treated_POM × Crisis	-0.027 (0.020)	-0.030 (0.020)	0.003 (0.003)	0.006 (0.009)	-0.021 (0.020)	-0.013 (0.018)	-0.026 (0.018)
Treated_Other × Crisis	0.008 (0.021)	0.012 (0.021)	-0.004 (0.005)	-0.014 (0.014)	-0.006 (0.020)	0.053** (0.025)	-0.011 (0.022)
Crisis	-0.005 (0.008)	-0.006 (0.008)	0.001 (0.002)	-0.005 (0.005)	-0.010 (0.008)	0.016* (0.009)	-0.009 (0.009)
Firm Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,947	1,947	1,947	1,947	1,947	1,943	1,947
Adjusted R ²	0.023	0.027	-0.041	0.225	0.145	0.836	0.265
Test: PostDF × Treated_POM – PostDF × Treated_Other = 0							
<i>F-Statistic</i>	0.53	0.72	0.72	0.88	0.01	4.74**	0.03

Table 7: Variation based on demand for debt capital

The table reports regression results based on firms' demand for debt capital and institutional ownership. Panel A (B) presents results for the full (PSM) sample. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after the Dodd-Frank Act. The dependent variables are Net Debt Issues and Net Investments. PostDF is an indicator variable that equals 1 if fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is unrated. High Lev (Low Lev) is an indicator variable that equals 1 if the firm's average book leverage in the pre-Dodd-Frank period (January 2005 to June 2010) is greater (less) than the sample median, and equals 0 otherwise. High (Low) Inst is an indicator variable that equals 1, if the institutional ownership in the firm is greater (less) than the sample median, and equals 0 otherwise. Crisis is an indicator variable that equals 1 for the years 2008-2009, and equals 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A: Full Sample

VARIABLES	(1) Net Debt Issues	(2) Net Investment	(3) Net Debt Issues	(4) Net Investment
PostDF	0.006* (0.003)	0.005 (0.004)	0.006* (0.003)	0.005 (0.004)
PostDF×Treated×High Lev	-0.024** (0.011)	-0.028*** (0.011)		
PostDF×Treated×Low Lev	0.015 (0.014)	0.014 (0.020)		
PostDF×Treated×HighInst			-0.015 (0.012)	-0.022* (0.012)
PostDF×Treated×LowInst			-0.034*** (0.013)	-0.036*** (0.013)
High Inst			0.007 (0.005)	0.022*** (0.005)
Treated×Crisis	-0.019 (0.012)	-0.025** (0.012)	-0.019 (0.012)	-0.025** (0.012)
Crisis	-0.006** (0.003)	-0.010*** (0.003)	-0.006** (0.003)	-0.010*** (0.003)
Firm Level Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	11,308	11,308	11,308	11,308
Adjusted R ²	0.063	0.260	0.063	0.261
<i>F-Statistics (Diff in High vs. Low Interactions)</i>	6.53**	3.87**	2.26	1.30

Panel B: PSM Sample

VARIABLES	(1) Net Debt Issues	(7) Net Investment	(3) Net Debt Issues	(4) Net Investment
PostDF	0.005 (0.009)	-0.001 (0.009)	0.010 (0.009)	0.002 (0.009)
PostDF×Treated×High Lev	-0.028* (0.015)	-0.033** (0.015)		
PostDF×Treated×Low Lev	-0.001 (0.014)	-0.001 (0.016)		
PostDF×Treated×HighInst			-0.009 (0.015)	-0.002 (0.016)
PostDF×Treated×LowInst			-0.038** (0.015)	-0.044*** (0.015)
Treated×Crisis	-0.018 (0.015)	-0.022 (0.015)	-0.015 (0.015)	-0.021 (0.015)
Crisis	-0.008 (0.008)	-0.011 (0.009)	-0.005 (0.009)	-0.009 (0.002)
Firm Level Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	1,947	1,947	1,947	1,947
Adjusted R ²	0.074	0.271	0.026	0.270
<i>F-Statistics (Diff in High vs. Low Interactions)</i>	3.78*	4.20**	4.41**	9.45***

Table 8: Alternative supply-side channels: Liquidity shocks, financial crisis, and bank dependence

The table reports regression results based on the effect of the financial crisis and supply of debt capital after the crisis. All accounting, stock return, and credit rating variables are from Compustat and CRSP. Data on liquidity shocks to the junk bond market are from Investment Company Institute from 2005 to 2015. All firms meet the initial data requirements and the three criteria described in section 3.1. The dependent variables are Net Debt Issues and Net Investments. PostDF is an indicator variable that equals 1 if the fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is unrated. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

VARIABLES	(1) Net Debt Issues	(2) Net Investment	(3) Net Debt Issues	(4) Net Investment
PostDF	0.012*** (0.003)	0.009** (0.004)	0.001 (0.004)	-0.001 (0.006)
PostDF×Treated	-0.020* (0.011)	-0.028*** (0.011)	-0.021** (0.010)	-0.032*** (0.011)
PostDF×Treated×IlliqShock	-0.012 (0.015)	0.002 (0.016)		
PostDF× IlliqShock	0.001 (0.004)	0.001 (0.005)		
Treated× IlliqShock	0.013 (0.012)	0.015 (0.013)		
IlliqShock	0.013*** (0.003)	0.009*** (0.003)		
PostDF × CrisisRet_07_08			-0.001 (0.004)	0.003 (0.005)
Ind. Median ROA			0.041** (0.020)	0.110*** (0.031)
Ind. Median Debt Issues			0.953*** (0.054)	0.688*** (0.065)
Ind. Median Leverage			0.047*** (0.016)	0.008 (0.019)
Treated×crisis	-0.020 (0.012)	-0.027** (0.011)	-0.019 (0.012)	-0.028** (0.012)
Crisis	-0.006** (0.003)	-0.009*** (0.003)	-0.004 (0.003)	-0.005 (0.004)
Firm level controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	11,308	11,308	7,687	7,687
Adjusted R-squared	0.068	0.262	0.158	0.267

Table 9: Changes in debt structure

The table reports regression results based on changes in firms' debt structure. Data on debt structure are from Capital IQ and all other variables are from the Compustat and CRSP merged databases for the period 2005-2015. All firms meet the initial data requirement and the three criteria described in section 3.1: (1) below-investment grade firms remain in the below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after the Dodd-Frank Act. In addition, we require that (1) the sum of all types of drawn debt in Capital IQ not exceed total assets in Compustat and (2) this sum be non-missing in the pre-Dodd-Frank period. The dependent variables are annual changes in outstanding Bonds, Term loans, and Drawn credit lines all scaled by previous year-end Total Assets. For example, $\Delta\text{Bonds \& Notes}$ is the amount of bonds and notes this year minus their amount last year as reported in Capital IQ, scaled by last year's total assets. *Pre-bank dependence* is the mean of the ratio of all types of drawn and committed bank debt scaled by the sum of all types of debt in Capital IQ before the Dodd-Frank Act. PostDF is an indicator variable that equals 1 if the fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is unrated. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 in the Appendix shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

VARIABLES	(1) ΔBonds & Notes	(2) ΔTerm Loans	(3) ΔDrawn Credit Lines	(4) ΔBonds & Notes	(5) ΔTerm Loans	(6) ΔDrawn Credit Lines
PostDF	0.010*** (0.003)	0.004 (0.003)	-0.001 (0.002)	0.001 (0.007)	0.018*** (0.005)	0.004 (0.003)
Treated*PostDF	-0.032** (0.016)	-0.035** (0.015)	0.000 (0.004)	-0.028* (0.016)	-0.039*** (0.015)	-0.001 (0.005)
PostDF*Pre-Bank dependence				0.011 (0.007)	-0.018*** (0.004)	-0.007*** (0.002)
Ind. Median ROA				-0.003 (0.046)	-0.042 (0.032)	-0.012 (0.021)
Ind. Median Net Debt Issues				0.213** (0.084)	0.269*** (0.082)	0.192*** (0.054)
Ind. Median Leverage				-0.021 (0.028)	-0.007 (0.025)	-0.001 (0.015)
Treated*crisis	-0.016 (0.022)	-0.024 (0.015)	-0.011 (0.008)	-0.015 (0.022)	-0.025* (0.015)	-0.011 (0.008)
crisis	0.002 (0.003)	0.001 (0.003)	-0.001 (0.002)	0.003 (0.003)	0.001 (0.003)	-0.000 (0.002)
Observations	7,351	7,351	7,351	7,351	7,351	7,351
Adjusted R-squared	0.021	-0.006	-0.042	0.023	0.000	-0.038
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Appendix

Table A.1: Rating descriptions

The table provides detailed information on the credit ratings used in this study for the period 2005-2015. We used monthly credit ratings provided by three nationally recognized credit rating agencies: S&P, Moody's and Fitch. S&P domestic long-term issuer debt ratings are from Compustat database. Moody's and Fitch ratings are collected from Mergent Online database. Investment grade and below-investment grade refer to firms with AAA to BBB- and BB+ to CC ratings, respectively. We drop all firms that are rated C or below for this study.

Numerical Rating Scale	S&P/S&P domestic long- term issuer debt rating	Moody's	Fitch
1	AAA	Aaa	AAA
2	AA+	Aa1	AA+
3	AA	Aa2	AA
4	AA-	Aa3	AA-
5	A+	A1	A+
6	A	A2	A
7	A-	A3	A-
8	BBB+	Baa1	BBB+
9	BBB	Baa2	BBB
10	BBB-	Baa3	BBB-
11	BB+	Ba1	BB+
12	BB	Ba2	BB
13	BB-	Ba3	BB-
14	B+	B1	B+
15	B	B2	B
16	B-	B3	B-
17	CCC+	Caa1	CCC+
18	CCC	Caa2	CCC
19	CCC-	Caa3	CCC-
20	CC	Ca	CC
21	C	C	C
22	D	N/A	DDD/DD/D
23	SD		

Table A.2: Variable definitions

Variables	Definitions
Net LTD Issues	$(\text{Long-term debt issues (DLTIS)} - \text{Long-term debt reduction (DLTR)}) \div \text{Previous-year-end total assets (AT)}$
Net STD Issues	$\text{Change in current debt (DLCCH)} \div \text{Previous-year-end total assets}$
Net Debt Issues	$\text{Net LTD Issues} + \text{Net STD Issues}$
Net Equity Issues	$(\text{Sale of common and preferred stock (SSTK)} - \text{Purchase of common and preferred stock (PRSTKC)}) \div \text{Previous-year-end total assets}$
Total Net Security Issues	$\text{Net Debt Issues} + \text{Net Equity Issues}$
Total Debt	$\text{Total long-term debt (DLTT)} + \text{Total debt in current liabilities (DLC)}$
Book Leverage	$\text{Total debt} \div \text{Total assets}$
Net Investment	$(\text{Capital expenditures (CAPX)} + \text{Acquisitions (AQC)} + \text{Increase in investments (IVCH)} - \text{Sale of property (SPPE)} - \text{Sale of investments (SIV)}) \div \text{Previous-year-end total assets}$
Firm Size	Natural log of sales, where sales is deflated by the 2004 GDP deflator
Market Value of Assets	$\text{Stock price (PRCC_F)} \times \text{Common shares outstanding (CSHO)} + \text{Total debt} + \text{Preferred stock liquidating value (PSTKR)} - \text{Deferred taxes and investment tax credit (TXDITC)}$
MtoB	$\text{Market value of assets} \div \text{Total assets}$
Zscore	$(3.3 \times \text{Pre-tax income (EBIT)} + \text{Sales} + 1.4 \times \text{Retained earnings (RE)} + 1.2 \times (\text{Current assets (ACT)} - \text{Current liabilities (LCT)})) \div \text{Total assets}$
Ln (Firm Age)	Natural log of one plus firm age, the number of years the firm has been listed on Compustat
Operating Income	$\text{Operating income before depreciation (OIBDP)} \div \text{Total assets}$
Tangibility	$\text{Total net property, plant, and equipment (PPENT)} \div \text{Total assets}$
Cash	$\text{Cash} \div \text{Total assets}$
S&P 500	Indicator variable that equals 1 if the firm is in the S&P 500 index and 0 otherwise
NYSE	Indicator variable that equals 1 if the firm is listed on the NYSE and 0 otherwise
Crisis	Indicator variable that equals 1 for the years 2008-2009 and 0 otherwise
High (Low) Inst	Indicator variable that equals 1 if the institutional ownership in the firm is greater (less) than the sample median and 0 otherwise
High (Low) Lev	Indicator variable that equals 1 if the firm's book leverage in the pre-Dodd-Frank period is greater (less) than the sample median and 0 otherwise
POM	Indicator variable that equals 1 if the firm has plus or Minus sign in its credit rating and 0 otherwise
Tobin's Q	$[(\text{Total assets (at)} + \text{Market value of shareholders' equity (prcc_f*cscho)} - \text{Book value of shareholders' equity (ceq)}) \div \text{Total assets (at)}]$
IlliqShock	Indicator variable that equals 1 for the years with negative aggregate flows to junk bond mutual funds and 0 otherwise
Pre-Bank dependence	$(\text{Sum of term loans} + \text{Sum of drawn and undrawn credit lines}) \div \text{Sum of all debt from Capital IQ database, averaged over pre-DF period}$
Bonds and notes	$\text{Sum of senior and sub-ordinate bonds and notes} \div \text{Previous-year-end total assets (AT)}$
Term loan	$\text{Sum of term loans} \div \text{Previous-year-end total assets (AT)}$
Drawn credit line	$\text{Sum of drawn credit lines} \div \text{Previous-year-end total assets (AT)}$
CrisisRet_07_08	Buy-and-hold returns from July 2007 through December 2008
Ind. Median	Industry median calculated based on 3-digit SIC and fiscal year

Table A.3: Tests of parallel trends

The table presents mean differences in financing and investment growth rates between below-investment grade firms and unrated firms during the pre-Dodd-Frank period. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after Dodd-Frank.

	Unrated (1)	Below-investment grade (2)	Mean Difference (2) - (1)	<i>t</i> -statistics
Net Debt Issues Growth	-5.950	-2.620	3.330	0.34
Net LTD Issues Growth	-4.547	-1.795	2.752	0.28
Net STD Issues Growth	-0.418	-2.293	-1.875	-1.33
Net Equity Issues Growth	31.162	4.573	-26.59	-0.33
Total Net Security Issues Growth	0.751	-2.405	-3.156	-0.39
Net Investment Growth	0.759	-0.115	-0.855	-0.99

Table A.4: Results from alternative control group (below-investment grade versus investment grade firms)

The table reports regression results where we change the control group firms to be investment grade firms. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) investment grade firms remain in below-investment grade category throughout the sample period, and (3) each firm has at least one observation before and after the Dodd-Frank Act. The dependent variables are Net Debt Issues, Net LTD Issues, Net STD Issues, Net Equity Issues, Net Security Issues, Book Leverage and Net Investments. PostDF is an indicator variable that equals 1 if fiscal year ending date is after July 2010 and otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is investment grade. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at firm level, are reported in the parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

VARIABLES	(1) Net Debt Issues	(2) Net LTD Issues	(3) Net STD Issues	(4) Net Equity Issue	(5) Total Net Security Issues	(6) Book Leverage	(7) Net Investment
PostDF	0.009 (0.007)	0.006 (0.007)	0.003 (0.002)	0.001 (0.005)	0.010 (0.008)	0.027** (0.011)	0.003 (0.008)
<i>PostDF*</i>	<i>-0.025**</i>	<i>-0.026**</i>	<i>0.001</i>	<i>-0.023***</i>	<i>-0.048***</i>	<i>-0.046***</i>	<i>-0.032**</i>
<i>Treated</i>	<i>(0.012)</i>	<i>(0.012)</i>	<i>(0.002)</i>	<i>(0.007)</i>	<i>(0.013)</i>	<i>(0.014)</i>	<i>(0.013)</i>
Crisis*Treated	-0.037** (0.015)	-0.040*** (0.014)	0.003 (0.002)	-0.015** (0.007)	-0.052*** (0.015)	-0.009 (0.013)	-0.042*** (0.014)
Crisis	0.006 (0.007)	0.007 (0.007)	-0.001 (0.002)	0.004 (0.005)	0.009 (0.008)	0.016** (0.008)	0.002 (0.008)
Firm Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,150	2,150	2,150	2,150	2,150	2,144	2,150
Adjusted R ²	0.038	0.045	-0.039	0.341	0.157	0.860	0.272

Table A.5: Results from alternative treated group (investment grade versus unrated firms)

The table reports regression results where we change the treated group to investment grade firms (*Alt. Treated*). Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after the Dodd-Frank Act. The dependent variables are Net Debt Issues, Net LTD Issues, Net STD Issues, Net Equity Issues, Net Security Issues, Book Leverage and Net Investments. PostDF is an indicator variable that equals 1 if the fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is investment grade and 0 if it is unrated. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at the firm level, are reported in the parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

VARIABLES	(1) Net Debt Issues	(2) Net LTD Issues	(3) Net STD Issues	(4) Net Equity Issue	(5) Total Net Security Issues	(6) Book Leverage	(7) Net Investment
<i>PostDF</i>	0.006* (0.003)	0.003 (0.003)	0.002*** (0.001)	-0.001 (0.005)	0.005 (0.006)	-0.010** (0.005)	0.006 (0.004)
<i>PostDF*Alt. Treated</i>	0.003 (0.006)	0.002 (0.005)	0.001 (0.002)	0.012** (0.005)	0.015** (0.007)	0.053*** (0.009)	-0.001 (0.007)
<i>Alt. Treated*Crisis</i>	0.011 (0.007)	0.013** (0.006)	-0.002 (0.002)	0.028*** (0.006)	0.038*** (0.009)	0.011 (0.007)	0.006 (0.008)
Crisis	-0.007*** (0.003)	-0.008*** (0.003)	0.001 (0.001)	-0.014*** (0.004)	-0.022*** (0.004)	0.003 (0.003)	-0.010*** (0.003)
Firm Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,513	11,513	11,513	11,513	11,513	11,485	11,513
Adjusted R ²	0.061	0.063	0.006	0.357	0.305	0.734	0.252

Table A.6: Results from the sub-sample of treated firms

The table reports regression results from the sub-sample of treated firms which excludes all CCC+ and lower rated firm. Data are from the annual Compustat database for the period 2005-2015. In addition to the initial data requirements, the firms meet the three criteria described in section 3.1: (1) below-investment grade firms remain in below-investment grade category throughout the sample period, (2) unrated firms remain unrated throughout the sample period, and (3) each firm has at least one observation before and after the Dodd-Frank Act. The dependent variables are Net Debt Issues, Net LTD Issues, Net STD Issues, Net Equity Issues, Net Security Issues, Book Leverage and Net Investments. PostDF is an indicator variable that equals 1 if the fiscal year ending date is after July 2010 and 0 otherwise. Treated is an indicator variable that equals 1 if the firm is below-investment grade and 0 if it is unrated. High Lev is an indicator variable that equals 1 if the firm has above sample median book leverage in the pre-Dodd-Frank period and 0 otherwise. Alternatively, Low Lev is an indicator variable that equals 1 if the firm has below sample median book leverage in the pre-Dodd-Frank period and 0 otherwise. Crisis is an indicator variable that equals 1 for the years 2008-2009 and 0 otherwise. The regressions include firm-level controls as in Table 3 and firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. All continuous variables are winsorized at their 1st and 99th percentiles. Table A.1 shows credit rating scales and Table A.2 defines the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

VARIABLES	(1) Net Debt Issues	(2) Net LTD Issues	(3) Net STD Issues	(4) Net Equity Issue	(5) Total Net Security Issues	(6) Book Leverag e	(7) Net Investmen t
Post2010	0.006* (0.003)	0.003 (0.003)	0.003*** (0.001)	-0.000 (0.005)	0.006 (0.006)	-0.007 (0.005)	0.005 (0.004)
Post2010*Treated*High Lev	-0.024** (0.011)	-0.026** (0.011)	0.002* (0.001)	-0.005 (0.007)	-0.029** (0.012)	0.010 (0.015)	-0.028** (0.011)
Post2010*Treated*Low Lev	0.015 (0.014)	0.015 (0.014)	0.000 (0.001)	-0.024** (0.011)	-0.008 (0.017)	0.012 (0.021)	0.014 (0.020)
Treated*Crisis	-0.018 (0.013)	-0.019 (0.013)	0.001 (0.002)	0.021*** (0.007)	0.003 (0.013)	0.021 (0.013)	-0.025** (0.012)
Crisis	-0.006** (0.003)	-0.006** (0.003)	0.001 (0.001)	-0.016*** (0.004)	-0.021*** (0.005)	0.004 (0.003)	-0.010*** (0.003)
Firm Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,287	11,287	11,287	11,287	11,287	11,258	11,287
Adjusted R ²	0.062	0.064	0.011	0.350	0.301	0.776	0.257