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Three Essays on The Cost of Debt Capital

Katarzyna Nelicka Platt
Graduate Center, City University of New York

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by

Katarzyna Nelicka Platt

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	Professor Armen Hovakimian
Date	Chair of Examining Committee
	Professor Joseph Weintrop
Date	Executive Officer

Professor Theodore Joyce

Professor Jonathan Wang

Professor Joseph Weintrop

Supervisory Committee

Abstract

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Adviser: Professor Armen Hovakimian

This dissertation consists of three chapters that examine how product market competition affects the cost of public bond debt and how credit rating adjustments influence the cost of debt and leverage of industry rivals.

Chapter 1 explores how competitive threats affect the yield spread of corporate bonds. I find that firms that face high levels of competition also face higher costs of debt. After controlling for common bond-level, firm-level and macroeconomic variables, I find that bondholders of firms that are subject to increased competition demand significantly higher credit spreads than holders of otherwise similar bonds. My analysis also reveals that information about competition is incorporated in bond credit ratings. Combined, these findings provide strong evidence that competitive threats are being reflected in corporate debt prices and that competitive dynamics influence firms' access to capital.

Chapter 2 analyzes the information transfer effect of bond rating adjustments among firms competing in the same industry. Specifically, I investigate the impact of a bond credit rating change with respect to one firm in an industry on the corporate bond yield spreads of rival firms. I find that a credit rating downgrade of an investment-grade firm is followed by a significant increase in the corporate bond yield spreads of competing firms in the same industry. I also find that not all competitors are affected equally by bond credit rating downgrades in their industry. Smaller, more opaque firms operating in competitive markets

are found to be more sensitive to rival's credit adjustments.

Chapter 3 examines the intra-industry information transfer effect of bond rating adjustments. I analyze how the effect of the announcement of a bond rating change is transferred from the downgraded or upgraded company to its industry rivals. Specifically, I investigate the effect of the rating change on the leverage ratios of rival firms. I find that rivals of downgraded firms reduce their leverage in the year following the downgrade.

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Chapter 1

Competition and the Cost of Corporate Bond Debt

1.1 Introduction

Competitive threats in the product market in which firms operate influence their financial policies. Recent empirical work shows that higher levels of competition lead to higher level of cash holdings, lower dividend payments, and greater hedging (e.g., Chi and Su (2013); Hoberg, Phillips, and Prabhala (2014); Haushalter, Klasa, and Maxwell (2007)). Furthermore, firms facing more competition face increased cost of bank loan financing (Valta, 2012). This paper extends the literature by exploring how product market competition affect the cost of public debt.

Bondholders focus on future cash flows to ensure a firm's ability to pay periodic interest and bond principal. Because higher levels of product market threats may have negative impact on future cash flows, bondholders are likely to be concerned about the firm's competitive position. Therefore, bondholders may benefit from less competitive product markets, which

enjoy higher profit margins and lower default risk. Additionally, liquidation value is important to the bondholders, because in the event of default on promised payments creditors have the right to take over the assets. Since buyers of these assets who operate inside the firm's industry are willing to pay higher prices for an asset than buyers who operate outside the industry, firms operating in more competitive environments are expected to have lower liquidation values (Shleifer and Vishny, 1992). This is because firms subject to higher levels of competition may have lower profit margins and less financial slack and may not be able to purchase the assets in question. Therefore, product market competition can negatively affect the cost of public bond debt through both the increased probability of default and decreased firm liquidation value. On the other hand, a larger number of competitors in an industry raises the likelihood that a defaulted firm's assets can be sold at high prices, increasing that firm's liquidation value of assets and hence reducing the cost of debt capital.

Additionally, competition may act as a disciplinary mechanism and reduce agency problem (Hart, 1983; Schmidt, 1997; Giroud and Mueller, 2011). The literature documents the existence of a substantial shareholder-bondholder conflict, where shareholders expropriate wealth from bondholders by over-investing in risky projects and capturing most of the gains while at the same time shifting the cost onto the creditors (Jensen and Meckling, 1976; Klock, Mansi, and Maxwell, 2005). Consequently, product market competition reduces asymmetric information and monitoring costs by generating greater opportunities for outsiders to benchmark the performance of a firm to the performance of its competitors and thus reduces managerial slack and the likelihood of over-investment. Therefore, if competition reduces agency problems and acts as a substitute for corporate governance, it may actually reduce the cost of debt. Conversely, in less competitive industries, bondholders may be exposed to greater default risk.

Overall, the previous literature suggests that product market competition can have both

positive and negative impact on the cost of debt financing. Therefore, the goal of this paper is to extend the literature and identify whether product market competition is an important determinant of debt pricing and reveal the net direction of that effect.

Traditional competitive economic theory predicts that the level of product market competition increases with the number of competitors. For this reason, market concentration, proxied by either the Herfindahl-Hirschman Index (henceforth HHI) or the four-firm concentration ratio, is frequently used to measure competition. Both measures focus on the distribution of production across firms within an industry. However, some researchers worry that market concentration may not accurately reflect the changes in the competitive dynamics of product markets that occur within industries that do not experience the addition or loss of a competitor. For example, competition becomes more intense if one firm's products are more ready substitutes for another firm's product. An additional problem with the traditional measures of competition is that they do not capture potential competition and they require a definition of the relevant product market. However, this could be difficult for some industries, such as business services, which are not well defined (Phillips, 2013). What is more, using HHI as a proxy for market competition inevitably leads to an endogeneity problem if financial policy and product market strategy are jointly determined. Therefore, it may be problematic to draw clear inferences from empirical research based on HHI. The level of HHI in a specific industry could very likely represent an equilibrium outcome of competition for that industry. Because of this, it may be unclear whether higher levels of industry HHI measures represent higher or lower levels of competition. Valta and Fresard (2013), using reductions in import tariff rates as a source of variation in competitive pressure, find that firms' reaction to increased competition is indeed heterogeneous and depends on competitive position as well as on the structure of the product markets. Also, Kjenstad and Su (2013) show that under certain market structures a larger number of competitors may reduce the chances of predation, if the predator has to share the profit from predation with more

competitors or free-riders. Hence, increasing the number of competitors may decrease the intensity of competition. Therefore, HHI may not accurately capture all different dimensions of competition, and HHI as an industry-level measure may not reflect some of the dynamic interactions between firms within the industry.

For that reason, in addition to traditional measures of competition such as HHI and four-firm concentration ratio, I am using a novel measure of competition, fluidity, developed by Hoberg, Phillips, and Prabhala (2014). There are two important reasons for this measure choice. Firstly, fluidity captures the similarity between a firm's products and the product evolution of its rivals. It allows for the separation of the effect of competitive threats from the effect of market concentration. Secondly, because it measures moves made by rival firms competing in a product space, the potential endogeneity problem is mitigated. Although fluidity is a novel measure, it has been used in several recent studies as a proxy for product market competition. Hoberg, Phillips, and Prabhala (2014) show that product market fluidity decreases firm propensity to make payouts via dividends or repurchases. It also increases cash held by firms, especially for firms with less access to financial markets. When product markets are changing rapidly, the future is less certain and this, in turn, has an effect on firm's payout policy, which is based on the expectations about the future market for the firms' products. Kjenstad and Su (2012) find that for small firms, fluidity is significantly related to the use of performance sensitive debt. Specifically, they find that product market threats are negatively related to the probability of bank loan contracts having the performance-sensitive feature. Morellec, Valta, and Zhdanov (2014) look at the firm's decision to issue bank debt versus public debt. In their study, they find that firms operating in more competitive product market and facing lower credit supply are more likely to issue public debt.

Another strand of literature investigates the relationship between product market com-

petition and debt financing costs. Valta (2012) links product market competition to spreads on bank loans. Using several market concentration-based proxies for product market competition, the author empirically shows that firms operating in competitive environments have significantly higher costs of debt financing. Moreover, his paper shows that the effect of competition on debt pricing depends also on rival financial strength, meaning that the firms who are in industry leading positions not only benefit from cheaper financing but could also increase the cost of financing for their rivals. Paligorova and Yang (2014) examine the impact of product market competition and corporate governance on the cost of debt financing and the use of bond covenants. The article uses market concentration as a proxy for product market competition and concludes that firms with higher anti-takeover provisions pay a lower cost of debt only in competitive industries, as product market competition increases the probability of takeovers.

In this paper, using the universe of bond transactions, I find that higher product market competition is associated with higher costs of debt financing. After controlling for industry and firm specific attributes, my analysis indicates that debt costs are significantly higher for firms with high product similarity to their competitors. Specifically, a one stardard deviation increase in product market competition increases bond yield spreads by about 10%, which is 30 basis points for an average bond in my sample. I also find a negative relationship between product market competition and bond credit rating. Specifically, I find that one standard deviation increase in product market competition decreases firm's bond credit rating by one half of a credit rating notch. The results are robust to various specifications and control variables and are both economically and statistically significant. Overall, my results suggest that bondholders take product markets into consideration in the pricing of the firm's debt.

This paper is closest to that of Valta (2012) who also studies the effect of product market competition on the cost of debt. However, this paper analyzes public bond markets, whereas

Valta (2012) concentrates on the market for bank loans. Thus, this paper contributes to the literature by identifying that changes in product market dynamics affect corporate bond valuation. I add to to the literature that studies the interactions between product markets and financial markets. By providing compelling evidence that bond yields incorporate a substantial product market dimension, this analysis broadens the understanding of the implications of the industry structure for the cost of debt financing. Also, my study complements recent papers that document how corporate behavior is influenced by the decisions of firms' peers (MacKay and Phillips, 2005; Leary and Roberts, 2014). By establishing a link between product market threats and corporate bond pricing, the findings of this paper suggest that there are spillover effects between product market rivals. Those effects have implications for the firm's financial decisions. Studies by Fresard (2010) and Chi and Su (2013) also show that firms do not operate in isolation, but incorporate rivals' financial status and competitive position in their decision process. Their research sheds light on the role of cash holdings and product market threats. Firms that hold large cash reserves enjoy future market share gains at the expense of their rivals. Last, but not least, I also extend the recent research in corporate bond pricing explaining what factors affect bond credit spreads (Collin-Dufresne et al., 2001; Elton et al., 2001; Campbell and Taksler, 2003; Chen et al., 2007; Dick-Nielsen et al., 2012).

The remainder of the paper is organized as follows. Section 1.2 develops the hypotheses. Section 1.3 introduces the data, presents the summary statistics, and describes the empirical strategy. Section 1.4 presents the main results and sensitivity tests. Section 1.5 presents the paper's conclusions.

1.2 Hypothesis Development

Credit spread has two main determinants: the risk of default itself; and the recovery rate, where, in the event of default, the bondholder receives only a portion of the promised payments (Collin-Dufresne, Goldstein, and Martin, 2001). Product market competition levels influence both of these determinants. The higher the competitive threats from rival firms, the less certain are the future cash flows of the firm. This, in turn, increases firm's default risk. Hou and Robinson (2006) argue that the structure of product markets helps to determine a firm's risk by affecting the equilibrium operating decisions it makes. They find that stocks of companies operating in more competitive industries earn higher average returns and attribute this premium to higher default risk of these firms. When competition is more intense, firms that fail to quickly adapt to changes in the environment are drawn out of business. Therefore it is likely that creditors require higher rates of return on their capital from firms that face more product market competition.

Furthermore, the asset liquidation value may also be affected by competition. Whenever firms assets are liquidated, the highest value potential buyers are likely to be other firms in the industry, provided that they have financial slack. Otherwise the assets may be sold to industry outsiders for a lower price (Shleifer and Vishny, 1992). Since competitive product market may influence both the financial strength and number of firms in the industry, higher levels of product market competition may also affect the cost of debt by reducing the firm's liquidation value (Ortiz-Molina and Phillips, 2014).

Ortiz-Molina and Phillips (2014), show that firms with more illiquid real assets have a higher cost of capital. Valta (2012) posits that competitive threats may impact dimensions that may be distinct from default risk, such as firm's collateral value.In adverse economic circumstances, firms may be under pressure to restructure their operations in order to avoid default, especially if they own unproductive assets which generate large fixed costs. There-

fore, firms that own more illiquid assets will be subject to increased cost of debt financing. Firms that operate in markets that are subject to more product market competition, may be especially susceptible to such effect, because in those markets firms that fail to quickly adapt to changes in the environment will be drawn out of business quicker.

Generally firms that exhibit high tangibility are believed to be less risky as a result of high collateral value; however, it is possible that firms that face considerable amounts of product market threats and, as a result, have lower profit margins than firms from less competitive industries have liquidation values of their tangible assets lower than firms from less dynamic markets. This is because there may be fewer potential buyers that would have enough financial slack to purchase the bankrupt or restructuring firm's assets. Therefore, it is possible that competition affects bond credit spreads through an impact on firm's collateral value.

In his article, Valta (2012) finds that competition is an important determinant of banks' willingness to provide financing and the price of the offer. He examines how competition relates to the cost of bank debt and finds that the bank loans of firms that operate in competitive product markets exhibit higher spreads. This result should also hold true for bondholders. Consequently, I expect the bond market participants to take product market threats into consideration when pricing the firm's debt. Accordingly, my first hypothesis is:

Hypothesis 1: The level of product market competition is positively related to bond yield spreads.

Also, higher cost of debt will lead rating agencies to assign lower bond ratings to firms where product market threats are more substantial. In conducting its surveillance, a rating agency will consider many factors, including, but not limited to: changes in the business climate, credit markets, new technology or competition that may hurt an issuer's earnings or projected revenues; issuer performance; and regulatory changes (Standard & Poor's, 2011).

Credit agencies pay close attention to product differentiation, competitive advantage and its sustainability. Thus, to examine whether product market threats have an impact on bond ratings I formulate the next hypothesis as follows:

Hypothesis 2: The level of product market competition is negatively related to bond ratings.

1.3 Methodology and Descriptive Statistics

1.3.1 Sample

The data for this study come from several sources. The main sample of firms is obtained from Annual Compustat files. Following the standard approach, I exclude firms in the financial sector (SIC codes 6000-6999) and utilities (4900-4999). I also exclude firms with values of total assets or sales are less than one million dollars and replace extreme observations of all ratio variables with missing values (those in one percent in both tails of the distribution). Leverage ratios are trimmed at the value one.

There is no readily available dataset of bond pricing. In order to construct bond prices, I use bond transaction data from the Transaction Reporting and Compliance Engine (TRACE) database which reports individual bond transactions at a daily (or finer) frequency. This database, operated by FINRA, and now covers essentially all publicly traded bonds is a result of a recent regulatory initiative to increase the price transparency in secondary corporate bond markets. The TRACE database initiated in 2002, became fully operational in 2005 (Bessembinder, Maxwell, and Venkataraman, 2006; Edwards, Harris, and Piwowar, 2007).[12]

[1]The Financial Industry Regulatory Authority, Inc. (FINRA), formerly National Association of Securities Dealers, Inc. (NASD), is a private corporation that acts as a non-governmental, self-regulatory organization that regulates member brokerage firms and exchange markets. http://www.finra.org/AboutFINRA/

[2]See FINRA news release http://www.finra.org/Newsroom/NewsReleases/2005/P013274.

Since the TRACE database provides me with a short time series of data, I extend the sample with data from the National Association of Insurance Commissioners's (NAIC) bond transaction file, which cover all insurance companies' trading records of publicly traded bonds in the post-1994 period. NAIC data is obtained from Mergent Fixed Income Securities Database (FISD) and contains prices for all trades in public corporate bonds made by insurance companies since 1994. I follow the cleaning procedure of bond data outlined in Dick-Nielsen (2009) and Bessembinder, Kahle, Maxwell, and Xu (2009) and eliminate canceled, corrected, and commission trades. I also eliminate observations that are obvious data entry errors, e.g. with negative prices, with maturity dates prior to issuance or trade dates, etc.

Mergent's FISD portion of the database contains a comprehensive set of bond characteristics. I use FISD to obtain bond-level information such as issue date, issuance size, coupon rate, and credit rating, as well as to identify the special features of bonds. I exclude all convertible bonds, pay-in-kind bonds, asset-backed securities, Yankee bonds, Canadian bonds, bonds denominated in non-U.S. currencies, floating-rate bonds, unit deals, puttable bonds, exchangeable bonds, perpetual bonds and agency bonds from my sample.

In order to calculate bond prices using the combined TRACE and NAIC dataset, I follow the methodology proposed by Bessembinder et al. (2009) and eliminate all trades that are below $ 100,000 and construct a daily price by weighing each trade by its size. For my sample, I retain the last daily price available for a given bond that is closest to the end of the fiscal year, provided that the difference between the last trade date and the end of the fiscal year is less than 90 days. Next, I use these prices to calculate yield to maturity. In tests of new bond issues, I employ the promised yield to maturity at issue reported by Mergent FISD.

Information on stock prices, trading volume, and market capitalizations are obtained from

the Center for Research in Security Prices (CRSP). S&P credit ratings are obtained from Mergent FISD database.

I obtain data related to firms product market environment, including data on HHI, industry classification and product market fluidity, from the Hoberg- Phillips data library.[3]

Data on foreign trade are acquired from Peter Schott's Web site. Macroeconomic data are retrieved from U.S. Bureau of Economic Analysis and the Treasury bond data from Federal Reserve Bank in St. Louis. Data on firm level default probability is obtained from Kamakura's Risk Manager.

1.3.2 Variables

Measuring Bond Yield Spreads and Bond Credit Ratings

The dependent variables in my analysis are bond yield spreads and bond ratings. My first dependent variable, natural logarithm of bond yield spread, measures the cost of debt (Elton, Gruber, Agrawal, and Mann, 2001; Klock, Mansi, and Maxwell, 2005). The yield spread is defined as the difference between the yield-to-maturity on a corporate bond and the yield-to-maturity on its maturity-equivalent risk-free bond. To calculate yield spreads for individual corporate bonds, I use the constant maturity Benchmark Treasury rates as risk-free rates. Since the rates are available for maturities of 1, 3, 5, 7, 10, and 30 years, If there is no maturity-equivalent Treasury security available to match the maturity of the corporate bond, I perform a linear interpolation between the two closest maturity matches to estimate the entire yield curve.

My second dependent variable is bond credit rating, which measures the perceived risk of the bond. I measure the bonds' credit rating by the S&P credit ratings that assess the

[3]The data is available at http://www.rhsmith.umd.edu/industrydata/.

creditworthiness of the obligor with respect to its debt obligations. There are 21 ratings ranging from highest (AAA) to lowest (C) in the S&P rating sample. I convert the letter ratings into numerical equivalents using an ordinal scale ranging from 1 for the lowest rated firms to 17 for the highest rated firms (AAA). Because I have very few observations with a C rating, I follow Alp (2013) and I pool C, CC, CCC+ and CCC- together to form the lowest ordinal category. I also exclude observations with credit ratings D that indicate default from the analysis.

Measuring Product Market Competition

My first proxy for product market competition, fluidity, captures how company's i's rivals are changing the product words that overlap with company i's vocabulary. Technically, fluidity is the dot product between the words used in a firms business description and the change in the words used by its rivals. The variable is constructed by Hoberg et al. (2014) using text-based analysis of 10K product descriptions. Fluidity reflects product market threats and instabilities arising from actions of firm i's competitors. Because fluidity is calculated each year and captures the change in rivals word usage relative to the firms word usage, it is a dynamic measure of product similarity.

A second proxy for product market competition is the Herfindhal-Hirschman Index *(HHI)*. The HHI is computed as the sum of squared market shares,

$$HHI_{jt} = \sum_{i=1}^{N_j} s_{ijt}^2 \tag{1.1}$$

where s_{ijt} is the market share of firm i in industry j in year t. Market shares are computed from Compustat using firms' sales (Giroud and Mueller, 2011). When computing the *HHI* I use all available Compustat firms. I exclude firms for which sales are missing or negative. *HHI*

is widely used measure in the empirical industrial organization literature as a proxy for the intensity of product market competition. It is also routinely used by government agencies. A higher *HHI* implies weaker competition. I classify industries using four-digit SIC industries.[4] In robustness checks I also use three-digit SIC industries. To identify competitive industries I follow Valta (2012) and define a dummy variable *HHI Dummy* which equals one if the *HHI* is in the lowest quartile of the yearly sample distribution and equals zero otherwise. This procedure mitigates measurement problems which sometimes arise when measuring *HHI* and allows for an intuitive economic interpretation of the results.

I also employ the four-firm concentration ratio (*C4-Index*) as my third proxy for competition. *C4-Index* measures the market share of the four largest firms in an industry, where market shares, similarly to *HHI*, are computed based on firms' sales.

Control Variables

I selected a number of explanatory variables based on prior research on the determinants of corporate bond spreads and credit ratings. The studies typically explain bond spreads in terms of issue characteristics, issuer characteristics and macroeconomic variables. Therefore, in my study, I control for several macroeconomic, bond-specific, and firm-specific proxies for common default and recovery risk factors. This is to verify that known determinants of credit spreads do not drive my results. Table 1.13 in the Appendix provides the list of all variables with brief descriptions.

All of my regressions control for the characteristics of the bond issued. Since the increase in leverage makes the bond riskier, then the issue size relative to firm's assets should be related to higher yield spread (Datta, Iskandar-Datta, and Patel, 1999). Longer maturity

[4]Kahle and Walkling (1996) show that tests in which firms are matched to their industry using 4-digit Compustat SIC codes are likely to have considerable power.

debt is subject to greater interest rate risk exposure and can have a higher default risk. What is more, longer maturities may make it easier for shareholders to gain at the expense of the bondholders by means of selecting riskier projects. Therefore, the relationship between a bond's maturity and yield spreads is expected to be negative (Ortiz-Molina, 2006).

Following Elton, Gruber, Agrawal, and Mann (2004) and Campbell and Taksler (2003) I include coupon rate in my analysis. Throughout most of the period used in our study the tax rates on capital gains and interest income were the same, but since capital gains are paid at the time of sale, bonds with lower coupons may be more valuable due to the fact that some taxes are postponed until the time of sale and because the holder of the bond has control over when these taxes are paid.

In certain specifications, I also include a dummy variable controlling for the callable feature of the bond. From the bondholder's perspective, callable bonds bear prepayment risk. Therefore I expect callable bonds to have higher yield spreads.

Several recent studies such as Bao, Pan, and Wang (2011), Longstaff, Mithal, and Neis (2005) and Chen, Lesmond, and Wei (2007) posit that liquidity is priced in the yield spread. For the same promised cash flows, less liquid bonds trade less frequently, realize lower prices and exhibit higher spreads. Therefore, I control for bond liquidity by including a trading activity measure. Turnover is the natural logarithm of yearly turnover in percent of the total amount outstanding.

To control for firm-specific variation, I use accounting variables similar to measures used in Campbell and Taksler (2003); Klock et al. (2005), and Dick-Nielsen et al. (2012). High levels of profitability, measured as operating income to sales indicate that the firm is financially healthy and are expected to be associated with a low yield spread. On the other hand, high levels of leverage are expected to to be associated with a higher yield spread, as higher debt usage is associated with an increase on the probability of default and therefore a higher cost of

debt financing. Firm size is measured as the natural log of total assets and is expected to be negatively related to yield spreads, as larger firms are generally considered safer investments because of larger asset bases, higher likelihood of diversified assets, greater proportion of tangible assets and overall better chances of survival in the long run (Ortiz-Molina, 2006).

Because investment in fixed capital is easily observable and can provide for good collateral, firms with high levels of tangible assets are generally considered less risky, Therefore, I expect asset tangibility to be negatively correlated with yield spreads.

I also include firm-level default probability obtained from Kamakura's Risk Manager. It is based on Merton Structural Model that uses option pricing methods to relate the probability of firm default to its financial structure and information about the firms market price of equity. The variables used in the model include a measure of the firms outstanding debt, its market valuation, and information about firm and market equity price behavior.[5]

Since yield spreads vary through time, I include a set of year dummy variables to capture the potential effects of changes in the term structure and the economic environment that may affect the bond yield spreads in a given year. Also, I include 49 industry dummies based on Fama and French (1997) to ensure that it is the variation in product fluidity within industries that identifies the coefficients I estimate in my regressions.

1.3.3 Specifications

First, I test the cross-sectional relation between various proxies for product market competition and the cost of debt financing while controlling for firm- and security- specific measures. To test the relation between product market competition and bond yields and ratings, I use the following general specification:

[5]http://www.kamakuraco.com

$$Spread_{j,i,t} = \delta(Competition_{i,t-1}) + \beta' X_{i,t-1} + \gamma' Y_{j,t-1} + \alpha_t + \lambda_j + \epsilon_{j,i,t} \tag{1.2}$$

Subscripts j, i, and t, represent the bond, firm, and year, respectively. The dependent variable $Spread_{j,i,t}$ is the logarithm of the bond yield spread.[6] My primary interest is in the marginal effect of product market competition on bond credit spreads δ. The vector $X_{i,t-1}$ includes control variables at firm level and the vector $Y_{j,t-1}$ includes control variables at the bond level. I also include year dummies α_t and industry fixed effects λ_j in some specifications.[7] I cluster all standard errors at the firm level.

Next, to test whether product market competition predicts bond ratings I estimate both the ordinary least squares model as well as the ordered probit model, given that the dependent variable is ordinal (Ederington, 1985).

$$Rating_{j,i,t} = \delta(Competition_{i,t-1}) + \beta' X_{i,t-1} + \gamma' Y_{j,t-1} + \alpha_t + \lambda_j + \epsilon_{j,i,t} \tag{1.3}$$

Subscripts j, i, and t, represent the bond, firm, and year, respectively. The dependent variable $Rating_{j,i,t}$ is the ordinal variable ranging from 1 for the lowest rated firms to 17 for the highest rated firms. My primary interest is in the marginal effect of product market competition on bond credit rating δ. The vector $X_{i,t-1}$ includes control variables at firm level and the vector $Y_{j,t-1}$ includes control variables at the bond level. I also include year dummies α_t and industry fixed effects λ_j in some specifications. I cluster all standard errors at the firm level.

[6] I follow Valta (2012) and use the natural logarithm of bond credit spreads to address the problem of skewness in the data. If I use levels of bond credit spreads, the results remain virtually unchanged.

[7] My research question is aimed at understanding cross-sectional variation in the product market competition proxies, and including firm-fixed effects seems to defeat this purpose. In the fixed effects setting, all variables are forced to have the same mean. Therefore, the data variation that would identify δ would be within-firm variation and not the cross-sectional variation I am interested in (Roberts and Whited, 2012).

1.3.4 Descriptive Statistics

Table 1.1 presents bond, firm and product market competition characteristics. There are 6118 bonds in my full sample, although the total number of bonds varies from year to year. The total number of firms issuing the bonds in my sample is 1231 firms, which amounts to around 3 bonds per firm.

Panel A of Table 1 reports bond characteristics. In the sample, the average bond credit spread is 306 basis points over a corresponding maturity Treasury instrument, whereas a median bond credit spread is almost 206 basis points. The average bond maturity is about 10 years and the bonds mean offering size is $390 million. Over 70 percent of the bond sample is callable bonds. Around 33% of the bonds in my sample are non-investment grade.

Panel B presents firm level statistics. The average bond issuer in my study is the firm with approximately $11 billion in total assets. The average firm exhibits high leverage, with the mean leverage ratio of 35.6%. The mean profitability level of my sample firms is 15%. The average market-to-book is 1.6 and tangibility ratio is almost 35%.

Table 1.2 shows the pairwise correlation coefficients between the competition proxies and measures of cost of debt. In general, bond credit spread is negatively correlated to *HHI* and *C4-Index*, which suggests that firms that exhibit lower concentration ratios have higher cost of debt capital. The *Fluidity* variable is positively correlated to bond credit spread, which further confirms that firms that are exposed to higher levels of product market threats have higher cost of public debt capital. However, the multivariate framework is necessary since other factors such as firm size are known to have an effect on debt yields.

In order to obtain further insight on the relation between competition and bond credit spreads, I analyze the distribution of bond credit spreads across groups based on the fluidity level, concentration ratio and the *C4-Index*. First, Panel A of Table 1.3 reports the

average and median bond credit spreads for quartile portfolios of bonds formed using the *Fluidity* measure. In each year, I group observations into four groups based on *Fluidity*. Observations with low levels of *Fluidity* are assigned into quartile 1 (Q1) and observations with high levels of *Fluidity* are assigned into quartile 4 (Q4). The last row reports the differences between the means and the medians of the first and fourth quartile along with their level of significance.

Panel A of Table Table 1.3 shows that there are significant differences between bond credit spreads of firms that exhibit high levels of product market fluidity versus the firms that exhibit low levels of product market fluidity. The average bond credit spread for firms that exhibit high levels of fluidity is 363 basis points. The spread decreases monotonically from higher to lower levels of fluidity. For firms with low level of fluidity the average spread is 260 basis points. The difference of 102 basis points is economically and statistically significant. Also, firms with low fluidity have a median spread lower by almost 81 basis points and that difference is also statistically significant. This suggests that bondholders of firms that operate in more dynamic, competitive environment demand higher yields than bondholders of firms operating in less competitive markets.

Next, I conduct a quartile analysis based on product market concentration measure, HHI. Panel B presents average and median corporate bond spreads for quartile portfolios formed using the Herfindhal-Hirschman Index (*HHI*) at the three-digit industry level from Hoberg and Phillips (2010). Higher values of *HHI* are associated with lower level of competition. In order to form quartile portfolios, I sort bonds each year based on *HHI* and assign bonds into quartiles. Next, I compute average and median loan spreads for each quartile. I report the difference in means and medians between competitive (Q4) and concentrated (Q1) industries. The spread decreases monotonically from more to less concentrated industries with a significant difference of 112 basis points. Also, firms with low concentration

have a median spread higher by over 85 basis points and that difference is also statistically significant.

In Panel C of Table 1.3 I repeat the same procedure for the *C4-Index*. Higher values of *C4 Index* are associated with lower level of competition. The spread decreases from more to less concentrated industries with a significant difference of 100 basis points. Also, firms with low concentration have a median spread higher by over 70 basis points and that difference is also statistically significant.

1.4 Empirical Results

In this section, I empirically test the hypotheses formed earlier. In my tests, all t-values are based on standard errors adjusted for heteroskedasticity and firm-level clustering.

1.4.1 Regression Analysis

Product Market Competition and the Cost of Debt Capital

Using the yield spread to the U.S. Treasury benchmark for every bond at the end of each year as a dependent variable, I first consider how product market competition affects the cost of public debt. I apply a multivariate regression model exploiting the cross-sectional variation in product market competition to examine whether the level of competitive threats affects the cost of debt finance. Table 1.4 presents the coefficient estimates for my primary specification. In Panel A column 1, the coefficient of *Fluidity* is 0.0303 and it is statistically significant at the 1% confidence level. This implies that firms that exhibit higher fluidity of their products have higher spreads on their corporate bonds as their counterparts with less fluid products. This means that one standard deviation change in the level of product

market threats when proxied by *Fluidity* leads to a change in corporate bond credit spread by approximately 10%. This effect is economically significant. For the sample average bond credit spread of 306.4 basis points, this coefficient translates to a difference of 30 basis points.

The coefficients on the control variables have the expected signs. Negative coefficient on size suggests that larger firms have easier access to financing. The coefficient on proxy for growth opportunities, market-to-book, is also negative. Other control variables such as interest coverage, tangibility, profitability, bond size and bond maturity are consistent with previous literature (Valta, 2012). In column 2 I include year and industry fixed effects to control for unobserved time effects and industry fixed effects to control for differences between industries that are unrelated to product market competition that could influence bond credit spreads. The coefficient on *Fluidity* remains statistically and economically significant.

In column 3 I estimate the equation using Fama and MacBeth (1973) approach. Still, the coefficient on *Fluidity* is positive and significant. In Panel B of table 1.4 I repeat the analysis using *HHI Dummy* as my primary variable of interest. I find that the coefficient on *HHI Dummy* is 0.101 in the baseline specification and statistically significant in all three models. This coefficient allows for a straightforward economic interpretation and confirms the result from columns 1 thrugh 3. On average, bond credit spreads for firms in competitive industries (HHI in the lowest quartile) have a 10% higher spread than loans in less competitive industries. In Panel C I repeat the analysis from Panel A using *C4-Index* and confirm the earlier results.

In Table 1.5 I run additional specifications in which I introduce additional control variables. In column 1 I control for default risk using the default probability from the Merton model and the Z-score as additional measure of default probability.

The effect of product market competition on bond yield spread remains positive after these controls are added, which suggests that these proxies of firm's default risk do not fully

capture the bond market's assessment of competitive threats. In column 2 I include S&P bond credit rating as a control variable. I also follow Klock, Mansi, and Maxwell (2005) and include a control variable *High Yield*, which is a dummy variable indicating a below investment-grade credit rating. This is to control for a fact that yield spread exhibits a distinct jump when going from investment to non-investment rating. Additionally, I include the callable dummy. The coefficient on all three proxies for product market threats remain statistically and economically significant. In column 3 I include other control variables that capture other unobservable effects, such as *Credit spread* (a difference between BAA and AAA corporate bonds), *Term spread* (difference between yields on 10-year Treasury bonds and 2-year Treasury bonds) The inclusion of these additional variables does not change the significance or economic magnitude of the coefficients of interest.

New Issues

Next, I examine new issues of corporate bonds. My dependent variable is bond credit spreads at issue. The new issues data provides direct transaction prices and does not rely on potentially less accurate matrix prices taken from secondary data. Table 1.6 presents the results. The coefficient on all three proxies of competition are significant for all specifications. They analysis confirms my initial result that product market competition is significantly related to the cost of debt. Furthermore, I find and that higher levels of competition are associated with higher spreads on new corporate bond issues.

Credit Ratings and Competition

One of the most important factors influencing bond yield spread is the credit rating. I examine whether credit rating agencies incorporate product market threats in bond ratings. In this section, I estimate both the ordered probit model and ordinary least squares model

to relate bond ratings to my measure of product market threats and bond and firm characteristics. The main model is given in equation (**??**). The dependent variable is the S&P Credit Rating for a given corporate bond converted into numerical identifiers 1 through 17 (AAA receives a score of 17). I also estimate the same model using Moody's Credit Rating as my dependent variable and obtain similar results (not reported for brevity).

Control variables include firm level controls such as leverage, size, profitability, tangibility, market-to-book ratio, total assets and default probability, as well as bond level controls such as bond size, coupon and maturity. Table 1.7 presents the maximum likelihood estimates of the credit rating using an ordered probit specification. Except for tangibility in certain specifications, most of firm characteristics are significant and consistent with prior literature and expectations. Larger, more profitable and less levered firms obtain better credit ratings. The coefficient estimate on market-to-book ratio is positive, which indicates that firms which exhibit higher growth opportunities are less risky. As expected, default probability is negatively related to credit ratings. Bond characteristics are significant for some specifications. My explanatory variables of interest are significant for all specifications. This result implies that greater product market competition decreases credit ratings.

This analysis reveals that information about product markets incorporated in the level of product market threats is valuable for determining ratings on corporate bonds. This indicates that product market competition captures certain aspects of product market risk that are not reflected in other variables.

In Table 1.8 I present the specification defined by equation (1.2) and included rating fixed effects. I find that the coefficients on product market competition are still statistically and economically significant,which implies that product market competition affects the cost of public bond debt not only through default probability channel, but also potentially through liquidation value of assets channel.

Public debt Market Access and Competition

In Table 1.9 I examine whether the firms that have access to public bond debt markets are operating in the less competitive environments. I use the indicator whether the firm has a debt rating as a measure of access to public bond markets (Faulkender and Petersen, 2006). Consistent with the literature, around 20% of the companies in the Compustat sample have access to public debt markets in a given year. I also have to consider the endogeneity of becoming rated. Notably, having a rating is related to a firm's size and leverage. In addition to controlling for these factors in my analysis I also control for profitability, tangibility and the level of market-to-book. If we compare firms that are able to borrow from the bond market with those that cannot, we will find that product market competition decreases the likelihood of having access to public bond markets.

Decision to Issue Debt vs. Equity and Competition

Table 1.10 describes the results from estimating the probit model of the probability of issuing debt versus equity as a function of the independent variables. The independent variable is a dummy variable taking a value of one for firms that have a net debt issue of at least 5% of their book assets and zero for firms that have an equity issue of at least 5% of their book assets (Hovakimian, Opler, and Titman, 2001). The results suggest that firms with higher level of product market competition are more likely to issue equity than debt. This confirms the result from Table 1.9 that product market competition makes it less likely for the firm to access debt markets and is consistent with the idea that it is more difficult for the firm facing increased product market threats to finance itself with debt. This further confirms that the level of product market competition influences firm's access to capital.

1.4.2 Sensitivity Analysis

Reductions of Import Tariff Rates

In order to further confirm the results of my analysis, I examine the response of the corporate bond spreads to unexpected variations of industry import tariff rates. I follow Valta (2012) and Fresard (2010) and use large reductions of tariff import rates as events that can trigger a sudden increase in competitive pressure from foreign rivals. In order to conduct this analysis, I use U.S. import data compiled by Schott (2010). For each industry-year I calculate the ad-valorem tariff rate as the duties collected by U.S. custom divided by the Free-on-Board value of imports. Next, I compare the tariff reduction in a given industry to the same industry's average change over the whole sample period. I first compute the average and median tariff rate changes and the largest tariff rate change for each industry (the averages and medians are negative). Next, I identify all industries in which the largest tariff rate reduction is larger than three times the average (median) tariff rate reduction for that industry. I also exclude tariff rate reductions that are preceded or followed by equivalently large increases in tariff rates.

In order to test for the effect of large changes in import tariff rates on corporate bond yield spreads, I follow Valta (2012) and estimate the model:

$$y_{i,j,t} = \delta(\textit{Post-Reduction}_{j,t}) + \beta' X_{i,t-1} + \alpha_t + \epsilon_{i,j,t} \tag{1.4}$$

In the model, the subscripts i, j and t represent the borrower, industry and the year, respectively. The dependent variable $y_{i,j,t}$ is the natural logarithm of the loan spread. The vector $X_{i,t-1}$ includes the control variables. The variable $\textit{Post-Reduction}_{j,t}$ is a dummy variable that equals one if industry j has experienced a tariff rate reduction by year t that is

larger than three times the median tariff rate reduction in industry j and zero otherwise. I also include year fixed effects α_t in the estimations. The coefficient δ on the *Post-Reduction*$_{j,t}$ variable is the estimate of the competitive shock's effect on bond credit spreads.

Table 1.11 presents the univariate tests that explore whether bond credit spreads are affected by tariff rate reductions. Specifically, the table presents average bond credit spreads before and after a competitive shock for all firms as well as for the subsamples of large and small firms. Large firms are defined as having their total asset size above the sample median and small firms are defined as having their total asset size below the sample median. Panel A shows that loan spreads increase by 44 basis points after tariff rate reduction for the full sample of firms. This increase is statistically and economically significant. Further analysis of panels B and C reveals that the effect is more prominent for large firms: almost 56 basis points increase in bond credit spreads, whereas only 13 basis points increase for small firms.

Table 1.12 presents the estimation results from equation 1.4. I define the variable of interest, *Post-Reduction*$_{j,t}$ three different ways: In column 1 *Post-Reduction*$_{j,t}$ is equal to one if tariff rate reduction is at least three times larger than the median tariff rate reduction in that industry. In column 2, *Post-Reduction*$_{j,t}$ equals one if the tariff rate reduction is two times larger than the median tariff rate reduction in that industry. In column 1 *Post-Reduction*$_{j,t}$ is equal to one if tariff rate reduction is at least three times larger than the mean tariff rate reduction in that industry. *Post-Reduction*$_{j,t}$ is positive and significant in all three specifications. The results suggest that the bondholders require higher bond spreads in the aftermath of a competitive shock. To sum up, the results in Table 1.12 further confirm the main findings of this paper that a higher intensity of competition significantly increases bond credit spreads.

Multiple Issues and Other Controls

Given that there is variation in the number of bonds issued by each firm during the sample period, one could argue that firms with many issues in a year tend to receive too much weight while firms with only a few issues per year receive too little weight in the estimation. To address this concern, I follow Klock, Mansi, and Maxwell (2005) and Ortiz-Molina (2006) and I restrict the sample to allow only one issue per firm-year. For firms with multiple issues in a given year, I select the bond with the largest amount issued. I also restrict the sample to the last bond issued by the firm, since that bond may convey the most relevant information about the firm. The results persist for both procedures.

In order to control for industry-specific changes in the economic environment from one year to another, which could affect industry risk I also interact industry and year dummies. This procedure also does not change my previous results. The results are not reported for brevity.

1.5 Conclusion

This paper provides evidence that connects product market competition to bond credit spreads. The main finding is that firms operating in more dynamic environments have significantly higher cost of debt financing. Overall, the results confirm that there product markets and financial markets are linked together. Also, the analysis suggests that there might be potential spill-over effects on industry rivals that need to be taken into account when evaluating firm's cost of debt.

My analysis also shows that information about product markets is incorporated in the bond credit ratings. Together, these findings suggest that product market threats are being reflected in corporate debt prices and that product market dynamics influence firms' access

to capital. Overall, this study adds to previous work by showing that lenders rationally price bond issues using the information about the firm's product market dynamics.

Table 1.1: **Summary Statistics.** This table presents summary statistics for corporate bonds, issuing firms' characteristics and for proxies for product market competition. I present means, medians, standard deviations of the variables. The sample period is from 1997 to 2011.

Panel A: Bond characteristics

	count	mean	sd	min	p50	max
Spread (basis points)	22,346	306	325	2.04	206	2,743
Yield	22,346	.0689	.0342	.00377	.0643	.359
Bond maturity (in days)	22,346	3,784	3,991	366	2,593	36,525
Bond size (in M USD)	22,346	392,957	351,551	500	299,500	2500000
Bond size (to total assets)	22,346	.0617	.0842	.0000356	.0312	.708
Coupon	22,346	7.16	1.68	.75	7	14.5
Callable dummy	22,346	.73	.444	0	1	1
High Yield	21,967	.33	.47	0	0	1
Observations	22346					

Panel B: Firm characteristics and product market competition proxies

	count	mean	sd	min	p50	max
Fluidity	7,575	6.44	3.57	.381	5.6	24.7
Compustat HHI	7,536	.291	.215	.0426	.227	1
HHI Dummy	7,536	.273	.446	0	0	1
4-Firm Concentration Ratio	7,536	.773	.194	.314	.814	1
Assets - Total	7,575	10,851	26,145	57.3	3,574	479,921
Leverage	7,575	.356	.176	.000526	.329	1
Long-term debt	7,575	.322	.176	0	.291	.995
Cash flow	7,575	.0876	.0887	-.674	.0881	.474
Tangibility	7,575	.349	.242	.00169	.289	.965
Market-to-book	7,575	1.57	.796	.448	1.34	9.35
Profitability	7,563	.149	.0913	-.456	.142	.642
Default probability	7,076	.888	2.11	.0291	.235	17.8
Number of bonds	7,575	2.95	3.04	1	2	27
Observations	7575					

Table 1.2: **Correlation coefficients**. This table provides correlation coefficients of key variables.

	Spread (basis points)	HHI	HHI Dummy	C4-Index	Fluidity	S&P Rating
Spread (basis points)	1					
HHI	-0.11	1				
HHI Dummy	0.12	-0.55	1			
C4-Index	-0.11	0.78	-0.81	1		
Fluidity	0.090	-0.24	0.29	-0.32	1	
S&P Rating	-0.58	0.20	-0.14	0.19	-0.16	1
Observations	15056					

Table 1.3: **Bond credit spreads across quartiles of competition measures.** Panel A presents corporate average and median corporate bond yield spreads across quartile portfolios based on *Fluidity* measure created by Hoberg et al. (2014). Higher values of *Fluidity* are associated with higher levels of product market threats. In order to form quartile portfolios, I sort bonds each year based on *Fluidity* ans assign bonds into quartiles. Next, I compute average and median loan spreads for each quartile. Below, I report the difference in means and medians between high product market threat quartile (Q4) and low product market threat quartile (Q1) industries. Panel B presents corporate yield spreads across quartile portfolios based on *HHI*. The quartile portfolios are formed using the Herfindhal-Hirschman Index (*HHI*) at the three-digit industry level from Hoberg and Phillips (2010). Higher values of *HHI* are associated with lower level of competition. Panel C presents corporate yield spreads across quartile portfolios based on 4-Firm Concentration Ratio. For all panels, I compute the statistical significance of the difference in means with a mean comparison t-test and the difference in medians with a Wilcoxon rank-sum test. The sample period is from 1997 to 2011. Significance at the 10%, 5% and 1% level is indicated by *, **, and ***, respectively.

Panel A: Corporate yield spreads across quartile portfolios based on Fluidity.

Fluidity quartile	**mean(spread)**	**median(spread)**	**obs**
Lowest competition	260.70	169.96	5573
2	286.74	190.41	5592
3	315.75	214.93	5601
Highest competition	363.00	250.87	5584
Diff (4-1)	102.3***	80.91***	

Panel B: Corporate yield spreads across quartile portfolios based on HHI.

HHI quartile	**mean(spread)**	**median(spread)**	**obs**
Lowest competition	261.36	172.46	5488
2	292.37	199.54	5554
3	294.12	200.16	5516
Highest competition	374.04	257.67	5721
Diff(4-1)	112.68***	85.21***	

Panel C: Corporate yield spreads across quartile portfolios based on C4-Index.

C4-Index quartile	**mean(spread)**	**median(spread)**	**obs**
Lowest competition	268.56	182.81	5460
2	293.29	192.57	5496
3	289.71	197.53	5476
Highest competition	368.68	253.29	5847
Diff(4-1)	100.12***	70.48***	

Table 1.4: **Product market threats and the cost of debt: panel results**. This table presents coefficient estimates of regressions which examine the effect of product market threats on corporate bond spreads. The dependent variable is the logarithm of corporate yield spreads.The sample period is from 1997 to 2011. I report t-statistics in parentheses below the coefficient estimates. The standard errors are calculated using the robust estimator clustered at the firm level.

Panel A: Fluidity

	(1) No fixed effects	(2) Fixed effects	(3) Fama-MacBeth
Fluidity	0.0303***	0.0242***	0.0262***
	(6.58)	(5.08)	(8.96)
Leverage	0.705***	0.782***	0.798***
	(4.51)	(7.04)	(7.79)
Market-to-book	-0.222***	-0.182***	-0.236***
	(-9.33)	(-8.77)	(-8.14)
Log(total assets)	-0.248***	-0.236***	-0.225***
	(-13.05)	(-16.81)	(-12.31)
Tangibility	-0.128	-0.0688	-0.123*
	(-1.49)	(-0.77)	(-1.96)
Profitability	-1.276***	-1.508***	-1.059***
	(-5.45)	(-9.51)	(-3.24)
Coupon	0.141***	0.171***	0.173***
	(13.00)	(19.29)	(16.24)
Log(bond size)	0.0263	-0.0713***	-0.0749**
	(0.96)	(-3.54)	(-2.85)
Log(bond maturity)	0.139***	0.176***	0.148***
	(9.40)	(15.54)	(3.62)
Turnover	0.0226**	0.0320***	0.0470**
	(2.41)	(4.60)	(2.51)
Constant	-4.083***	-4.706***	-3.590***
	(-14.02)	(-21.77)	(-7.45)
Year FE	No	Yes	No
Industry FE	No	Yes	No
Observations	14451	14434	14451
Adjusted R^2	0.357	0.665	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: HHI Dummy

	(1) No fixed effects	(2) Fixed effects	(3) Fama-MacBeth
HHI Dummy	0.204***	0.144***	0.154***
	(4.70)	(3.12)	(8.46)
Leverage	0.726***	0.790***	0.820***
	(4.47)	(7.23)	(7.97)
Market-to-book	-0.234***	-0.187***	-0.239***
	(-9.59)	(-9.19)	(-8.42)
Log(total assets)	-0.233***	-0.228***	-0.217***
	(-11.99)	(-16.15)	(-13.36)
Tangibility	-0.169**	-0.120	-0.122**
	(-2.05)	(-1.28)	(-2.39)
Profitability	-1.360***	-1.621***	-1.213***
	(-5.84)	(-10.04)	(-3.88)
Coupon	0.145***	0.173***	0.178***
	(13.42)	(19.77)	(15.84)
Log(bond size)	0.0442	-0.0698***	-0.0588**
	(1.58)	(-3.58)	(-2.40)
Log(bond maturity)	0.139***	0.177***	0.146***
	(9.12)	(15.49)	(3.57)
Turnover	0.0173*	0.0290***	0.0444**
	(1.81)	(4.07)	(2.34)
Constant	-4.264***	-4.609***	-3.735***
	(-14.63)	(-21.29)	(-7.68)
Year FE	No	Yes	No
Industry FE	No	Yes	No
Observations	14417	14400	14417
Adjusted R^2	0.352	0.663	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel C: Four-firm Concentration Ratio

	(1) No fixed effects	(2) Fixed effects	(3) Fama-MacBeth
4-Firm Concentration Ratio	-0.364***	-0.220*	-0.329***
	(-3.35)	(-1.94)	(-4.32)
Leverage	0.764***	0.806***	0.871***
	(4.78)	(7.26)	(7.49)
Market-to-book	-0.228***	-0.187***	-0.232***
	(-9.45)	(-9.12)	(-8.07)
Log(total assets)	-0.230***	-0.227***	-0.217***
	(-11.80)	(-15.34)	(-14.24)
Tangibility	-0.195**	-0.107	-0.142**
	(-2.35)	(-1.14)	(-2.89)
Profitability	-1.362***	-1.610***	-1.216***
	(-5.79)	(-9.98)	(-3.92)
Coupon	0.146***	0.174***	0.179***
	(13.30)	(19.27)	(16.03)
Log(bond size)	0.0472*	-0.0682***	-0.0578**
	(1.68)	(-3.46)	(-2.34)
Log(bond maturity)	0.138***	0.176***	0.147***
	(8.98)	(15.33)	(3.55)
Turnover	0.0200**	0.0294***	0.0436**
	(2.09)	(4.13)	(2.32)
Constant	-4.018***	-4.456***	-3.487***
	(-12.95)	(-18.84)	(-7.12)
Year FE	No	Yes	No
Industry FE	No	Yes	No
Observations	14417	14400	14417
Adjusted R^2	0.349	0.662	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.5: **Product market threats and the cost of debt: panel results. Robustness.** This table presents coefficient estimates of regressions which examine the effect of product market threats on corporate bond spreads. The dependent variable is the logarithm of corporate yield spreads. The sample period is from 1997 to 2011. I report t-statistics in parentheses below the coefficient estimates. The standard errors are calculated using the robust estimator clustered at the firm level.

Panel A: Fluidity

	(1) Default Probability	(2) Credit Ratings	(3) Additional Controls
Fluidity	0.0244***	0.0143***	0.0323***
	(5.35)	(3.86)	(7.17)
Leverage	0.585***	0.174*	0.702***
	(4.46)	(1.82)	(4.61)
Market-to-book	-0.115***	-0.0977***	-0.213***
	(-4.48)	(-5.28)	(-9.31)
Log(total assets)	-0.236***	-0.0834***	-0.249***
	(-15.80)	(-5.73)	(-13.29)
Tangibility	-0.117	-0.0844	-0.122
	(-1.34)	(-1.21)	(-1.49)
Profitability	-1.282***	-0.698***	-1.433***
	(-6.98)	(-5.25)	(-6.35)
Coupon	0.161***	0.0901***	0.147***
	(18.59)	(13.86)	(13.91)
Log(bond size)	-0.0795***	-0.0937***	0.0233
	(-3.71)	(-5.45)	(0.86)
Log(bond maturity)	0.163***	0.191***	0.141***
	(13.43)	(17.65)	(9.79)
Turnover	0.0282***	0.00479	0.0407***
	(3.97)	(0.74)	(4.38)
Default probability	0.0617***	0.0411***	
	(9.47)	(7.86)	
Z-score	-0.0481***	0.00268	
	(-3.03)	(0.24)	
Callable dummy		0.0164	
		(0.65)	
High Yield		0.243***	
		(5.60)	
S&P Rating		-0.0955***	
		(-13.15)	
Credit spread			0.169***
			(11.74)
Term Spread			-0.110***
			(-15.71)
Constant	-4.260***	-4.187***	-4.210***
	(-18.70)	(-20.37)	(-15.02)
Year FE	Yes	Yes	No
Industry FE	Yes	Yes	No
Observations	12331	12080	14451
Adjusted R^2	0.671	0.716	0.383

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: HHI Dummy

	(1) Default Probability	(2) Credit Ratings	(3) Additional Controls
HHI Dummy	0.136***	0.0933***	0.200***
	(2.97)	(2.67)	(4.80)
Leverage	0.564***	0.151	0.727***
	(4.21)	(1.56)	(4.56)
Market-to-book	-0.121***	-0.101***	-0.225***
	(-4.59)	(-5.26)	(-9.50)
Log(total assets)	-0.233***	-0.0794***	-0.233***
	(-15.54)	(-5.48)	(-12.04)
Tangibility	-0.167*	-0.119*	-0.160**
	(-1.83)	(-1.65)	(-2.02)
Profitability	-1.414***	-0.769***	-1.516***
	(-7.40)	(-5.44)	(-6.69)
Coupon	0.163***	0.0898***	0.151***
	(18.92)	(13.85)	(14.37)
Log(bond size)	-0.0753***	-0.0898***	0.0432
	(-3.60)	(-5.30)	(1.55)
Log(bond maturity)	0.164***	0.193***	0.141***
	(13.47)	(17.84)	(9.42)
Turnover	0.0256***	0.00231	0.0346***
	(3.55)	(0.35)	(3.65)
Default probability	0.0610***	0.0405***	
	(9.57)	(7.96)	
Z-score	-0.0487***	0.00348	
	(-2.94)	(0.30)	
Callable dummy		0.0133	
		(0.53)	
High Yield		0.241***	
		(5.46)	
S&P Rating		-0.0979***	
		(-13.15)	
Credit spread			0.162***
			(10.57)
Term Spread			-0.106***
			(-15.09)
Constant	-4.157***	-4.125***	-4.405***
	(-18.03)	(-20.22)	(-15.68)
Year FE	Yes	Yes	No
Industry FE	Yes	Yes	No
Observations	12311	12060	14417
Adjusted R^2	0.668	0.715	0.376

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel C: Four-firm Concentration Ratio

	(1) Default Probability	(2) Credit Ratings	(3) Additional Controls
4-Firm Concentration Ratio	-0.230**	-0.150*	-0.336***
	(-2.00)	(-1.66)	(-3.24)
Leverage	0.578***	0.158	0.763***
	(4.30)	(1.63)	(4.86)
Market-to-book	-0.121***	-0.101***	-0.219***
	(-4.63)	(-5.31)	(-9.31)
Log(total assets)	-0.230***	-0.0772***	-0.231***
	(-14.79)	(-5.15)	(-11.86)
Tangibility	-0.162*	-0.115	-0.180**
	(-1.75)	(-1.60)	(-2.26)
Profitability	-1.394***	-0.752***	-1.516***
	(-7.36)	(-5.41)	(-6.60)
Coupon	0.164***	0.0904***	0.153***
	(18.54)	(13.84)	(14.25)
Log(bond size)	-0.0741***	-0.0895***	0.0460
	(-3.50)	(-5.25)	(1.63)
Log(bond maturity)	0.162***	0.192***	0.140***
	(13.29)	(17.62)	(9.27)
Turnover	0.0261***	0.00269	0.0373***
	(3.61)	(0.40)	(3.91)
Default probability	0.0618***	0.0409***	
	(9.50)	(7.93)	
Z-score	-0.0485***	0.00363	
	(-2.97)	(0.32)	
Callable dummy		0.0146	
		(0.58)	
High Yield		0.249***	
		(5.59)	
S&P Rating		-0.0974***	
		(-13.04)	
Credit spread			0.165***
			(10.71)
Term Spread			-0.104***
			(-14.82)
Constant	-3.991***	-4.025***	-4.182***
	(-16.00)	(-18.93)	(-13.93)
Year FE	Yes	Yes	No
Industry FE	Yes	Yes	No
Observations	12311	12060	14417
Adjusted R^2	0.667	0.714	0.372

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.6: **Product market competition and the cost of debt: new issues.** This table presents coefficient estimates of regressions which examine the effect of product market threats on corporate bond spreads. The dependent variable is the logarithm of corporate yield spreads. I report t-statistics in parentheses below the coefficient estimates. The standard errors are calculated using the robust estimator clustered at the firm level.

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
Fluidity	0.0252***	0.0151***				
	(6.04)	(3.30)				
HHI Dummy			0.118***	0.0770**		
			(4.31)	(2.58)		
4-Firm Concentration Ratio					-0.225***	-0.219***
					(-2.93)	(-2.58)
Leverage	0.468***	0.457***	0.561***	0.515***	0.572***	0.512***
	(5.10)	(5.23)	(6.49)	(6.33)	(6.63)	(6.33)
Market-to-book	-0.131***	-0.133***	-0.123***	-0.125***	-0.123***	-0.124***
	(-6.53)	(-6.35)	(-6.44)	(-6.42)	(-6.40)	(-6.37)
Log(total assets)	-0.171***	-0.188***	-0.161***	-0.181***	-0.158***	-0.180***
	(-7.46)	(-8.32)	(-7.63)	(-9.48)	(-7.49)	(-9.45)
Tangibility	0.0637	0.0711	0.0790	-0.0135	0.0901*	-0.0211
	(1.24)	(0.89)	(1.56)	(-0.17)	(1.72)	(-0.27)
Profitability	-0.674***	-0.693***	-0.934***	-0.855***	-0.932***	-0.852***
	(-4.02)	(-4.26)	(-5.57)	(-5.72)	(-5.51)	(-5.69)
Coupon	0.286***	0.274***	0.291***	0.276***	0.292***	0.277***
	(13.07)	(12.74)	(14.34)	(14.16)	(14.37)	(14.18)
Log(bond size)	0.0978***	0.0892***	0.0863***	0.0663**	0.0846***	0.0656**
	(3.51)	(3.40)	(2.86)	(2.57)	(2.70)	(2.50)
Log(bond maturity)	-0.00738	0.00582	-0.0180	-0.00461	-0.0186	-0.00532
	(-0.30)	(0.25)	(-0.75)	(-0.21)	(-0.77)	(-0.24)
Constant	7.643***	7.782***	7.949***	8.721***	8.276***	9.010***
	(24.30)	(24.58)	(23.17)	(25.31)	(21.76)	(24.12)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No	Yes
Observations	4100	4095	5806	5799	5806	5799
Adjusted R^2	0.588	0.596	0.556	0.571	0.556	0.571

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.7: **Credit ratings and competition.** This table displays estimation results for the ordered probit model and OLS model. The dependent variable is the S&P Credit Rating for a given corporate bond converted into numerical identifiers 1 through 17 (AAA is 17). I report t-statistics in parentheses below the coefficient estimates. The standard errors are calculated using the robust estimator clustered at the firm level.

	(1) Probit	(2) Probit	(3) Probit	(4) OLS	(5) OLS	(6) OLS
main						
Fluidity	-0.0616***			-0.122***		
	(-5.16)			(-5.55)		
HHI Dummy		-0.208**			-0.497***	
		(-2.31)			(-2.93)	
4-Firm Concentration Ratio			0.720***			1.521***
			(3.18)			(3.50)
Leverage	-2.518***	-2.537***	-2.584***	-5.002***	-5.134***	-5.231***
	(-6.85)	(-6.75)	(-7.06)	(-7.48)	(-7.24)	(-7.60)
Market-to-book	0.654***	0.657***	0.652***	1.106***	1.140***	1.123***
	(8.97)	(8.88)	(9.04)	(10.50)	(10.38)	(10.55)
Log(total assets)	0.603***	0.567***	0.560***	1.185***	1.134***	1.116***
	(12.12)	(11.03)	(11.00)	(13.60)	(12.24)	(12.37)
Tangibility	-0.282*	-0.273*	-0.161	-0.607**	-0.569*	-0.348
	(-1.75)	(-1.66)	(-0.97)	(-2.04)	(-1.88)	(-1.16)
Profitability	3.165***	3.279***	3.282***	6.401***	6.738***	6.717***
	(7.03)	(7.55)	(7.60)	(7.35)	(7.85)	(7.91)
Coupon	-0.288***	-0.296***	-0.298***	-0.593***	-0.619***	-0.622***
	(-13.97)	(-14.32)	(-14.45)	(-14.21)	(-14.95)	(-14.94)
Log(bond size)	-0.0712	-0.104*	-0.103*	-0.158	-0.224**	-0.223**
	(-1.33)	(-1.87)	(-1.87)	(-1.54)	(-2.05)	(-2.07)
Log(bond maturity)	0.181***	0.181***	0.182***	0.343***	0.348***	0.348***
	(6.10)	(5.98)	(5.97)	(5.97)	(5.91)	(5.92)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13646	13614	13614	13646	13614	13614
Pseudo R^2	0.223	0.216	0.217	0.693	0.680	0.683

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.8: **Rating fixed effects.** The sample period is from 1997 to 2011. I report t-statistics in parentheses below the coefficient estimates. The standard errors are calculated using the robust estimator clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
Fluidity	0.0104***	0.0133***				
	(3.53)	(3.48)				
HHI Dummy			0.0893***	0.100***		
			(3.54)	(2.76)		
4-Firm Concentration Ratio					-0.157***	-0.139
					(-2.60)	(-1.57)
Leverage	0.223**	0.155*	0.214**	0.146*	0.231**	0.154*
	(2.42)	(1.81)	(2.30)	(1.73)	(2.50)	(1.81)
Market-to-book	-0.0926***	-0.105***	-0.0934***	-0.106***	-0.0922***	-0.107***
	(-6.31)	(-7.03)	(-6.29)	(-7.10)	(-6.21)	(-7.07)
Log(total assets)	-0.0841***	-0.0974***	-0.0763***	-0.0908***	-0.0753***	-0.0896***
	(-5.40)	(-6.77)	(-4.99)	(-6.59)	(-4.85)	(-6.21)
Tangibility	-0.156***	-0.0267	-0.177***	-0.0641	-0.188***	-0.0543
	(-2.67)	(-0.38)	(-3.09)	(-0.89)	(-3.32)	(-0.75)
Profitability	-0.581***	-0.683***	-0.598***	-0.736***	-0.594***	-0.722***
	(-3.96)	(-6.03)	(-3.90)	(-6.24)	(-3.86)	(-6.20)
Coupon	0.0934***	0.0950***	0.0936***	0.0947***	0.0941***	0.0951***
	(14.55)	(16.18)	(14.56)	(16.19)	(14.70)	(16.09)
Log(bond size)	-0.0786***	-0.0757***	-0.0723***	-0.0739***	-0.0718***	-0.0732***
	(-4.76)	(-4.59)	(-4.49)	(-4.69)	(-4.43)	(-4.58)
Log(bond maturity)	0.198***	0.209***	0.199***	0.210***	0.199***	0.209***
	(18.36)	(20.66)	(18.30)	(20.97)	(18.15)	(20.76)
Turnover	0.00694	-0.000548	0.00311	-0.00317	0.00365	-0.00283
	(1.16)	(-0.09)	(0.51)	(-0.53)	(0.60)	(-0.48)
Constant	-5.535***	-5.827***	-5.650***	-5.809***	-5.531***	-5.705***
	(-25.34)	(-28.34)	(-25.67)	(-28.06)	(-24.44)	(-26.69)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No	Yes
Rating FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14256	14239	14225	14208	14225	14208
Adjusted R^2	0.705	0.716	0.705	0.716	0.704	0.715

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.9: **Public debt market access.** Probit model. Dependent variable is equal to one if the firm has a bond credit rating and zero otherwise. Firm size is the log of assets. Book leverage is the book value of debt divided by total assets. Market-to-book is calculated as (total assets - book value of equity + market value of equity) / total assets. Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets . Profitability is defined as EBITDA/Assets. The stock return is measured as the percentage return over the last year. All independent variables are lagged. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) 1=Rated	(2) 1=Rated	(3) 1=Rated	(4) 1=Rated	(5) 1=Rated	(6) 1=Rated	(7) 1=Rated	(8) 1=Rated	(9) 1=Rated
rating									
Fluidity	-0.0477***	-0.0475***	-0.0158**						
	(-8.02)	(-7.81)	(-2.01)						
HHI Dummy				-0.108**	-0.106**	-0.0312			
				(-2.51)	(-2.41)	(-0.67)			
4-Firm Concentration Ratio							0.211**	0.290***	0.110
							(2.19)	(2.94)	(0.99)
Size	0.888***	0.906***	0.960***	0.834***	0.898***	0.909***	0.833***	0.897***	0.909***
	(41.69)	(40.91)	(39.51)	(52.09)	(48.16)	(48.68)	(51.88)	(48.12)	(48.62)
Leverage	3.038***	3.063***	2.848***	2.569***	2.553***	2.626***	2.570***	2.552***	2.626***
	(25.74)	(25.39)	(23.25)	(29.58)	(28.45)	(28.18)	(29.60)	(28.44)	(28.17)
Market-to-book	-0.0392**	-0.0489**	-0.0922***	-0.110***	-0.101***	-0.0698***	-0.106***	-0.0954***	-0.0693***
	(-2.01)	(-2.44)	(-4.37)	(-5.92)	(-5.28)	(-3.72)	(-5.67)	(-4.98)	(-3.69)
Tangibility	0.413***	0.419***	-0.290**	0.140*	0.0374	-0.294***	0.141*	0.0506	-0.290***
	(4.30)	(4.33)	(-2.11)	(1.66)	(0.44)	(-2.68)	(1.68)	(0.59)	(-2.64)
Profitability	0.900***	0.952***	0.450***	0.327**	0.141	0.0476	0.312**	0.114	0.0445
	(5.76)	(5.97)	(2.99)	(2.47)	(1.02)	(0.36)	(2.37)	(0.83)	(0.34)
retan	0.0396***	0.0261*	0.0495***	0.0570***	0.0549***	0.0463***	0.0563***	0.0542***	0.0462***
	(3.26)	(1.95)	(3.78)	(5.57)	(5.05)	(4.21)	(5.48)	(4.97)	(4.19)
Constant	-7.159***	-7.160***	-7.173***	-6.469***	-6.255***	-5.946***	-6.639***	-6.549***	-6.065***
	(-42.30)	(-37.46)	(-23.62)	(-55.86)	(-11.85)	(-11.14)	(-49.80)	(-12.22)	(-11.10)
Year FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Industry FE	No	No	Yes	No	No	Yes	No	No	Yes
Observations	52663	52663	52438	85177	85176	84802	85177	85176	84802
Pseudo R^2	0.587	0.591	0.628	0.578	0.590	0.599	0.578	0.590	0.599

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.10: **Debt-equity issuance.** Probit model. Dependent variable is equal to one if the firm issued debt and zero if the firm issued equity. Firm size is the log of assets. Book leverage is the book value of debt divided by total assets. Market-to-book is calculated as (total assets - book value of equity + market value of equity) / total assets. Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets . Profitability is defined as EBITDA/Assets. The stock return is measured as the percentage return over the last year. All independent variables are lagged. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) D vs. E	(2) D vs. E	(3) D vs. E	(4) D vs. E	(5) D vs. E	(6) D vs. E	(7) D vs. E	(8) D vs. E	(9) D vs. E
F.de									
Fluidity	-0.0463***	-0.0477***	-0.0513***						
	(-11.02)	(-11.09)	(-9.36)						
HHI Dummy				-0.0289	-0.0516**	0.0112			
				(-1.13)	(-1.99)	(0.37)			
4-Firm Concentration Ratio							0.650***	0.672***	0.296***
							(11.06)	(11.33)	(4.52)
Size	0.173***	0.192***	0.175***	0.126***	0.140***	0.137***	0.125***	0.141***	0.138***
	(20.08)	(20.83)	(18.44)	(21.32)	(21.14)	(20.27)	(21.19)	(21.27)	(20.37)
Leverage	-0.177**	-0.274***	-0.433***	-0.362***	-0.447***	-0.606***	-0.398***	-0.485***	-0.613***
	(-2.27)	(-3.44)	(-5.25)	(-6.47)	(-7.82)	(-10.17)	(-7.06)	(-8.44)	(-10.29)
Market-to-book	-0.199***	-0.213***	-0.174***	-0.224***	-0.231***	-0.204***	-0.214***	-0.221***	-0.203***
	(-16.24)	(-16.84)	(-13.68)	(-22.34)	(-22.41)	(-19.90)	(-21.61)	(-21.76)	(-19.76)
Tangibility	-0.0576	-0.0658	0.248***	0.0633	0.0455	0.275***	0.159***	0.147***	0.293***
	(-0.84)	(-0.96)	(2.65)	(1.19)	(0.85)	(4.17)	(3.09)	(2.84)	(4.44)
Profitability	1.076***	0.939***	0.902***	1.313***	1.209***	1.077***	1.293***	1.184***	1.076***
	(12.40)	(10.66)	(10.15)	(20.78)	(18.49)	(16.28)	(20.52)	(18.18)	(16.26)
retan	-0.0690***	-0.0640***	-0.0672***	-0.0895***	-0.0857***	-0.0830***	-0.0909***	-0.0861***	-0.0833***
	(-4.54)	(-3.90)	(-3.95)	(-6.56)	(-5.85)	(-5.77)	(-6.74)	(-5.95)	(-5.81)
Constant	0.341***	0.437***	0.839***	0.303***	0.410***	0.442**	-0.198***	-0.150*	0.142
	(5.81)	(4.13)	(2.90)	(7.51)	(5.22)	(2.19)	(-3.43)	(-1.65)	(0.67)
Year FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Industry FE	No	No	Yes	No	No	Yes	No	No	Yes
Observations	12895	12895	12845	23315	23313	23226	23315	23313	23226
Pseudo R^2	0.164	0.184	0.219	0.131	0.151	0.172	0.137	0.157	0.173

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.11: **Corporate yield spread and firm characteristics before and after a reduction in import tariff rates.** This table presents average corporate yield spreads and firm characteristics *before* and *after* a large reduction of import tariff rates for large firms. The tariff rate reduction is considered large if it is at least three times larger than a median tariff rate reduction in that industry. Panel A presents descriptive statistics for all firms in the sample, Panel B presents statistics for a subset of large firms defined as having their total asset size above the sample median and Panel C presents statistics for a subset of large firms defined as having their total asset size below the sample median. The sample period is from 1992 to 2005. Significance at the 10%, 5% and 1% level is indicated by *, **, and ***, respectively.

Panel A: All firms

	Before	After	Difference	t-stat
Spread	213.680	257.834	-44.154	-5.808***
Default probability	0.540	0.564	-0.024	-0.550
Leverage	0.338	0.343	-0.005	-1.299
Observations	6784			

Panel B: Large firms

	Before	After	Difference	t-stat
Spread	125.201	180.924	-55.723	-8.437***
Default probability	0.268	0.439	-0.171	-4.796***
Leverage	0.308	0.337	-0.029	-6.405***
Observations	3563			

Panel C: Small firms

	Before	After	Difference	t-stat
Spread	320.869	333.939	-13.070	-0.970
Default probability	0.862	0.683	0.179	2.234*
Leverage	0.375	0.349	0.026	4.485***
Observations	3221			

Table 1.12: **Reductions of import tariff rates and the cost of public debt.** This table presents coefficient estimates of the effect of tariff rate reductions on corporate yield spreads. The dependent variable is the logarithm of corporate yield spreads. In columns 1 equals one if industry j has experienced a tariff rate reduction by time t that is larger than three times the median tariff rate reduction in that industry and zero otherwise. In column 2, *Post Reduction* equals one if industry j has experienced a tariff rate reduction by time t that is larger than three times the average tariff rate reduction in that industry and zero otherwise. The sample period is from 1994 to 2005. the standard errors are calculated using the robust estimator and clustered at the firm level.

	(1) $abs(\Delta Tariff) > 3 \times median$	(2) $abs(\Delta Tariff) > 2 \times median$	(3) $abs(\Delta Tariff) > 3 \times mean$
Post Reduction	0.112**	0.101*	0.0841*
	(1.99)	(1.83)	(1.69)
Leverage	0.0608	0.00636	0.0969
	(0.33)	(0.03)	(0.52)
Market-to-book	-0.0363	-0.0367	-0.0316
	(-1.62)	(-1.60)	(-1.46)
Log(total assets)	-0.0784**	-0.0817**	-0.0796**
	(-2.39)	(-2.50)	(-2.41)
Tangibility	0.0755	0.0416	0.0326
	(0.50)	(0.29)	(0.23)
Profitability	-0.793	-0.738	-0.739
	(-1.64)	(-1.49)	(-1.49)
Coupon	0.113***	0.114***	0.113***
	(7.06)	(7.13)	(7.00)
Log(bond size)	-0.0726**	-0.0687**	-0.0718**
	(-2.36)	(-2.21)	(-2.30)
Log(bond maturity)	0.141***	0.140***	0.139***
	(5.12)	(5.10)	(4.96)
Turnover	-0.00201	-0.000858	-0.00188
	(-0.15)	(-0.06)	(-0.14)
Default probability	0.0503***	0.0500***	0.0510***
	(3.59)	(3.67)	(3.72)
S&P Rating	-0.134***	-0.137***	-0.135***
	(-10.64)	(-10.42)	(-10.58)
Year FE	Yes	Yes	Yes
Observations	2894	2894	2894
Adjusted R^2	0.644	0.643	0.643

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.13: Variable Descriptions

The main sample of firms is obtained from Annual Compustat files. Stock prices and market capitalizations are obtained from the Center for Research in Security Prices (CRSP). Bond transaction data is from the Transaction Reporting and Compliance Engine (TRACE) and National Association of Insurance Commissioners's (NAIC) extracted from Mergent Fixed Income Securities Database (FISD). Bond characteristics are from Mergent FISD. Data on foreign trade are acquired from Peter Schott's Web site. Macroeconomic data are retrieved from U.S. Bureau of Economic Analysis and the Treasury bond data from Federal Reserve Bank in St. Louis. Data on firm level default probability is obtained from Kamakura's Risk Manager.

Variable	**Description**
Spread	Bond yield based on the last price for a bond in the month minus the relevant end-of-month Treasury yield for the bond.
Fluidity	A measure of firm-level competitive threats based on the description of firms' product space and rival moves in their 10-K's developed by Hoberg et al. (2014).
HHI	Herfindahl-Hirschmann Index computed using Compustat firms. It is defined as the sum of squared market shares. Market shares are computed using firms' sales.
HHI Dummy	An indicator variable which equals one if the *HHI* is in the lowest quartile of the yearly sample distribution, and equals zero otherwise.
C4-Index	4-Firm Concentration Ratio is the sum of market shares of the four largest firms in the industry.
Bond size	Amount outstanding of a bond issue.
Bond maturity	Bond maturity measured in days.
Total assets	Total book assets in billions USD.
Tangibility	Net property, plant and equipment divided by total assets.
Profitability	Operating income before depreciation divided by total assets.
Market-to-book	(Debt in current liabilities + total long-term debt + preferred stock carrying value deferred taxes and investment tax credit + stock price at the end of quarter x common shares outstanding) divided by total assets.
Leverage	(Debt in current liabilities + total long term debt) divided by total assets.
Default probability	Estimate of firms default probability based on Merton Structural Model.
Z-score	1.2(current assets - current liabilities)/total assets + 1.4(retained earnings/total assets) + 3.3(pretax income/total assets) + 0.6(market capitalization/total liabilities) + 0.9(sales/total assets).
Credit spread	Difference between the yields of a long-term Baa bond index and long-term Aaa bond index.
Term spread	Difference between a 10-year Treasury bond yield and a 1-year Treasury bond yield.
S&P Rating	S&P rating at the bond level. Ratings are converted to an ordinal scale of 1-17, with 17 being the highest rated bond and 1 being the lowest rated bond.
High Yield	Dummy variable for a non-investment grade rating.
Turnover	Natural logarithm of yearly turnover in percent of the total amount outstanding.
Post Reduction	Dummy variable equal to one if industry j has experienced a tariff reduction that is three times larger than the median tariff rate reduction in that industry at time t.

Chapter 2

Industry Contagion in Bond Yield Spreads

2.1 Introduction

This paper improves our understanding of intra-industry information transfer effects resulting from the bond rating changes of industry participants. Specifically, it explores the question of whether the credit rating change of one firm affects the cost of debt capital of its rivals. Thus, the goal of this paper is to analyze the effect of credit rating upgrades and downgrades of single firms on the bond spreads of its industry competitors. Additionally, I examine if there are any differences as to how rivals are affected by the rating change based on several cross-sectional factors.

Bond ratings provide information on the creditworthiness of corporate bond issues. The ratings reflect the credit agency's opinions of the risk that a company will default on its bond payments. Credit ratings have the potential to convey information to the market about the quality of a company that is not in the public domain, since credit agencies receive non-

public information from the rated firms (Kisgen, 2007). Thus, market reactions to rating announcements are to be expected.[1]

Previous studies confirm that bond credit ratings convey new information about the affected firm and that rating adjustments result in significant changes in the rated firm's stock prices (Hand, Holthausen, and Leftwich, 1992; Ederington, Yawitz, and Roberts, 1987; Ederington and Goh, 1998). In general, studies find evidence that market reactions to credit rating downgrades and upgrades are asymmetric, with significant reactions to downgrades and little or no reaction to upgrades, which appear to be anticipated. (Dichev and Piotroski, 2001; Zaima and McCarthy, 1988).

Another stream of research investigates information transfers across firms for corporate events. Specific announcements about a single firm contain signals about the whole industry. However, most prior research into intra-industry information transfer focuses mostly on short-term stock price reactions and changes of the CDS spreads of industry rivals. Akhigbe, Madura, and Whyte (1997) explore the potential secondary impact of bond rating changes on stock returns. Akhigbe, Borde, and Whyte (2003) and Hsu, Reed, and Rocholl (2010) find industry-wide effects resulting from a firm's initial public offerings. In addition, Slovin, Sushka, and Polonchek (1992) find competitors' share price reactions are affected by SEOs in their industry. Similarly, Lang and Stulz (1992) look at the effects of a firm's bankruptcy announcement on its industry rivals and find two distinct types of effects, *contagion* and *competition*.

Contagion implies that a negative credit event will impact industry rivals negatively,

[1] "Credit ratings are forward-looking opinions about credit risk. Standard & Poor's credit ratings express the agency's opinion about the ability and willingness of an issuer, such as a corporation or state or city government, to meet its financial obligations in full and on time. The reasons for ratings adjustments vary, and may be broadly related to overall shifts in the economy or business environment or more narrowly focused on circumstances affecting a specific industry, entity, or individual debt issue (...) The reasons for ratings adjustments vary, and may be broadly related to overall shifts in the economy or business environment or more narrowly focused on circumstances affecting a specific industry, entity, or individual debt issue." (http://www.standardandpoors.com/ratings/definitions-and-faqs/en/eu)

whereas a positive credit events will impact the rivals positively. This is because the event will reveal new information about shocks to cash flows that are common across the industry. A *contagion* effect may also be due to counterparty risk, meaning that the change of the financial position of a firm may impact other firms that have business relationship with that firm, e.g. a supplier or a creditor. Finally, a *contagion* effect may result from a change in the market's perception of the entire industry, which may prompt investors to require higher or lower rates of return on their investment. Conversely, the presence of a a *competition* effect implies that a negative credit event for one firm will positively impact this firm's industry rivals, while a positive credit event will have negative impact on the rivals. This is because these rivals may be affected by a resulting change in industry and, as a result, may be gaining or losing market power.

Both contagion and competitive effects have been observed following a corporate bankruptcies. Lang and Stulz (1992) provide evidence that a bankruptcy announcement has both *contagion* and *competitive* effect on other firms in the industry. The authors find that the *competitive* effect is dominant in industries typified by low leverage ratios and low levels of competition. Jorion and Zhang (2007a) also analyze the effects of Chapter 11 and Chapter 7 bankruptcies in concentrated and competitive industries. Using CDS spreads, they document that industry rivals are affected negatively by a Chapter 11 bankruptcy, which involves reorganization of the company. This finding is consistent with the *contagion* effect. However, they also find that industry rivals are positively affected by Chapter 7 bankruptcy, which involves liquidation of the company. This, in turn, is consistent with the *competition* effect.

Hertzel, Li, Officer, and Rodgers (2008) subsequently examined the vertical effects of bankruptcies and show that multiple suppliers to firms filing for bankruptcy experience negative stock price reactions around the filing. These findings are consistent with the *con-*

tagion effect. More recently, Hertzel and Officer (2012) study contagion effects of corporate bankruptcies on corporate loans and show that spreads on bank loans are significantly higher when the loan is originated or renegotiated in the two years surrounding the bankruptcy filing of an industry rival. They also show that this effect is mitigated in concentrated industries.

Contagion and competition effects have also been observed in response to credit rating changes. Indeed this paper advances and strengthens the findings of Jorion and Zhang (2010) Caton and Goh (2003) and Akhigbe et al. (1997). Akhigbe et al. (1997) study equity market reaction to the credit rating change and conclude that the stock market does respond to bond credit rating downgrades and that this response is spread from individual firms to the corresponding industry rivals. In the same spirit, Caton and Goh (2003) study the implications of ratings downgrades for earnings forecasts and find that stock analysts revise their earnings expectations downward for rivals of companies with downgraded debt. Jorion and Zhang (2010) expand the analysis of Akhigbe et al. (1997) by conditioning their result on the rating before the firm was downgraded. By doing so, Jorion and Zhang (2010) observe both *contagion* and *competition* effects. They confirm that the bond rating downgrade of *investment grade* firms results in negative abnormal stock returns for its industry rivals. This information transfer effect is consistent with the *contagion* effect. However, the downgrade of *speculative grade* firms results in positive abnormal stock returns are consistent with the *competition* effect. Thus, the negative credit events of speculative grade firms will positively affect other firms in the industry.[2]

In this paper I examine the bond market response to credit rating changes. This paper contributes to the literature by confirming that a firm's credit ratings adjustments can significantly impact its industry rivals' cost of debt. My findings establish a link between credit ratings adjustments and corporate bond pricing and confirm that there are spillover

[2]This result is consistent with Brander and Lewis (1988) who argue that external benefits to firm's rivals increase with the extent of financial distress to the company.

effects between market rivals. These effects, in turn, have implications for the firm's financial decisions.[3] My study complements recent papers that document how corporate behavior is influenced by the decisions of firms' rivals (MacKay and Phillips, 2005; Leary and Roberts, 2014). This paper also extends recent research into corporate bond pricing which seeks to identify what factors affect bond credit spreads (Collin-Dufresne et al., 2001; Elton et al., 2001; Campbell and Taksler, 2003; Chen et al., 2007; Dick-Nielsen et al., 2012). I find that corporate bond pricing is subject to *contagion* effects.

The remainder of this paper is organized as follows. Section 2.2 discusses the development of the hypotheses. Section 2.3 introduces the data, presents the summary statistics, and describes the empirical strategy. Section 2.4 presents the main results and sensitivity tests. Section 2.5 presents the paper's conclusions.

2.2 Hypothesis Development

Credit rating changes by credit rating agencies convey information about the industry. In this paper I examine whether this effect is reflected in bond yield spreads. Prior studies find that credit rating downgrades and upgrades have effects on the stock and bond prices of the adjusted firm (Hand et al., 1992; Ederington et al., 1987; Ederington and Goh, 1998). The studies find asymmetric results with respect to rating change downgrades and upgrades. The effect of upgrades is found to be weaker or even insignificant. Thus, my first hypothesis is meant to test and confirm the presence of these results in my sample of bond credit spreads. As a result of a credit rating change, I expect the cost of debt for downgraded firms to

[3]Kisgen (2006) examines bond credit ratings in the context of capital structure. He looks at the costs and benefits of a credit rating adjustments and finds that rating changes directly affect firms' financing decisions. Kisgen (2009) extends that research showing by studying firms' behavior after the rating adjustments and finds that firms reduce leverage following credit rating downgrades. Kisgen and Strahan (2010) show that regulations based on credit ratings that constrain bond investment affect yields and thus firms' cost of capital.

increase, and the cost of debt for upgraded firms is expected to decrease. Thus, I formulate my first hypothesis as follows:

> *Hypothesis 1: Bond rating downgrade (upgrade) has a positive (negative) effect on bond yield spreads of publicly traded firms.*

While Hypothesis 1 focus the impact of bond rating changes on the affected firms, the next set of hypotheses relates to the spillover effect of the information contained in bond rating changes on industry rivals.

A downgrade for one firm can be either good or bad news for the rival firm. It can be good news since the deterioration of the financial position of a competitor may limit its ability to fund expansion, R&D, increase its costs, and potentially lead to its elimination. The decrease in competitive strength might, in turn, decrease the cost of their debt; consistent with a *competition* effect. A credit rating downgrade of a firm can also be bad news to its rivals if it conveys information about adverse economic conditions for the industry and increases the rival firms' probability of credit rating downgrade. This would result in an increase in the cost of debt for rivals of downgraded firms, consistent with the *contagion* effect.

Similarly, a credit rating upgrade can be good or bad news for the rival firm. It can be good news if it signals favorable economic conditions for the industry, while it can also be bad news if it is the result of a competitor's improved financial position and acquisition of a larger market share. Lastly, an alternative hypothesis posits that the credit rating downgrade is firm specific and does not convey any new information that is relevant for industry rivals.

> *Hypothesis 2: Bond rating downgrades (upgrades) have a positive (negative) effect on the bond yield spreads of publicly traded firms in the same industry.*

Hypothesis 3: Bond rating downgrades (upgrades) have a negative (positive) effect on the bond yield spreads of publicly traded firms in the same industry.

Hypotheses 1, 2 and 3 focus on the impact of rating changes on the bond credit spread of the affected firm and on the impact of the same rating change on the affected firms' industry rivals. The next hypothesis, Hypothesis 4, focus on differences in these effects across firms. I expect the factors which explain the cross-sectional variation of bond credit spread changes to include: the *ex ante* bond rating level, product market structure, opacity and relative firm size.

Firms operating in industries with lower bond ratings are expected to be affected more by the credit rating adjustments of their industry rivals. Also, I expect the effect of credit rating adjustments on industry rivals to be greater for firms that are more opaque. Similarly, the smaller firms in the industry are expected to be more affected by credit rating changes of rival firms.

If the company operates in more competitive industry, I expect the *contagion* effect of the rival firm's credit rating adjustment to be stronger. In more concentrated industries, the increase of market share due to the rival competitor's downgrade is more likely therefore I expect the *competition* effect to dominate.

The effect of credit ratings adjustments should also depend on original credit quality of adjusted firm. Larger, investment grade firms are more likely to be perceived as industry leaders. Therefore, I expect the effect of their rating adjustment to be more significant than the effects of rating adjustments of smaller, speculative-grade firms. Moreover, the investment grade firms are larger in size and have more relationships with counterparties who require less credit protection from them (Jorion and Zhang, 2007b).

Hypothesis 4: Relative firm size, product market structure, opacity and rating level are

significant determinants of cross-sectional variation in bond credit spread changes after credit rating changes.

2.3 Methodology and Descriptive Statistics

2.3.1 Sample

The data for this study come from several sources. In order to be included in the sample, the firm has to be present in Annual Compustat files. Following the standard approach, I exclude firms in the financial sector (SIC codes 6000-6999) and utilities (4900-4999). I also exclude firms with values of total assets or sales are less than one million dollars and replace extreme observations of all ratio variables with missing values (those in one percent in both tails of the distribution). Leverage ratios are trimmed at the value one.

In order to construct bond prices, I use bond transaction data from the Transaction Reporting and Compliance Engine (TRACE) database which reports individual bond transactions at a daily (or finer) frequency. The TRACE database initiated in 2002, became fully operational in 2005 and now covers essentially all publicly traded bonds (Bessembinder et al., 2006; Edwards et al., 2007).[4]

Since the TRACE database provides me with a short time series of data, I extend the sample with data from the National Association of Insurance Commissioners's (NAIC) bond transaction file, which cover all insurance companies' trading records of publicly traded bonds in the post-1994 period. NAIC data is obtained from Mergent Fixed Income Securities Database (FISD). Insurance companies hold between one-third and 40% of corporate bonds, therefore NAIC data represent a substantial portion of the corporate bond market

[4]See FINRA news release http://www.finra.org/Newsroom/NewsReleases/2005/P013274.

Campbell and Taksler (2003); Bessembinder et al. (2006). I eliminate canceled, corrected, and commission trades as described in Dick-Nielsen (2009) and Bessembinder et al. (2009). I also eliminate observations that are data entry errors, e.g. with negative prices, with maturity dates prior to issuance or trade dates, etc.

Mergent's FISD portion of the database contains a comprehensive set of bond characteristics. I use FISD to obtain bond-level information such as issue date, issuance size, coupon rate, and credit rating, as well as to identify the special features of bonds. I exclude all convertible bonds, pay-in-kind bonds, asset-backed securities, Yankee bonds, Canadian bonds, bonds denominated in non-U.S. currencies, floating-rate bonds, unit deals, puttable bonds, exchangeable bonds, perpetual bonds and agency bonds from my sample.

In order to create the sample of bond credit spreads I first calculate bond prices using the combined TRACE and NAIC dataset, I follow the methodology as in Bessembinder et al. (2009). I eliminate all trades that are below $ 100,000 and construct a daily price by weighing each trade by its size. For my sample, I retain the last daily price available for a given bond that is closest to the end of the fiscal year, provided that the difference between the last trade date and the end of the fiscal year is less than 90 days. Next, I use these prices to calculate yield to maturity. In tests of new bond issues, I employ the promised yield to maturity at issue reported by Mergent FISD. For my sample, I retain the last daily price available for a given bond that is closest to the end of the fiscal year, provided that the difference between the last trade date and the end of the fiscal year is less than 90 days.

Information on stock prices, trading volume, and market capitalizations are obtained from the Center for Research in Security Prices (CRSP). S&P credit ratings are obtained from Compustat database.[5] Treasury bond data is obtained from Federal Reserve Bank in St. Louis. Information on the number of analysts is obtained from Thomson Reuters I/B/E/S

[5]In unreported regressions, I repeat the analysis using S&P and Moody's credit ratings at the bond level from Mergent and obtain very similar results.

database.

2.3.2 Variables

Measuring bond yield spreads

My first dependent variable is the change in bond yield spread, measures the cost of debt (Elton et al., 2001; Klock et al., 2005). The yield spread is defined as the difference between the yield-to-maturity on a corporate bond and the yield-to-maturity on its maturity-equivalent risk-free bond. To calculate yield spreads for individual corporate bonds, I use the constant maturity Benchmark Treasury rates as risk-free rates. Since the rates are available for maturities of 1, 3, 5, 7, 10, and 30 years, I perform a linear interpolation between the two closest maturity matches to estimate the entire yield curve. In my analysis, I follow the literature and use the natural logarithm of the yield spread to control for skewness (Valta, 2012)

Bond credit rating variables

I measure the bonds' credit rating by the the S&P credit ratings that assess the creditworthiness of the obligor with respect to its debt obligations. There are 22 ratings ranging from highest (AAA) to lowest (D) in the S&P rating sample. I convert the letter ratings into numerical equivalents using an ordinal scale ranging from 1 for the lowest rated firms (D) to 22 for the highest rated firms (AAA).

A sample of rivals in the corresponding industries of the firms subject to a credit rating change is identified based on a three digit SIC code.[6] The median number of rivals in the

[6]In a series of unreported regressions I repeat the analysis in this paper using four digit SIC codes. The results are virtually unchanged.

industry is seven.

Control variables

I selected a number of explanatory variables based on prior research on the determinants of corporate bond spreads and credit ratings. The studies typically explain bond spreads in terms of issue characteristics, issuer characteristics and macroeconomic variables. Therefore, in my study, I control for several macroeconomic, bond-specific, and firm-specific proxies for common default and recovery risk factors. This is to verify that known determinants of credit spreads do not drive my results. Table 2.11 provides the list of all variables with brief descriptions.

All of my regressions control for the characteristics of the bond issued. Since the increase in leverage makes the bond riskier, then the issue size relative to firm's assets should be related to higher yield spread (Datta, Iskandar-Datta, and Patel, 1999). Longer maturity debt is subject to greater interest rate risk exposure and can have a higher default risk. What is more, longer maturities may make it easier for shareholders to gain at the expense of the bondholders by means of selecting riskier projects. Therefore, the relationship between a bond's maturity and yield spreads is expected to be negative (Ortiz-Molina, 2006).

Following Elton et al. (2004) and Campbell and Taksler (2003) I include bond coupon rate in my analysis. Throughout most of the period used in our study the tax rates on capital gains and interest income were the same, but since capital gains are paid at the time of sale, bonds with lower coupons may be more valuable due to the fact that some taxes are postponed until the time of sale and because the holder of the bond has control over when these taxes are paid.

To control for firm-specific variation, I use accounting variables similar to measures used in Campbell and Taksler (2003); Klock et al. (2005), and Dick-Nielsen et al. (2012). High levels

of profitability, measured as operating income to sales indicate that the firm is financially healthy and are expected to be associated with a low yield spread. On the other hand, high levels of leverage are expected to to be associated with a higher yield spread, as higher debt usage is associated with an increase on the probability of default and therefore a higher cost of debt financing. Firm size is measured as the natural log of total assets and is expected to be negatively related to yield spreads, as larger firms are generally considered safer investments because of larger asset bases, higher likelihood of diversified assets, greater proportion of tangible assets and overall better chances of survival in the long run (Ortiz-Molina, 2006). Because investment in fixed capital is easily observable and can provide for good collateral, firms with high levels of tangible assets are generally considered less risky, Therefore, I expect asset tangibility to be negatively correlated with yield spreads.

2.3.3 Specifications

To test the relation between credit rating adjustments and bond yields and ratings, I use the following general specification.

$$\begin{aligned} log(y_{i,t}) - log(y_{i,t-1}) = \phi_1 Firm\ downgrade_{i,t-1} + \phi_2 Firm\ upgrade_{i,t-1} + \\ + \kappa_1 Industry\ downgrade_{j,t-1} + \kappa_2 Industry\ upgrade_{j,t-1} + \beta X_{i,t-1} + \alpha_t + \epsilon_{i,t} \end{aligned} \tag{2.1}$$

Subscripts i, and t, represent the firm and year, respectively. The dependent variable $y_{i,t}$ is the logarithm of the bond yield spread. My primary interest is in the marginal effect of credit rating changes on bond credit spreads of the firms in the industry κ_1 and κ_2. *Industry downgrade* and *Industry upgrade* are dummy variables indicating that there has been a credit rating downgrade in the industry and credit rating upgrade in the industry, respectively. *Firm Downgrade* and *Firm upgrade* indicate that the particular firm's respective credit rating was downgraded or upgraded. The vector $X_{i,t-1}$ includes control variables

at firm level. Because yield spreads may vary through time, I include a set of year dummy variables α_t in some of my regressions to capture the potential effects of changes in macroeconomic environment or term structure that may affect the yield spread in a particular year. Depending on the specification, I also include industry fixed effects, firm fixed effects and rating dummies.

2.3.4 Descriptive Statistics

Table 2.1 presents bond and firm characteristics of the sample. The total number of firms in the sample is 1108 and the number of firm-years is 6,219. One firm has about 5 bonds issued, on average. Bond characteristics from Mergent FISD are available at the bond level, therefore, weighing by value of outstanding bonds, I calculate average bond characteristics by firm-year: spread, maturity, and the coupon rate. Panel A reports statistics for the whole sample, while Panels B and C include figures for investment-grade and speculative grade, respectively. The median yield spread in the sample is 281 and the mean spread is 386 basis points. For investment-grade bonds, the yield spread is around 140 basis points and the median spread on speculative-grade bonds is around 431 basis points. The variation in coupon rates is smaller, with most coupons falling into 6.5 to 8.8% range. The median maturity of firm's bonds is 2,667 days. A median firm that holds corporate debt has issued around $483 million in bonds and has $3,729 million in total assets. A median investment-grade firm has $825 million corporate bonds outstanding and $8,174 million in total assets, whereas a median speculative-grade has $350 million in bonds outstanding and $2,004 million in total assets. The mean and median leverage ratio for the full sample is 36% 33%, respectively. Investment grade firms have mean leverage ratio of 28% and median leverage ratio of 26%, whereas speculative grade firms have mean leverage ratio of 42% and median leverage ratio of 40%. The mean and median market to book is lower for speculative grade firms (1.33

and 1.2 respectively) than for investment grade firms (1.85 and 1.58). Tangibility is higher for speculative grade firms (mean 38.7%, median 34.6%) than for speculative grade firms (mean 34%, median 28.6%). Profitability (ROA) is higher for investment grade firms with the mean of 17.1% (median 16.3%) in comparison to speculative grade firms with the mean of 13.2% (median 12.3%).

Table 2.2 presents a distribution of rating adjustments by year. The data sample spans from 1997 to 2011. I identify the initial sample of downgrades from Compustat, which provides information on ratings from Standard & Poor's. Table 2.3 displays a distribution of rating adjustments by rating level. Almost each rating category has exhibited upgrade and downgrade activity. The last two columns report the number of rival firms for each rating level.

2.4 Empirical Results

2.4.1 Baseline Regressions

In order to analyze the effect of rating changes on the cost of debt capital, I first run a series of contemporaneous regressions. Table 2.4 contains the results of ordinary least squares (OLS) regressions examining the effects of credit rating adjustments on bond yield spreads, holding borrower, market and bond characteristics constant. The dependent variable in all regressions is the the first difference of the bond credit spread.[7]

The key independent variables of interest are dummy variables that are used to indicate whether the firm was downgraded or upgraded (*Firm downgrade* and *Firm upgrade*) and the two dummies indicating the downgraded or upgraded firm's rivals *Industry downgrade*

[7]I use the logarithm of spreads to address the problem of skewness in the data. Using levels does not alter the results.

and *Industry upgrade*. Table 2.4 includes both the independent variables of interest that are contemporaneous and lagged one period. Consistent with *Hypothesis 1* we contemporaneously observe higher bond yield spread for firms that has been downgraded and lower bond spread for the firms that have been upgraded. At the same time there is no significant contemporaneous effect on industry rivals. This suggests that there is no immediate effect of bond rating changes on industry peers.

However, the positive coefficient of on *Industry downgrade (t-1)* indicates that the firms whose rival was downgraded experience an increased cost of debt capital in the subsequent period. Column 2 is my baseline regression and it shows the coefficient of 0.0433. This suggests that if there is a credit rating downgrade in the industry, the rival firm's credit yield spread This points to contagion effect around credit rating downgrades that is consistent with *Hypothesis 2*. The effect of *Industry upgrade (t-1)* is insignificant. This implies that the upgrades do not reveal any new information for industry rivals. This is consistent with the literature which finds that spillover effects of credit rating upgrades are much less significant than that of downgrades or altogether insignificant.

All results are reported with heteroscedasticity-consistent standard errors clustered by firm. The results in column 1 include year fixed effects. In column 2 I include industry fixed effects and in column 3 firm fixed effects. Column 4 includes rating fixed effects.

2.4.2 Ratings of Rivals

Column 1 and column 2 of table 2.5 presents the results for investment-grade and non-investment grade, respectively. Next, consistent with Jorion and Zhang (2007b) the results indicate that the impact is only significant for firms with speculative grade ratings. The result of a credit rating change of an industry rival is not significant for firms which are investment grade. This is because

2.4.3 Relative Size of Rivals

I compare the size of each industry rival with the size of a firm subject to a ratings adjustment and categorize rivals into large and small rivals. Large rivals are defined as firms that are larger than the adjusted firm and small rivals are defined as firms that are smaller than the adjusted firm. I test if larger and smaller rivals react differently to the news about the adjustment. I expect the effect of rating adjustment to be more significant on the rivals that are smaller than the firm subject to the rating adjustment.

In order to test the relationship between rivals' credit yield spreads and their relative size I include a set of dummy variables indicating whether the firm is larger than the downgraded or upgraded industry rival. Table 2.6 presents the results. I find that the intra-industry effect varies across the relative size of rival and announcing firms. Similar to Hsu, Reed, and Rocholl (2010) I find that firm downgrades create contagion effect on small industry rivals. It appears that smaller rivals are more vulnerable than their larger counterparts to credit rating downgrades. I find no effect on credit rating upgrades, which is consistent with my previous results.

2.4.4 Level of Competitiveness in the Industry

Next, I examine the effect of industry concentration on bond credit spread contagion. Brander and Lewis (1988) imply that industries with less competition should benefit more from financial deterioration of one of the firms in the industry because the remaining firms will be gaining more market power. Lang and Stulz (1992) shows that, in concentrated industries, bankruptcy filings have positive consequences for rivals. Hertzel and Officer (2012) find some that contagion is mitigated in concentrated industries. Therefore, I expect the effects of credit rating adjustments to be stronger in less concentrated, more competitive

industries.

In order to examine whether the level of competition has any effect on industry rivals of a company which ratings were upgraded or downgraded I divide the sample into two groups based on the Herfindahl-Hirchmann index (HHI). Table 2.7 presents the results of the effect of competitiveness of the market on the credit yield spreads response to credit rating changes.

2.4.5 Information Opacity

Higher information opacity reflects the lower amount of publicly available information. Firms covered by stock analysts are likely to be more informationally transparent. If other market participants, such as equity analysts, do not have access to information about the firm, the informational advantage of ratings agencies is enhanced (Jones, Lee, and McBrayer, 2015). Therefore, the effect of credit rating adjustments should be stronger for firms with no equity analyst following. I classify peer firms as transparent when the firm has at least one analyst, and opaque, if no analyst is following the firm (Bharath, Dahiya, Saunders, and Srinivasan, 2011).

Table 2.8 presents the results. Column 1 presents the results of the baseline regression for transparent firms and column 2 presents the results for the sample of opaque firms. I find that the bond credit spread is related to the opacity of the firms. Specifically, I find that the effect on the credit yield spread is significant only for downgrades for informationally opaque rivals. This is consistent with my prediction that informationally opaque firms will have a stronger reaction to credit rating adjustments of their industry rivals.

2.4.6 Rating of an Upgraded/Downgraded Firm

Next, I divide the downgraded companies into three subsamples based on the level of their bonds' pre- and post-adjustment bond rating. I distinguish between three groups. In group 1, both pre- and post-adjustment ratings are investment grade, regardless if I am analyzing downgrades or upgrades. For group 2, pre-downgrade rating for downgrades is investment grade and post-downgrade rating is non-investment grade. Conversely, for upgrades the pre-upgrade rating is non-investment grade and post-upgrade rating is investment grade. Finally, Group 3 is comprised of those bonds that are below investment grade in both the pre- and post-adjustment periods. The results are presented in Table 2.9 and Table 2.10.

Again, I begin by measuring the effect of a credit rating change on the downgraded or upgraded company itself. Table 2.9 presents the results. Column 2 shows that in contemporaneous regressions the bond - reacts to the news of a company credit rating being downgraded by increasing the bond yield spread. What is more, the effect is stronger if the company gets downgraded from investment to speculative grade. When a company gets upgraded, the credit spread decreases, again, the effect is stronger if the firm is upgraded from speculative to investment grade.

Table 2.10 presents the results for the rivals. The analysis shows that bond investors perceive downgrades of high-rated firms as reflecting new information regarding the conditions of an industry. The sign of the coefficient points to a contagion effect. On the other hand, it seems that the upgrade in the industry also results in an increase of credit yield spread for high rated firms and for firms that were upgraded from speculative to investment grade. This may be due to a competition effect, where a rival upgraded to investment grade status is perceived as a competitive threat to the firms in the industry.

Overall, the results suggest that investors perceive that credit rating adjustments, and especially downgrades, of high-rated firms reflect new information about general conditions

of the industry.

2.5 Conclusion

This article analyzes the information transfer effects of bond rating changes. Specifically, I study the effect of bond rating adjustments on the pricing of corporate bonds. Prior studies show that rating downgrades elicit significant stock and bond price responses of the downgraded firm. They also document a stock price response experienced by the competitors of the downgraded ore upgraded firm. This paper shows that rating changes in an industry are also priced in the bond market. Specifically, I find that the bond yield spreads of industry rivals are significantly higher if there has been a credit rating downgrade in the industry. This is only true for investment-grade firms, speculative-grade debt downgrades seem to have no effect on the industry rivals. Moreover, I find that the structure of the industry, relative size of the firm and whether the firm is being followed by equity analysts are also significant determinants of the bond yield change that occurred due to the credit rating downgrade of an industry rival.

Table 2.1: **Summary statistics**. This table reports mean, median, standard deviation, minimum and maximum of variables in my sample. Spread is bond yield based on the last price for a bond in the month minus the relevant end-of-month Treasury yield for the bond expressed in basis points. Maturity is bond maturity measured in days. Amount outstanding is the size of a bond issue that is outstanding. Book leverage is the book value of debt (DLTT + DLC) divided by total assets (AT). Market-to-book is calculated as [total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF × CSHO]/total assets (AT). Return on assets (ROA) is defined as EBITDA/Assets (OIBDP/AT). Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets (PPENT/AT). Firm size is the log of sales (SALE). The sample consists of 6216 firm-level observations of 1108 firms. The sample period covers years 1997 to 2011. Panel A includes all firms in the sample, Panel B include firms categorized as investment grade (credit rating of BBB or above) and Panel C includes firms categorized as speculative grade (credit rating of BBB- or below).

Panel A: Full sample (N=1107)

	count	mean	sd	min	p50	max
Corporate bond spread *(basis points)*	6,216	386	382	1.24	281	3,088
Change in log(SPREAD)	4,660	.0402	.662	-4.7	.0159	3.99
Maturity *(days)*	6,216	3,189	2,146	379	2,667	35,860
Coupon	6,216	7.64	1.68	1.68	7.41	14.5
Amount outstanding	6,216	1,565	3,272	.025	483	42,123
Total assets	6,216	11,633	28,110	57.3	3,746	479,921
Leverage	6,216	.36	.177	.000526	.331	.998
Market-to-book	6,216	1.55	.78	.513	1.33	9.17
Tangibility	6,216	.366	.25	.00169	.31	.965
ROA	6,210	.149	.0928	-.456	.141	.642
Analyst	6,216	.847	.36	0	1	1
HHI	6,180	.088	.0759	.017	.0645	.744
Observations	6216					

Panel B: Investment grade bonds (N=521)

	count	mean	sd	min	p50	max
Corporate bond spread *(basis points)*	2,698	198	233	1.24	140	2,922
Change in log(SPREAD)	2,057	.0243	.734	-4.7	-.0186	3.99
Maturity *(days)*	2,698	3,866	2,665	399	3,282	35,860
Coupon	2,698	6.65	1.37	1.68	6.63	14
Amount outstanding	2,698	2,371	4,166	.38	825	42,123
Total assets	2,698	19,575	35,480	57.3	8,174	448,507
Leverage	2,698	.28	.139	.000526	.26	.99
Market-to-book	2,698	1.85	.953	.57	1.58	9.17
Tangibility	2,698	.34	.223	.00205	.286	.961
ROA	2,698	.171	.0802	-.261	.163	.629
Analyst	2,698	.878	.328	0	1	1
HHI	2,683	.0899	.0835	.017	.0596	.744
Observations	2698					

Panel C: Speculative grade bonds (N=795)

	count	mean	sd	min	p50	max
Corporate bond spread *(basis points)*	3,518	531	410	41.1	431	3,088
Change in log(SPREAD)	2,603	.0527	.599	-2.13	.0311	2.78
Maturity *(days)*	3,518	2,670	1,439	379	2,483	17,919
Coupon	3,518	8.4	1.49	4.7	8.25	14.5
Amount outstanding	3,518	947	2,175	.025	350	41,395
Total assets	3,518	5,542	18,586	86	2,004	479,921
Leverage	3,518	.421	.179	.00163	.4	.998
Market-to-book	3,518	1.33	.512	.513	1.2	7.1
Tangibility	3,518	.387	.267	.00169	.346	.965
ROA	3,512	.132	.098	-.456	.123	.642
Analyst	3,518	.824	.381	0	1	1
HHI	3,497	.0865	.0694	.017	.0687	.744
Observations	3518					

Table 2.2: **Distribution of of rating adjustments by year.** This table shows the distribution of the sample of credit rating adjustments from Compustat by year.

Year	*Downgrades*	*Upgrades*	*Downgrade in ind*	*Upgrade in ind*	*Obs*
1996	0	0	0	0	20
1997	4	5	14	25	317
1998	27	27	90	126	385
1999	37	15	107	87	396
2000	33	16	127	84	338
2001	61	16	130	78	395
2002	72	22	171	92	475
2003	73	41	151	132	499
2004	59	40	155	146	479
2005	60	41	133	135	437
2006	67	48	173	157	442
2007	61	40	135	124	411
2008	59	38	72	87	361
2009	65	21	140	71	416
2010	33	55	114	161	442
2011	25	52	103	143	406

Table 2.3: **Distribution of of rating adjustments by rating level.** This table shows the distribution of the sample of credit rating adjustments from Compustat by rating level.

Rating	Downgrades	Upgrades	Downgrade in ind	Upgrade in ind	Obs	No of Firms
AAA	0	0	25	20	41	7
AA	3	3	37	32	95	18
AA-	9	3	21	15	78	29
A+	9	11	46	36	219	66
A	30	24	129	94	491	116
A-	37	29	115	94	370	120
BBB+	52	39	139	132	526	167
BBB	77	53	206	182	711	223
BBB-	73	47	139	120	575	201
BB+	65	60	114	127	434	172
BB	67	66	181	163	593	238
BB-	83	60	245	217	712	292
B+	80	48	172	164	606	262
B	71	20	111	125	363	182
B-	46	12	52	42	158	93
CCC+	15	2	13	13	38	31
CCC	8	0	11	8	24	17
CC	4	0	1	2	5	4
D	6	0	1	0	10	10

Table 2.4: **Bond credit spread changes.** Dummy variable *Firm downgrade* is assigned a value one if a firm has been downgraded in the fiscal year t. Dummy variable *Firm upgrade* is assigned a value one if a firm has been upgraded in the fiscal year t Competitor i belongs to the same industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. Book leverage is the book value of debt (DLTT + DLC) divided by total assets (AT). Market-to-book is calculated as [total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF $\times$ CSHO]/total assets (AT). Return on assets (ROA) is defined as EBITDA/Assets (OIBDP/AT). Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets (PPENT/AT). Firm size is the log of sales (SALE). Industry is defined using SIC3. Models include fixed effects (FEs) as indicated in the table footer. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) dlSPREAD		(2) dlSPREAD		(3) dlSPREAD		(4) dlSPREAD	
Industry downgrade (t-1)	0.0388**	(2.32)	0.0433**	(2.53)	0.0441**	(2.24)	0.0387**	(2.31)
Industry upgrade (t-1)	0.0139	(0.72)	0.0313	(1.46)	0.00789	(0.33)	0.0148	(0.76)
Firm downgrade (t-1)	-0.0677***	(-2.93)	-0.0697***	(-3.02)	-0.0701***	(-2.70)	-0.0645***	(-2.76)
Firm upgrade (t-1)	0.0337	(1.34)	0.0246	(0.97)	0.0378	(1.33)	0.0331	(1.30)
Industry downgrade (t)	-0.0232	(-1.24)	-0.0207	(-1.02)	-0.0232	(-1.00)	-0.0228	(-1.20)
Industry upgrade (t)	0.0155	(0.99)	0.0379**	(2.26)	0.0357*	(1.95)	0.0152	(0.97)
Firm upgrade (t)	-0.132***	(-6.43)	-0.138***	(-6.59)	-0.129***	(-5.18)	-0.129***	(-6.09)
Firm downgrade (t)	0.235***	(10.45)	0.225***	(9.93)	0.193***	(7.77)	0.234***	(10.30)
Leverage	-0.0235	(-0.66)	-0.0841*	(-1.96)	-0.447***	(-3.43)	-0.0190	(-0.47)
Market-to-book	-0.0144	(-1.56)	-0.00395	(-0.39)	0.0383*	(1.93)	-0.0121	(-1.15)
Tangibility	-0.0364*	(-1.80)	-0.0392	(-1.26)	-0.452***	(-3.04)	-0.0330	(-1.57)
Size	-0.00163	(-0.28)	-0.0102	(-1.47)	-0.0541**	(-2.20)	0.0000333	(0.01)
ROA	0.191**	(2.11)	0.189*	(1.91)	0.591***	(3.85)	0.177*	(1.85)
Log(amount outstading)	-0.00433	(-0.66)	0.00191	(0.25)	0.0233	(1.15)	-0.00474	(-0.69)
Log(maturity)	-0.0289**	(-2.23)	-0.0325**	(-2.34)	-0.0608**	(-2.12)	-0.0314**	(-2.34)
Coupon	-0.0150***	(-3.13)	-0.0143***	(-2.74)	-0.0745***	(-7.69)	-0.0149**	(-2.47)
D.Leverage	-0.0458	(-0.38)	-0.0210	(-0.17)	0.130	(0.93)	-0.0388	(-0.32)
D.Market-to-book	-0.00297	(-0.15)	-0.00958	(-0.47)	-0.0133	(-0.56)	-0.00383	(-0.19)
D.Tangibility	0.207	(1.33)	0.203	(1.30)	0.243	(1.39)	0.203	(1.30)
D.Size	0.0444	(1.13)	0.0442	(1.12)	-0.00984	(-0.18)	0.0455	(1.14)
D.ROA	-0.0145	(-0.13)	-0.0108	(-0.10)	-0.0568	(-0.42)	-0.00546	(-0.05)
D.Log(amount outstading)	-0.0380*	(-1.95)	-0.0419**	(-2.17)	-0.0569***	(-2.71)	-0.0391**	(-2.00)
D.Log(maturity)	0.0211	(0.75)	0.0253	(0.90)	0.0430	(1.35)	0.0222	(0.79)
D.Coupon	0.0208*	(1.67)	0.0198	(1.57)	0.0433***	(2.97)	0.0205	(1.64)
Constant	0.690***	(5.63)	0.595***	(4.56)	1.546***	(3.81)	0.433	(0.85)
Year FE	Yes		Yes		Yes		Yes	
Industry FE	No		Yes		No		No	
Rating FE	No		No		No		Yes	
Firm FE	No		No		Yes		No	
Observations	3520		3510		3520		3520	
Adjusted R^2	0.592		0.593		0.613		0.591	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.5: **Bond credit spread changes in investment grade vs. speculative rivals** Column 1 includes the sample of investment grade rival firms (rated BBB or above), whereas column 2 includes rival firms with speculative grade rating (rated BBB- or below). Dummy variable *Firm downgrade* is assigned a value one if a firm has been downgraded in the fiscal year t. Dummy variable *Firm upgrade* is assigned a value one if a firm has been upgraded in the fiscal year t Competitor i belongs to the same industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. Book leverage is the book value of debt (DLTT + DLC) divided by total assets (AT). Market-to-book is calculated as [total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF $\times$ CSHO]/total assets (AT). Return on assets (ROA) is defined as EBITDA/Assets (OIBDP/AT). Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets (PPENT/AT). Firm size is the log of sales (SALE). Industry is defined using SIC3. Models include fixed effects (FEs) as indicated in the table footer. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1)		(2)	
	Investment Grade		Speculative Grade	
Industry downgrade (t-1)	0.0358	(1.27)	0.0682***	(3.21)
Industry upgrade (t-1)	0.0181	(0.46)	0.0454**	(2.10)
Firm downgrade (t-1)	0.0442	(0.97)	-0.127***	(-4.67)
Firm upgrade (t-1)	0.0863*	(1.94)	-0.0252	(-0.93)
Industry downgrade (t)	-0.0222	(-0.58)	-0.0163	(-0.80)
Industry upgrade (t)	0.0511*	(1.88)	0.0279	(1.46)
Firm upgrade (t)	-0.115***	(-2.60)	-0.133***	(-5.72)
Firm downgrade (t)	0.192***	(5.37)	0.217***	(7.19)
Leverage	-0.0545	(-0.47)	-0.146***	(-2.99)
Market-to-book	-0.00783	(-0.53)	0.00392	(0.18)
Tangibility	-0.0489	(-0.72)	-0.0402	(-1.01)
Size	0.0138	(0.93)	-0.0237***	(-2.86)
ROA	0.150	(0.75)	0.243**	(2.19)
Log(amount outstading)	-0.0182	(-1.22)	0.0119	(1.16)
Log(maturity)	-0.0466*	(-1.96)	0.0105	(0.59)
Coupon	-0.0233	(-1.64)	-0.00436	(-0.67)
D.Leverage	-0.0547	(-0.22)	-0.0501	(-0.37)
D.Market-to-book	-0.00160	(-0.06)	-0.0296	(-0.96)
D.Tangibility	0.306	(1.07)	0.0418	(0.25)
D.Size	-0.0839	(-1.23)	0.0699	(1.64)
D.ROA	0.188	(0.72)	-0.00337	(-0.03)
D.Log(amount outstading)	-0.0518*	(-1.81)	-0.0225	(-1.04)
D.Log(maturity)	0.00422	(0.11)	0.0645*	(1.72)
D.Coupon	0.00164	(0.06)	0.0189	(1.47)
Constant	0.878***	(4.22)	0.135	(0.75)
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
Observations	1609		1901	
Adjusted R^2	0.563		0.674	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.6: **Relative size of rivals.** *Small rival* is a dummy variable taking a value of 1 the the rival firm is smaller than the firm subject to credit rating adjustment and 0 otherwise. *Large rival* is a dummy variable taking a value of 1 the the rival firm is larger than the firm subject to credit rating adjustment and 0 otherwise. Models include fixed effects (FEs) as indicated in the table footer. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) dlSPREAD	
Industry downgrade (t-1) x small rival	0.0410**	(2.44)
Industry downgrade (t-1) x large rival	0.0386*	(1.85)
Industry upgrade (t-1) x small rival	0.0370	(1.64)
Industry upgrade (t-1) x large rival	0.0264	(1.00)
Firm downgrade (t-1)	-0.0699***	(-3.13)
Firm upgrade (t-1)	0.0216	(0.84)
Firm upgrade (t)	-0.116***	(-5.92)
Firm downgrade (t)	0.215***	(9.75)
Leverage	-0.0820*	(-1.90)
Market-to-book	-0.00584	(-0.57)
Tangibility	-0.0365	(-1.19)
Size	-0.00814	(-1.11)
ROA	0.209**	(2.15)
Log(amount outstading)	0.00138	(0.18)
Log(maturity)	-0.0322**	(-2.32)
Coupon	-0.0142***	(-2.72)
D.Leverage	-0.0249	(-0.21)
D.Market-to-book	-0.00519	(-0.26)
D.Tangibility	0.189	(1.22)
D.Size	0.0442	(1.11)
D.ROA	-0.0163	(-0.15)
D.Log(amount outstading)	-0.0402**	(-2.08)
D.Log(maturity)	0.0251	(0.90)
D.Coupon	0.0194	(1.53)
Constant	0.599***	(4.56)
Year FE	Yes	
Industry FE	Yes	
Observations	3510	
Adjusted R^2	0.592	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.7: **Level of competitiveness in the industry.** Firms are classified as *competitive* if their HHI index is below the median and as *concentrated* if their HHI index is above the median for a given year. Models include fixed effects (FEs) as indicated in the table footer. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1)		(2)	
	Competitive		Concentrated	
Industry downgrade (t-1)	0.0912***	(3.47)	-0.00286	(-0.13)
Industry upgrade (t-1)	0.0160	(0.43)	0.0371	(1.54)
Firm downgrade (t-1)	-0.0834**	(-2.43)	-0.0509	(-1.60)
Firm upgrade (t-1)	0.0187	(0.50)	0.0279	(0.84)
Industry downgrade (t)	-0.0676**	(-2.09)	0.0210	(0.87)
Industry upgrade (t)	0.0257	(0.98)	0.0762***	(3.51)
Firm upgrade (t)	-0.132***	(-4.34)	-0.160***	(-5.23)
Firm downgrade (t)	0.199***	(5.73)	0.233***	(7.56)
Leverage	-0.0906	(-1.17)	-0.0958*	(-1.72)
Market-to-book	0.00292	(0.21)	-0.0156	(-1.00)
Tangibility	-0.0605	(-1.14)	-0.00382	(-0.09)
Size	-0.00907	(-0.61)	-0.0114	(-1.29)
ROA	0.123	(0.98)	0.320*	(1.86)
Log(amount outstading)	-0.00593	(-0.43)	0.0110	(1.03)
Log(maturity)	0.00848	(0.39)	-0.0755***	(-4.18)
Coupon	-0.00908	(-1.21)	-0.0174**	(-2.16)
D.Leverage	-0.0605	(-0.33)	0.0619	(0.39)
D.Market-to-book	-0.0358	(-1.37)	0.0436	(1.36)
D.Tangibility	0.202	(0.94)	0.145	(0.61)
D.Size	0.0674	(1.25)	0.0209	(0.36)
D.ROA	-0.0247	(-0.16)	-0.0604	(-0.35)
D.Log(amount outstading)	-0.0220	(-0.84)	-0.0583*	(-1.88)
D.Log(maturity)	0.0239	(0.55)	0.0350	(0.97)
D.Coupon	0.0248	(1.27)	0.0138	(0.83)
Constant	0.339	(1.60)	0.861***	(5.18)
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
Observations	1693		1806	
Adjusted R^2	0.547		0.636	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.8: **Bond credit spread changes by analyst following.** I classify peer firms as *transparent* if they have at least one analyst following on I/B/E/S and *opaque* otherwise. Column 1 presents the results for *transparent* firms and column 2 for *opaque* firms, respectively. The industry is defined using SIC3 Models include fixed effects (FEs) as indicated in the table footer. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics..

	(1)		(2)	
	Transparent		Opaque	
Industry downgrade (t-1)	0.0424**	(2.24)	0.0869*	(1.95)
Industry upgrade (t-1)	0.0288	(1.20)	0.0518	(1.04)
Firm downgrade (t-1)	-0.0558**	(-2.22)	-0.187***	(-3.05)
Firm upgrade (t-1)	0.0356	(1.28)	-0.0633	(-0.97)
Industry downgrade (t)	-0.0249	(-1.10)	0.00950	(0.21)
Industry upgrade (t)	0.0312*	(1.73)	0.0811*	(1.70)
Firm upgrade (t)	-0.148***	(-6.41)	-0.0779	(-1.55)
Firm downgrade (t)	0.214***	(8.73)	0.271***	(5.09)
Leverage	-0.101**	(-2.09)	0.0853	(0.66)
Market-to-book	-0.00391	(-0.36)	0.0221	(0.56)
Tangibility	-0.0492	(-1.28)	-0.0335	(-0.40)
Size	-0.0130	(-1.58)	0.000806	(0.06)
ROA	0.203*	(1.95)	0.0954	(0.28)
Log(amount outstading)	0.00128	(0.15)	0.0156	(0.78)
Log(maturity)	-0.0295**	(-1.97)	-0.0720	(-1.47)
Coupon	-0.0159***	(-2.81)	-0.00810	(-0.38)
D.Leverage	-0.00167	(-0.01)	-0.0568	(-0.22)
D.Market-to-book	-0.00714	(-0.32)	-0.00301	(-0.06)
D.Tangibility	0.292	(1.64)	-0.00235	(-0.01)
D.Size	0.0170	(0.44)	0.256***	(2.68)
D.ROA	0.0491	(0.41)	-0.353	(-1.08)
D.Log(amount outstading)	-0.0299	(-1.41)	-0.143***	(-4.02)
D.Log(maturity)	0.00523	(0.17)	0.178***	(2.73)
D.Coupon	0.0284**	(2.06)	-0.0289	(-1.26)
Constant	0.618***	(4.28)	0.517	(1.13)
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
Observations	3043		467	
Adjusted R^2	0.572		0.725	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.9: **Classification of S&P's bond rating adjustments. Adjusted firms.** *Group 1*: changes within investment grade, *Group 2*: changes from investment grade to speculative grade, *Group 3*: changes within speculative grade. Models include fixed effects (FEs) as indicated in the table footer. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) dlSPREAD	
Group 1: Downgrade within investment grade	0.101***	(3.03)
Group 2: Downgrade from investment to speculative grade	0.258***	(5.72)
Group 3: Downgrade within speculative grade	0.169***	(6.59)
Group 1: Upgrade within investment grade	-0.0804*	(-1.93)
Group 2: Upgrade from investment to speculative grade	-0.0964**	(-2.27)
Group 3: Upgrade within speculative grade	-0.0785***	(-3.98)
Leverage	0.0239	(0.68)
Market-to-book	-0.0190**	(-2.20)
Tangibility	-0.00145	(-0.05)
Size	0.00176	(0.30)
ROA	-0.0538	(-0.78)
Log(amount outstading)	-0.0161**	(-2.51)
Log(maturity)	0.0178	(1.49)
Coupon	0.00145	(0.32)
D.Leverage	0.656***	(6.37)
D.Market-to-book	-0.0997***	(-4.22)
D.Tangibility	0.636***	(4.72)
D.Size	0.0101	(0.38)
D.ROA	-0.562***	(-5.44)
D.Log(amount outstading)	0.00710	(0.39)
D.Log(maturity)	0.106***	(3.66)
D.Coupon	0.0747***	(6.25)
Constant	0.301***	(2.66)
Year FE	Yes	
Industry FE	Yes	
Observations	4530	
Adjusted R^2	0.584	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.10: **Classification of S&P's bond rating changes. Rival firms.** *Group 1*: changes within investment grade, *Group 2*: changes from investment grade to speculative grade, *Group 3*: changes within speculative grade. Models include fixed effects (FEs) as indicated in the table footer. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) dlSPREAD	
Group 1: Downgrade within investment grade	0.0666**	(2.36)
Group 2: Downgrade from investment to speculative grade	-0.0183	(-0.46)
Group 3: Downgrade within speculative grade	-0.0293	(-1.14)
Group 1: Upgrade within investment grade	0.0868**	(2.40)
Group 2: Upgrade from investment to speculative grade	0.0427	(1.06)
Group 3: Upgrade within speculative grade	0.0126	(0.37)
Leverage	0.00124	(0.02)
Market-to-book	-0.0240*	(-1.68)
Tangibility	0.0299	(0.68)
Size	0.00289	(0.30)
ROA	-0.0688	(-0.58)
Log(amount outstading)	-0.0121	(-1.09)
Log(maturity)	-0.0313*	(-1.81)
Coupon	-0.0180***	(-2.70)
D.Leverage	0.0641	(0.44)
D.Market-to-book	-0.0270	(-1.01)
D.Tangibility	0.239	(1.22)
D.Size	-0.00655	(-0.15)
D.ROA	0.00167	(0.01)
D.Log(amount outstading)	-0.0578**	(-2.35)
D.Log(maturity)	0.0457	(1.35)
D.Coupon	0.0155	(0.87)
Constant	0.721***	(4.37)
Year FE	Yes	
Industry FE	Yes	
Observations	2692	
Adjusted R^2	0.565	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.11: Main Variable Descriptions

Variable	Description
Spread	Bond yield based on the last price for a bond in the month minus the relevant end-of-month Treasury yield for the bond.
Bond size	Amount outstanding of a bond issue.
Bond maturity	Bond maturity measured in days.
Total assets	Total book assets in billions USD.
Tangibility	Net property, plant and equipment divided by total assets.
Profitability	Operating income before depreciation divided by total assets.
Market-to-book	(Debt in current liabilities + total long-term debt + preferred stock carrying value deferred taxes and investment tax credit + stock price at the end of quarter x common shares outstanding) divided by total assets.
Leverage	(Debt in current liabilities + total long term debt) divided by total assets.
S&P Rating	S&P rating at the bond level. Ratings are converted to an ordinal scale of 1-22, with 22 being the highest rated bond and 1 being the lowest rated bond.
Analyst	1 id the firm is followed by at least one analyst in I/B/E/S in the fiscal year prior to the event year, 0 otherwise.
HHI	Herfindahl-Hirschmann Index computed using Compustat firms. It is defined as the sum of squared market shares. Market shares are computed using firms' sales.

Chapter 3

Information Transfer Effects and Leverage

3.1 Introduction

This paper examines the relationship between a firm's capital structure and the credit rating changes of its industry rivals. A survey of CFOs confirms that some firms are not only concerned about their own debt levels but also concerned about the debt levels of their competitors (Graham and Harvey, 2001). If this is true, we would expect to find that credit rating changes have an intra-industry effect. The objective of this paper therefore is to analyze empirically whether managers factor in credit rating changes of rival firms when making leverage decisions. The main finding of this paper is that a credit rating downgrade of one firm is associated with subsequent leverage reductions of other firms in the industry.

A credit rating is an evaluation of the long-term creditworthiness of a firm, which can be characterized as a subjective probability of default. Bond rating agencies claim their ratings incorporate private information on the rated companies that is unavailable to other

market participants (Ederington, Yawitz, and Roberts, 1987). In addition to incorporating various quantitative credit factors, rating agencies include qualitative measures such as the competitiveness of the company within the industry or the quality of the firm's management (Hovakimian, Kayhan, and Titman, 2012). Ratings appear to provide valuable assessment of firm's ability to manage debt because the rating agencies specialize in collecting and evaluating information about corporate creditworthiness (Kisgen, 2007).

Indeed, empirical findings confirm that bond ratings are have an information effect such that changes in the bond rating of a company has observable effects. Both stock and bond markets react to credit rating adjustments of firms (Hand, Holthausen, and Leftwich, 1992; Ederington, Yawitz, and Roberts, 1987; Ederington and Goh, 1998). Moreover, a firm's credit rating adjustments were also found to directly affect capital structure decisions of its managers. Firms expecting a ratings downgrade were found to issue approximately 1.0% less net debt relative to net equity annually as a percentage of total assets than firms not expecting a downgrade (Kisgen, 2006).In addition, after firms experienced downgrades they have been shown to respond by actually reducing their leverage (Kisgen, 2009).

The literature also confirms the existence of an intra-industry effect with respect to bond ratings adjustments. When the bond rating of one firm changes, other companies in the same industry are affected. Thus, the information of a firm's bond rating change will not only be company specific, but also industry-specific, as unexpected news about a given firm may reveal relevant information about its competitors' prospects. Akhigbe, Madura, and Whyte (1997) explore the potential secondary impact of bond rating changes on stock returns. They find that downgrades, in addition to being bad news for the downgraded company, are also bad news on average for the industry. Specifically, the stock market responds to the downgrade of one company in an industry by demanding lower prices on stocks from other firms in that industry.

To date, there has been a considerable amount of research produced that investigates similar intra-industry information transfer effects across firms for other corporate events such as bankruptcies, mergers and acquisitions, initial and seasoned equity issues, earnings announcements and stock repurchases. Most of the literature explores the intra-industry effect as a market response. Lang and Stulz (1992), Ferris, Jayaraman, and Makhija (1997), Hertzel, Li, Officer, and Rodgers (2008) and Jorion and Zhang (2007a, 2009) examine the spillover effects of distress. They document that a bankruptcy of a given firm is associated with negative equity returns for industry rivals(as well as suppliers and creditors). Schweitzer, Szewczyk, and Varma (2001) show that announcements of bank debt downgrades are associated with statistically significant negative stock price responses for non-downgraded banks.

This paper is similar to Akhigbe, Madura, and Whyte (1997) in that both examine the intra-industry impact of bond rating changes. However, whereas their paper employs an event study methodology to study the stock market reaction to rivals' rating downgrades, I examine leverage changes to test whether the firms themselves react to the credit rating changes by adjusting their capital structure. This paper is also similar to Kisgen (2009) in that it examines leverage changes in relation to bond rating announcements. However, Kisgen's paper examines the leverage changes of the firms whose rating was adjusted, I investigate whether the adjustment has a spillover effect on industry rivals.

In summary, my paper is the first to provide evidence on how credit rating adjustments by an industry rival affect leverage. I provide evidence that firms reduce their leverage after a rival (or multiple rivals) experiences a credit rating downgrade. My findings also contribute and extend the research on industry contagion. Whereas most studies focus on short run stock market effects of industry contagion, this paper provides a different approach by looking at the leverage adjustments and debt/equity issuance decisions.

The remainder of the paper is organized as follows. Section 3.2 develops the hypotheses. Section 3.3 introduces the data, presents the summary statistics, and describes the empirical strategy. Section 3.4 presents the main results and sensitivity tests. Section 3.5 presents the paper's conclusions.

3.2 Hypothesis Development

The major concern of this study is whether the change in credit rating agency's assessment of an issuer's creditworthiness will affect the leverage of its industry peers. This effect will depend on the direction of the assessment change, the company and the industry.

Kisgen (2009) find that firms reduce their leverage after their credit rating has been downgraded. This is because managers, who have been shown to care about maintaining better ratings (Kisgen, 2006), will alter capital structure and reduce leverage after downgrades in an attempt to restore their target rating. This may be achieved by issuing equity rather than debt or reducing debt rather than equity. These actions appear to be designed to avoid downgrades and to achieve upgrades. The rivals of the downgraded firm, if they are also rated, may become worried of sharing the fate of the affected firm and alter their capital structure to prevent such downgrade from happening.

However, not all firms are rated. In fact, only about a quarter of my sample of firms has a credit rating. Nonetheless, this does not mean that these unrated companies should not be affected by a rival credit rating adjustment. Credit rating changes may release information about the state of that firm's industry, as well as the industries of its suppliers or its customers (Lang and Stulz, 1992; Jorion and Zhang, 2007a). These spillover effects arise through an information channel, where the credit rating change of a given firm reveals positive or negative information about pre-existing issues at other firms. Moreover,

the credit rating change may directly transmit costs (or benefits) along the supply chain in the form of increased or decreased credit risk. Such risk contagion can arise from counterparty risk when the poor financial standing of one firm causes financial distress on entities with which it has close business ties or which have financial claims (Jorion and Zhang, 2009; Hertzel, Li, Officer, and Rodgers, 2008). Thus, to examine whether credit rating adjustments have a spillover effect on industry rivals, I formulate the following hypothesis:

Hypothesis 1: The credit rating downgrade/upgrade of a firm is likely to induce industry rivals to decrease/increase their leverage.

Most research on response to credit rating adjustments finds dominant contagion effect. Contagion implies that a negative credit event will impact industry rivals negatively. The opposite of the contagion effect is competition effect, which implies that a negative credit event for one firm will positively impact this firm's industry rivals. This is because these rivals may benefit from any resulting reduction in the number of competitors and increase in their market power (Platt, 2015). These effects are not mutually exclusive. A bond rating change announcement may be good news to some industry competitors and bad news for others. Lang and Stulz (1992) explore bankruptcy filings and find that in concentrated industries such extreme credit events can have positive consequences for the rivals resulting from increased market power and/or market share. Hertzel and Officer (2012) also finds that contagion in loan spreads is mitigated in concentrated industries. Therefore, my second hypothesis is as follows:

Hypothesis 2: Firms operating in more competitive industries will be more likely to adjust their leverage downward as a response to a credit rating downgrade of a rival firm.

3.3 Methodology and Descriptive Statistics

I test the impact of credit rating changes on capital structure decisions using the following models: First, I use the partial adjustment model of capital structure as defined in Kisgen (2009) and Flannery and Rangan (2006). Second, I use the debt-equity choice framework as conducted in Hovakimian, Opler, and Titman (2001). Additionally, I use the regressions of net capital issuance as employed by Graham (1996) and Kisgen (2009). Using alternate frameworks allows me to verify the robustness of the rating effects.

3.3.1 Sample

The sample is constructed from all firms available in Compustat and the stock return data is from CRSP. Firms in the financial sector (SIC codes 6000-6999) and utilities (SIC codes 4900-4999) are not included in the sample because their capital structures are likely to be very different from other firms in my sample. In addition, I restrict the sample to include only firms with book value of assets above $1 million. To limit the influence of outliers, all ratio variables are trimmed at the top 1% and, for variables that take on negative values, the bottom 1% of their values, with exception of book debt ratio, which is trimmed to exclude observations with book debt ratios of one and higher. Observations with missing values of the relevant variables are also excluded. The resulting sample consists of 72,503 observations.

Equity issues and repurchases are defined using the methodology in Hovakimian et al. (2001). A firm is defined as issuing (repurchasing)equity when net equity issued (repurchased) for cash divided by the book value of assets exceeded 5%.

My measure of credit rating is the S&P long term issuer rating, which was extracted from Compustat. For letter credit ratings I apply a scale from 1 to 22, with AAA rating assigned a 22 and Selected Default (SD) a 1.

Table 1 Panel A presents the time series of credit rating adjustments in my final sample. As my study covers a period from 1987 to 2012, it includes periods dominated by both downgrades and upgrades. Therefore, the sample is not biased towards a particular direction of the market. Panel B shows the distribution of credit rating adjustments by industry of the downgraded or upgraded firm. The industries are defined using Fama and French's 12 broad categories.[1] The credit rating adjustments are distributed across a variety of industries, with slight concentrations in manufacturing and wholesale and retail.

Table 2 presents the percentage of firm years that have debt and equity issuance and repurchase activity, with firm-years separated by the previous year's change in rating. Issuance and repurchase is defined as a net amount greater than 5% of the beginning of period assets, as in Hovakimian et al. (2001). The table indicates that rivals of downgraded firms are less likely to issue debt and more likely to issue equity. The rivals of upgraded firms are more likely to issue debt and equity and less likely to repurchase debt.

Table 3 presents the descriptive statistics for the variables used in this study. Book leverage is the book value of debt (DLTT + DLC) divided by total assets (AT). Market leverage is the market value of debt (DLTT + DLC) divided by total assets (total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF $\times$ CSHO). Market-to-book is calculated as [total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF $\times$ CSHO]/total assets (AT). Return on assets (ROA) is defined as EBITDA/Assets (OIBDP/AT). Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets (PPENT/AT). Firm size is the log of sales (SALE). The stock return is measured as the percentage return over the last year. R&D expenses is the ratio of research and development expenses to sales (XRD/SALE). R&D Dummy is a dummy variable equal to one if the R&D expense is larger than zero.

[1]For details, see Ken French's data library website: {http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data.library.html

3.3.2 Specifications

I test for the impact of rating changes on capital structure decisions within two different capital structure empirical frameworks. The first framework is the partial adjustment model of capital structure as formulated in Flannery and Rangan (2006) and adopted by Kisgen (2009) in his credit rating impact on downgraded/upgraded firm's leverage regressions. The second framework is regressions of net capital issuance and debt-equity choice.

The model from Flannery and Rangan (2006) is modified to examine the incremental effects of rating changes of rivals by directly including rating changes of rivals' dummies in this equation:

$$DR_{i,t+1} - DR_{i,t} = \lambda\beta X_{i,t} - \lambda DR_{i,t} + \phi_1 DOWNIND_{i,t} + \phi_2 UPIND_{i,t} + \epsilon_{i,t} \tag{3.1}$$

DOWNIND and *UPIND* are dummy variables equal to 1 if the firm in an industry was downgraded or upgraded the previous year, respectively. Industry is defined using SIC4 codes. Lagged changes in ratings are used to reduce potential endogeneity issues. The set of independent variables X includes firm size, market-to-book, asset tangibility, profitability, research and development expenses (R&D), R&D indicator, industry median leverage ratio and stock return.

The second set of tests implements the following regressions:

$$NetDI_{i,t} = \alpha + \phi_1 DOWNIND_{i,t-1} + \phi_2 UPIND_{i,t-1} + \beta X_{i,t-1} + \epsilon_{i,t} \tag{3.2}$$

Net debt issuance *(NetDI)* is a measure that identifies direct capital market activity decisions of managers. It is defined as the firm's leverage-changing capital market decision at time t, equal to a firm's net debt issuance minus net equity issuance divided by assets. Specifically,

net debt issuance is long-term debt issuance minus long-term debt reduction plus changes in current debt, and net equity issuance is the sale of common and preferred stock minus the purchase of common and preferred stock (Leary and Roberts, 2005; Kisgen, 2006, 2009).

Next, following Hovakimian (2004) I estimate binomial logistic regressions to model the choice between debt and equity, given the firm's decision to issue (repurchase) securities.

3.4 Empirical Results

Table 3.4 presents the results of tests using the model of Flannery and Rangan (2006) and replicates the analysis in Table 3 of Kisgen (2009). The control variables include profitability, M/B ratio, depreciation, size of the firm, stock return, fixed assets, R&D expense and R&D indicator dummy. The book debt ratio is defined as the book value of debt divided by the book value of debt plus book value of equity. The market debt ratio is defined as the book value of debt divided by the book value of debt plus the market capitalization of equity. The sample includes all available firms from Compustat for which the SIC code is available.

Column 1 of Table 3.4 includes dummy variables indicating whether the credit rating of industry rival was upgraded or downgraded in the previous year. The downgraded or upgraded firm is not included. The coefficient on the downgrade in the industry variable is negative and statistically significant. The coefficient suggests that the firms whose industry rival got downgraded reduce their leverage by 0.4% compared to other firms. To put this number in perspective, Kisgen (2009) finds that downgraded firms reduce their market leverage by 1.4% compared to other firms. Column 2 includes firm fixed effects into the regression, and confirm the results from Column 1. Columns 3-4 repeat the analysis from columns 1-2 using market leverage instead of book leverage and report similar results. These results indicated that the downgrades of industry rivals affect subsequent leverage behavior.

The upgrade of a rival firm does not seem to have a significant impact on the leverage of the firms in the industry in book leverage regressions. In market leverage regressions in Columns 3 coefficient is positive and significant, however, after adding firm fixed effect the coefficient becomes insignificant. This is consistent with the literature on the effects of credit rating adjustments that consistently finds much weaker or insignificant responses of rival firms to credit rating upgrades (Akhigbe et al., 1997).

Results of the regression of Equation (3.2) are given in Table 3.5. Two separate tests are conducted, one is using the changes in book and market leverage with assets in *NetDI* variable calculated according to the measure used in the corresponding regression. The explanatory variables have been chosen have been shown to predict capital structure behavior and are consistent with literature. The results indicate that firms in the industries that experienced credit rating downgrade in a given year issue nearly 0.5% less net debt minus net equity as a percentage of total assets the following year. Again, as a matter of comparison, Kisgen (2009) shows that a downgraded firm issues 4% less debt relative to net equity then other firms.

Table 3.6 reports the estimation results of the logit regressions of the choice between issuing equity versus debt and the choice between repurchasing equity versus retiring debt. The dependent variable is equal to one for equity issues (repurchases) and zero for debt issues (reductions). The results for credit rating downgrades are consistent with the hypothesis that rivals of firms which experience a credit rating downgrade are reducing their leverage. The coefficient estimate for *Downgrade(ind)* dummy is positive in Column 1, which indicates that firms which rivals were downgraded are less likely to issue debt vs.equity. The coefficient is statistically significant at the 1% level. In Column 2, the coefficient for *Downgrade(ind)* dummy is negative, implying that the rival firms are more likely to retire debt than repurchase equity. However, this coefficient estimate is insignificant.

Taken together, the results strongly suggest that industry rivals of downgraded firms decrease their leverage in the subsequent period. The result is robust to alternative specifications and statistically significant in all estimations. The upgrade variable is not significant across specifications which implies that there is no measurable response of industry rivals' leverage decisions to another firm's credit rating upgrade.

3.4.1 Industry Concentration

Having established that credit rating downgrades illicit subsequent leverage reductions of industry rivals, I conduct additional tests aimed at understanding more about which firms respond to industry rivals credit rating adjustments, as well as the reasons for this finding.

First, I examine the effect of industry concentration on the leverage response to credit rating change. Lang and Stulz (1992) find that bankruptcy filings in concentrated industries can have positive consequences for rivals because of increased market share or power.[2] Consistent with Lang and Stulz (1992) and Hertzel and Officer (2012), I find that the contagion of increased bankruptcy risk is mitigated in concentrated industries. This is consistent with the hypothesis that negative credit events in concentrated industries can have positive consequences for rivals as they potentially increase their market share and/or market power. Brander and Lewis (1988) also predict that industries with less competition should benefit more from the collapse of one of the firms because the remaining firms will have more market power. Therefore, negative effects of credit rating downgrades should be stronger when the industry is less concentrated.

To measure industry concentration, I use the Herfindahl-Hirshmann Index (HHI) of the

[2]Lang and Stulz (1992) look at the effects of a firm's bankruptcy announcement on its industry rivals and find two distinct types of effects, *contagion* and *competition*. *Contagion* implies that a negative credit event will impact industry rivals negatively, since the event will reveal new information about negative shocks to cash flows that are common across the industry.

industry. The HHI is computed as the sum of squared market shares,

$$HHI_{jt} = \sum_{i=1}^{N_j} s_{ijt}^2 \tag{3.3}$$

where s_{ijt} is the market share of firm i in industry j in year t. Market shares are computed from Compustat using firms' sales (Giroud and Mueller, 2011). When computing the *HHI*, I use all available Compustat firms that have available SIC codes. I exclude firms for which sales are missing or negative. *HHI* a is widely used measure in the empirical industrial organization literature as a proxy for the intensity of product market competition. It is also routinely used by government agencies. A higher *HHI* implies weaker competition. I classify industries using four-digit SIC industries (Kahle and Walkling, 1996).

Table 3.7 presents the model from Equation (3.2) on a split sample by concentration. *Low* concentration is the lowest quartile of firms ranked by *HHI*. *High* concentration is the highest *HHI* quartile (Valta, 2012). The main variable of interest, Downgrade(ind) is negative and significant at the 1% level for the *Low* concentration sample and insignificant, and also smaller in magnitude, for the *High* concentration sample. This confirms the hypothesis that firms operating in more competitive industries will be more likely to adjust their leverage downwards as a response to a credit rating downgrade of a rival firm.

3.4.2 Bond Market Access and Size

The tradeoff theory of capital structure states that each firm chooses its optimal capital structure by comparing the costs and benefits of issuing new debt versus issuing new stock. The theory is based on the assumption that there is an infinite supply of capital. However, Faulkender and Petersen (2006) show that, in practice, firms that lack access to the public debt markets are more restricted in their ability to borrow and therefore have lower leverage

ratios than firms with such access. Specifically, they show that U.S. firms with public bond market access have about six to eight percentage points higher leverage ratios than firms without such access. This result reflects the reasoned assumption that firms with bond market access will have higher leverage compared to firms without access because lenders are more willing to provide more funds and/or these firms can access a cheaper source of capital. For these firms a downgrade of their own credit rating will not only increase their borrowing costs but potentially signal weakness to the market and, as a consequence, affect their stock price. Therefore, it is reasonable to expect that rated firms' leverage will be affected by credit rating downgrades of industry rivals.

However, the results are perplexing. I find that rivals of downgraded companies that do not have access to the public bond markets as proxied by the existence of a bond credit rating for that company, experience a significant negative leverage response to credit rating downgrades, while rivals of downgraded companies that do have access to public bond markets, do not exhibit a strong response to the credit ratings' adjustments of rivals.

The explanation for this phenomenon can be two-fold. For example, rated firms may wish to maintain sub-optimal leverage to begin with, due to their greater concern of rating downgrades. Therefore, there is less need to worry about the downgrades of rival firms. The second reason could be the size of the company in question. Platt (2015) and Hsu, Reed, and Rocholl (2010) find that the intra-industry effect of credit rating downgrades on the cost of corporate debt varies across the relative size of the rival and downgraded firms. It appears that smaller rivals are more vulnerable than their larger counterparts to credit events in the industry.

3.4.3 Adjustment Speed

Lastly, a number of recent studies, such as Warr et al. (2012), Leary and Roberts (2005), Byoun (2008) and Faulkender et al. (2012) show that there is an asymmetry is the speed

of adjustment such that overlevered firms (with actual leverage ratio above the optimal leverage ratio) adjust more rapidly than underlevered firms (with actual leverage ratio below the optimal leverage ratio). I tested if overlevered firms decrease their leverage more as a response to a credit rating downgrade of an industry rival than underlevered firms. Table 3.11 shows that overlevered firms adjust their leverage more and that the coefficient on the variable of interest Downgrade(ind) is more significant.

3.5 Conclusion

Prior research into intra-industry information transfer focuses mostly on stock price reactions and changes of the CDS spreads of industry rivals. In this paper I expand the literature by considering how leverage ratios are affected by the credit rating changes of industry rivals. I specifically explore whether the changes in credit ratings of industry rivals affect firm's capital structure decisions. I find that a credit rating downgrade is associated with subsequent leverage reductions by rival firms in the industry. This result is robust to several different specifications. I also find that firms operating in more competitive environments are more likely to decrease their leverage as a response to the downgrade of an industry rival. Also unrated, smaller companies are more likely to be subject to such adjustment as opposed to larger, rated firms.

A question that is left for future research to explore is whether credit rating downgrades affect competitors in a causal manner, or whether the effect I observe is purely a reflection of new information available about an industry, or both. A study which disentangles these two effects could be a potential follow up to this study.

Table 3.1: **Distribution of Credit Rating Upgrades and Downgrades by Year and Industry.** This table shows the distribution of the sample of credit rating adjustments for the sample from 1988 to 2012. The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Year is the year when the credit rating adjustment occured. Industry is defined using the Fama and French 12-industry categorization.

Panel A: Credit rating adjustments - time series

Year	Downgraded	Upgraded	Downgrade in industry	Upgrade in industry	Number of observations
1988	79	62	776	397	3,409
1989	55	69	643	394	3,363
1990	85	41	1,065	383	3,369
1991	82	55	848	560	3,453
1992	56	71	545	749	3,656
1993	57	79	617	958	3,853
1994	50	51	754	487	4,013
1995	67	95	944	1,151	4,340
1996	63	75	924	797	4,598
1997	59	91	721	920	4,521
1998	81	92	1,048	1,039	4,273
1999	111	48	1,244	326	3,936
2000	134	59	1,604	518	3,842
2001	185	54	1,894	409	3,838
2002	176	52	1,845	358	3,677
2003	141	83	1,197	626	3,483
2004	94	78	958	816	3,335
2005	114	91	839	728	3,232
2006	108	88	742	661	3,096
2007	109	94	632	972	3,007
2008	144	92	875	824	2,956
2009	149	60	929	648	2,865
2010	55	157	255	1,251	2,713
2011	50	126	357	810	2,333
Total	2,304	1,863	22,256	16,782	88,680

Panel B: Credit rating adjustments - industry

Industry		Number of downgrades	Number of upgrades
1	Consumer nondurables	214	118
2	Consumer durables	144	83
3	Manufacturing	458	329
4	Energy	118	149
5	Consumer nondurables	130	94
6	Business equipment	209	212
7	Telecom	162	129
9	Wholesale, retail	354	306
10	Healthcare	96	133
12	Other	419	310
Total		2304	1863

Table 3.2: **Descriptive Statistics.** This table presents the summary statistics of the sample. Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Book leverage is the book value of debt (DLTT + DLC) divided by total assets (AT). Market leverage is the market value of debt (DLTT + DLC) divided by total assets (total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF × CSHO). Market-to-book is calculated as [total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF × CSHO]/total assets (AT). Return on assets (ROA) is defined as EBITDA/Assets (OIBDP/AT). Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets (PPENT/AT). Firm size is the log of sales (SALE). The stock return is measured as the percentage return over the last year. R&D expenses is the ratio of research and development expenses to sales (XRD/SALE). A dummy variable equal to one if the R&D expense is larger than zero.

	count	mean	sd	min	p25	p50	p75	max
Downgrade(ind)	72,503	.261	.439	0	0	0	1	1
Upgrade(ind)	72,503	.195	.397	0	0	0	0	1
Book Leverage	72,503	.216	.198	0	.0306	.184	.341	1
Market Leverage	72,503	.171	.176	0	.0159	.119	.27	.992
Market-to-Book	72,503	1.79	1.22	.166	1.05	1.39	2.06	9.85
ROA	72,503	.115	.158	-.701	.0524	.128	.2	.641
Tangibility	72,503	.275	.22	0	.103	.214	.389	.991
Sales	72,503	1,655	9,113	1.02	41.6	164	681	444,948
Assets - Total	72,503	1,695	9,142	1	39.3	150	643	448,507
Return	72,503	.16	.861	-.996	-.263	.0279	.36	48.3
RD	72,503	.0539	.128	0	0	0	.0534	1.36
RD Dummy	72,503	.647	.478	0	0	1	1	1
Observations	72503							

Table 3.3: **Debt and Equity Decisions of Rivals Following Rating Changes.** Percentage of firm-years in which the firm undertakes the indicated market activity given the change in rating of industry rival(s) in the previous year. The firms directly subject to upgrade/downgrade are excluded. Issuance and reduction are defined as a net issuance or reduction greater than 5% of beginning of period assets as in Hovakimian et al. (2001)). The indicated change in rating is as of the year prior to the capital structure decision. The sample includes all firms from Compustat excluding financials and utilities.

Downgrades	**d**	**dr**	**e**	**er**
No downgrade	.2547099	.1783161	.1552145	.0516555
Downgrade	.2399985	.1791999	.1409522	.0449955

Upgrades	**d**	**dr**	**e**	**er**
No upgrade	.2436315	.1855244	.1468596	.0463932
Upgrade	.2634945	.1641292	.1668305	.0563861

Table 3.4: **Leverage Changes Following Credit Rating Change in an Industry.** The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Book leverage is the book value of debt (DLTT + DLC) divided by total assets (AT). Market leverage is the market value of debt (DLTT + DLC) divided by total assets (total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF $\times$ CSHO). Market-to-book is calculated as [total assets (AT) - book value of equity (CEQ) + market value of equity (PRCCF $\times$ CSHO]/total assets (AT). Return on assets (ROA) is defined as EBITDA/Assets (OIBDP/AT). Tangibility is the ratio of fixed assets (property, plant, and equipment)to total assets (PPENT/AT). Firm size is the log of sales (SALE). The stock return is measured as the percentage return over the last year. R&D expenses is the ratio of research and development expenses to sales (XRD/SALE). A dummy variable equal to one if the R&D expense is larger than zero. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) dLEVB	(2) dLEVB	(3) dLEVM	(4) dLEVM
Downgrade(ind)	-0.00420**	-0.00243*	-0.00464**	-0.00363**
	(-4.42)	(-2.34)	(-5.31)	(-3.85)
Upgrade(ind)	0.00185	0.00105	0.00319**	0.0000623
	(1.81)	(0.93)	(3.40)	(0.06)
Book Leverage	-0.133**	-0.379**		
	(-42.68)	(-63.44)		
Market Leverage			-0.142**	-0.407**
			(-43.93)	(-65.76)
Market-to-Book	0.0000966	-0.000569	-0.000406	0.000679
	(0.23)	(-0.89)	(-1.42)	(1.58)
ROA	-0.0276**	-0.0142**	-0.00137	0.00135
	(-7.63)	(-2.79)	(-0.51)	(0.34)
Tangibility	0.0257**	0.0563**	0.0211**	0.0630**
	(9.22)	(7.80)	(8.03)	(9.52)
Size	0.000949**	0.00559**	0.000510**	0.0129**
	(4.60)	(7.43)	(2.74)	(18.68)
Return	-0.00303**	-0.00316**	0.00274**	-0.00123**
	(-5.68)	(-5.82)	(6.16)	(-3.02)
RD	-0.0109*	0.00263	-0.0131**	-0.00538
	(-2.44)	(0.31)	(-4.45)	(-1.05)
RD Dummy	-0.00661**	-0.00411	-0.00789**	-0.00153
	(-6.23)	(-1.52)	(-7.80)	(-0.60)
Constant	0.0373**	0.0487**	0.0310**	-0.00768
	(6.22)	(9.40)	(5.59)	(-1.62)
Industry FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Observations	71572	71871	71688	71988
Adjusted R^2	0.053	0.174	0.060	0.192

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$

Table 3.5: **Net Debt Changes.** Net debt raised for the year minus net equity raised for the year divided by beginning of year total book (column 1) or market (column 2) assets on credit rating change in the industry dummy variables and on various explanatory variables. The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) NetDIb	(2) NetDIb	(3) NetDIm	(4) NetDIm
Downgrade(ind)	-0.00530**	-0.00548**	-0.00446**	-0.00331*
	(-2.80)	(-2.59)	(-3.78)	(-2.52)
Upgrade(ind)	0.00279	0.00158	0.000895	-0.0000534
	(1.33)	(0.69)	(0.69)	(-0.04)
Book Leverage	-0.102**	-0.353**		
	(-17.87)	(-27.79)		
Market Leverage			-0.102**	-0.301**
			(-22.65)	(-32.43)
Market-to-Book	-0.00714**	-0.00361*	-0.00651**	-0.00755**
	(-6.25)	(-2.43)	(-15.66)	(-11.65)
ROA	0.130**	0.0833**	0.0586**	0.0453**
	(14.33)	(7.40)	(13.83)	(7.63)
Tangibility	0.00536	0.0801**	0.0129**	0.0585**
	(0.93)	(5.72)	(3.58)	(6.38)
Size	0.00785**	0.0187**	0.00366**	0.00814**
	(17.91)	(9.34)	(14.23)	(7.29)
Return	-0.00446**	-0.00271	-0.00106	-0.00247**
	(-3.23)	(-1.80)	(-1.48)	(-3.25)
RD	-0.0237*	-0.0301	-0.0109	-0.0219
	(-2.03)	(-1.22)	(-1.76)	(-1.93)
RD Dummy	-0.00596**	-0.00542	-0.00477**	-0.00348
	(-2.68)	(-0.96)	(-3.39)	(-0.93)
Constant	-0.00692	-0.0439**	0.00989	0.00182
	(-0.51)	(-3.60)	(1.14)	(0.25)
Industry FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Observations	27571	27684	27577	27689
Adjusted R^2	0.070	0.090	0.065	0.112

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$

Table 3.6: **Equity vs. Debt Choice**. Logit regressions. The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1)	(2)
	E vs. D	ER vs. DR
main		
Downgrade(ind)	0.298**	-0.0891
	(6.28)	(-1.36)
Upgrade(ind)	0.151**	0.0389
	(2.94)	(0.54)
Book Leverage	0.874**	-9.791**
	(7.15)	(-27.97)
Market-to-Book	0.278**	0.257**
	(15.04)	(6.60)
ROA	-0.988**	4.102**
	(-7.07)	(14.83)
Tangibility	-0.531**	0.0680
	(-4.91)	(0.35)
Size	-0.213**	0.429**
	(-18.09)	(24.36)
Return	0.0841**	-0.262**
	(3.73)	(-6.03)
RD	2.077**	-0.925**
	(7.66)	(-2.18)
RD Dummy	0.146**	0.0683
	(3.12)	(0.92)
Constant	-1.093**	-2.355**
	(-13.46)	(-16.42)
Observations	18438	13568
Pseudo R^2	0.107	0.397

t statistics in parentheses
** $p < 0.05$, ** $p < 0.01$

Table 3.7: **Sample Split By Concentration.** To measure industry concentration I use the Herfindahl-Hirshmann Index (HHI) of the industry. Industry is defined by SIC4. The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) Low	(2) High
Downgrade(ind)	-0.00595**	-0.00298
	(-3.01)	(-1.48)
Upgrade(ind)	0.0000172	0.00331
	(0.01)	(1.47)
Book Leverage	-0.144**	-0.123**
	(-21.63)	(-20.12)
Market-to-Book	0.000854	-0.000777
	(1.05)	(-0.90)
ROA	-0.0361**	-0.0265**
	(-5.21)	(-3.48)
Tangibility	0.0375**	0.0248**
	(6.25)	(4.60)
Size	0.000359	0.00156**
	(0.80)	(4.25)
Return	-0.00288**	-0.00296**
	(-2.79)	(-3.24)
RD	-0.0120	-0.00908
	(-1.61)	(-0.63)
RD Dummy	-0.00814**	-0.00391**
	(-3.06)	(-2.08)
Constant	0.0187**	0.0296**
	(4.59)	(3.66)
Industry FE	Yes	Yes
Observations	18455	17549
Adjusted R^2	0.055	0.050

t statistics in parentheses
** $p < 0.05$, ** $p < 0.01$

Table 3.8: **Sample Split By Bond Market Access.** The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) Rated	(2) Non-rated
Downgrade(ind)	-0.00161	-0.00484**
	(-0.92)	(-4.36)
Upgrade(ind)	0.00284	0.00191
	(1.45)	(1.61)
Book Leverage	-0.123**	-0.142**
	(-19.02)	(-38.56)
Market-to-Book	-0.00126	0.000154
	(-0.94)	(0.34)
ROA	-0.0325*	-0.0275**
	(-2.34)	(-7.22)
Tangibility	0.0185**	0.0289**
	(3.66)	(8.72)
Size	-0.00175**	0.000104
	(-2.75)	(0.36)
Return	-0.00902**	-0.00247**
	(-5.58)	(-4.40)
RD	-0.00725	-0.0106*
	(-0.39)	(-2.26)
RD Dummy	-0.00362	-0.00760**
	(-1.84)	(-6.09)
Constant	0.0639**	0.0415**
	(5.75)	(5.74)
Industry FE	Yes	Yes
Observations	13691	57881
Adjusted R^2	0.054	0.055

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$

Table 3.9: **Sample Split By Size.** The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) Small	(2) Large
Downgrade(ind)	-0.00493**	-0.00339**
	(-3.18)	(-2.99)
Upgrade(ind)	0.000194	0.00315*
	(0.12)	(2.54)
Book Leverage	-0.152**	-0.116**
	(-31.14)	(-29.83)
Market-to-Book	-0.0000209	-0.00101
	(-0.04)	(-1.41)
ROA	-0.0379**	0.000785
	(-8.50)	(0.11)
Tangibility	0.0335**	0.0182**
	(7.22)	(5.44)
Size	0.000902	0.000875**
	(1.69)	(2.76)
Return	-0.00165*	-0.00539**
	(-2.46)	(-6.22)
RD	-0.0114*	-0.0245*
	(-2.27)	(-2.26)
RD Dummy	-0.00906**	-0.00457**
	(-5.08)	(-3.69)
Constant	0.0407**	0.0337**
	(4.62)	(4.25)
Industry FE	Yes	Yes
Observations	34778	36794
Adjusted R^2	0.059	0.050

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$

Table 3.10: **Sample Split By Rating and Size.** The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	Rated		Not Rated	
	(1)	(2)	(3)	(4)
	Small	Large	Small	Large
Downgrade(ind)	0.00871	-0.00167	-0.00496**	-0.00442**
	(0.57)	(-0.95)	(-3.18)	(-2.93)
Upgrade(ind)	0.0194	0.00224	0.0000229	0.00434**
	(1.15)	(1.17)	(0.01)	(2.63)
Industry FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	568	13123	34210	23671
Adjusted R^2	0.108	0.052	0.059	0.051

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$

Table 3.11: **Sample Split By Deviation from Target.** The sample includes all firms from Compustat excluding financials and utilities. The credit rating used is Standard and Poor's Long-Term Domestic Issuer Credit Rating as reported in Compustat (SPLTICRM). Competitor i belongs to the same four-digit industry as downgraded/upgraded firm j in the fiscal year t of the downgrade/upgrade announcement. Dummy variable *Downgrade/Upgrade(ind)* is assigned a value one if there was a rating downgrade/upgrade in an industry. The downgraded/upgraded firm has been excluded from the sample of competitors. Models include fixed effects (FEs) as indicated in the table footer. All the explanatory variables are lagged by one period. Models are estimated with robust standard errors and clustered by firm to correct for correlation across observations of a given firm. Values in parenthesis are t-statistics.

	(1) Underlevered	(2) Overlevered
Downgrade(ind)	-0.00300*	-0.00375**
	(-2.51)	(-2.74)
Upgrade(ind)	0.00199	0.00155
	(1.51)	(1.06)
Book Leverage	0.0170**	-0.121**
	(4.69)	(-28.54)
Market-to-Book	0.00607**	-0.00401**
	(10.70)	(-7.19)
ROA	-0.0353**	0.0208**
	(-7.93)	(3.83)
Tangibility	0.00661*	0.0164**
	(2.06)	(4.56)
Size	-0.00364**	0.00449**
	(-15.18)	(16.82)
Return	-0.00227**	-0.00368**
	(-3.31)	(-4.63)
RD	-0.00563	0.00838
	(-0.96)	(1.31)
RD Dummy	-0.00564**	-0.00220
	(-4.48)	(-1.61)
Constant	0.0366**	0.0000270
	(5.53)	(0.00)
Industry FE	Yes	Yes
Observations	40005	31567
Adjusted R^2	0.018	0.058

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$

Bibliography

Akhigbe, A., S. F. Borde, and A. M. Whyte (2003). Does an industry effect exist for initial public offerings?. *Financial Review 38*(4), 531–551.

Akhigbe, A., J. Madura, and A. M. Whyte (1997). Intra-industry effects of bond rating adjustments. *Journal of Financial Research 20*(4), 545–61.

Alp, A. (2013). Structural shifts in credit rating standards. *The Journal of Finance 68*(6), 2435–2470.

Bao, J., J. Pan, and J. Wang (2011). The illiquidity of corporate bonds. *The Journal of Finance 66*(3), 911–946.

Bessembinder, H., K. M. Kahle, W. F. Maxwell, and D. Xu (2009). Measuring abnormal bond performance. *Review of Financial Studies 22*(10), 4219–4258.

Bessembinder, H., W. Maxwell, and K. Venkataraman (2006). Market transparency, liquidity externalities, and institutional trading costs in corporate bonds. *Journal of Financial Economics 82*(2), 251–288.

Bharath, S. T., S. Dahiya, A. Saunders, and A. Srinivasan (2011). Lending relationships and loan contract terms. *Review of Financial Studies 24*(4), 1141–1203.

Brander, J. A. and T. R. Lewis (1988). Bankruptcy costs and the theory of oligopoly. *Canadian Journal of Economics*, 221–243.

Byoun, S. (2008). How and when do firms adjust their capital structures toward targets? *Journal of Finance 63*(6), 3069–3096.

Campbell, J. Y. and G. B. Taksler (2003). Equity volatility and corporate bond yields. *The Journal of Finance 58*(6), 2321–2350.

Caton, G. L. and J. Goh (2003). Are all rivals affected equally by bond rating downgrades? *Review of Quantitative Finance and Accounting 20*(1), 49–62.

Chen, L., D. A. Lesmond, and J. Wei (2007). Corporate yield spreads and bond liquidity. *The Journal of Finance 62*(1), 119–149.

Chi, J. and X. Su (2013). Product market predation risk and the value of cash holdings. *Working paper*.

Collin-Dufresne, P., R. S. Goldstein, and J. S. Martin (2001). The determinants of credit spread changes. *The Journal of Finance 56*(6), 2177–2207.

Datta, S., M. Iskandar-Datta, and A. Patel (1999). Bank monitoring and the pricing of corporate public debt. *Journal of Financial Economics 51*(3), 435–449.

Dichev, I. D. and J. D. Piotroski (2001). The long-run stock returns following bond ratings changes. *The Journal of Finance 56*(1), 173–203.

Dick-Nielsen, J. (2009). Liquidity biases in trace. *Journal of Fixed Income 19*(2), 43–55.

Dick-Nielsen, J., P. Feldhtter, and D. Lando (2012). Corporate bond liquidity before and after the onset of the subprime crisis. *Journal of Financial Economics 103*(3), 471–492.

Ederington, L. H. (1985). Classification models and bond ratings. *Financial Review 20*(4), 237–262.

Ederington, L. H. and J. C. Goh (1998, 12). Bond rating agencies and stock analysts: Who knows what when? *Journal of Financial and Quantitative Analysis 33*, 569–585.

Ederington, L. H., J. B. Yawitz, and B. E. Roberts (1987). The informational content of bond ratings. *Journal of Financial Research 10*(3), 211.

Edwards, A. K., L. E. Harris, and M. S. Piwowar (2007). Corporate bond market transaction costs and transparency. *The Journal of Finance 62*(3), 1421–1451.

Elton, E. J., M. J. Gruber, D. Agrawal, and C. Mann (2001). Explaining the rate spread on corporate bonds. *The Journal of Finance 56*(1), 247–277.

Elton, E. J., M. J. Gruber, D. Agrawal, and C. Mann (2004). Factors affecting the valuation of corporate bonds. *Journal of Banking & Finance 28*(11), 2747 – 2767.

Fama, E. F. and K. R. French (1997). Industry costs of equity. *Journal of Financial Economics 43*(2), 153 – 193.

Fama, E. F. and J. D. MacBeth (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy 81*(3), 607–636.

Faulkender, M., M. J. Flannery, K. W. Hankins, and J. M. Smith (2012, 3). Cash flows and leverage adjustments. *Journal of Financial Economics 103*(3), 632–646.

Faulkender, M. and M. A. Petersen (2006). Does the source of capital affect capital structure? *The Review of Financial Studies 19*(1), pp. 45–79.

Ferris, S. P., N. Jayaraman, and A. K. Makhija (1997). The response of competitors to announcements of bankruptcy: An empirical examination of contagion and competitive effects. *Journal of Corporate Finance 3*(4), 367–395.

Flannery, M. J. and K. P. Rangan (2006). Partial adjustment toward target capital structures. *Journal of Financial Economics 79*(3), 469–506.

Fresard, L. (2010). Financial strength and product market behavior: The real effects of corporate cash holdings. *The Journal of Finance 65*(3), 1097–1122.

Giroud, X. and H. M. Mueller (2011). Corporate governance, product market competition, and equity prices. *The Journal of Finance 66*(2), 563–600.

Graham, J. R. (1996). Proxies for the corporate marginal tax rate. *Journal of Financial Economics 42*(2), 187–221.

Graham, J. R. and C. R. Harvey (2001). The theory and practice of corporate finance: Evidence from the field. *Journal of Financial Economics 60*(2), 187–243.

Hand, J. R. M., R. W. Holthausen, and R. W. Leftwich (1992). The effect of bond rating agency announcements on bond and stock prices. *The Journal of Finance 47*(2), pp. 733–752.

Hart, O. D. (1983). The market mechanism as an incentive scheme. *The Bell Journal of Economics 14*(2), pp. 366–382.

Haushalter, D., S. Klasa, and W. F. Maxwell (2007). The influence of product market dynamics on a firm's cash holdings and hedging behavior. *Journal of Financial Economics 84*(3), 797–825.

Hertzel, M. G., Z. Li, M. S. Officer, and K. J. Rodgers (2008). Inter-firm linkages and the wealth effects of financial distress along the supply chain. *Journal of Financial Economics 87*(2), 374–387.

Hertzel, M. G. and M. S. Officer (2012). Industry contagion in loan spreads. *Journal of Financial Economics 103*(3), 493–506.

Hoberg, G. and G. Phillips (2010). Real and financial industry booms and busts. *The Journal of Finance 65*(1), 45–86.

Hoberg, G., G. Phillips, and N. Prabhala (2014). Product market threats, payouts, and financial flexibility. *The Journal of Finance 69*(1), 293–324.

Hou, K. and D. T. Robinson (2006). Industry concentration and average stock returns. *The Journal of Finance 61*(4), 1927–1956.

Hovakimian, A. (2004, October). The role of target leverage in security issues and repurchases. *The Journal of Business 77*(4), 1041–1072.

Hovakimian, A., A. Kayhan, and S. Titman (2012). Are corporate default probabilities consistent with the static trade-off theory?. *Review of Financial Studies 25*(2), 315–340.

Hovakimian, A., T. Opler, and S. Titman (2001). The debt-equity choice. *Journal of Financial and Quantitative Analysis 36*(01), 1–24.

Hsu, H.-C., A. V. Reed, and J. Rocholl (2010). The new game in town: Competitive effects of ipos. *The Journal of Finance 65*(2), 495–528.

Jensen, M. C. and W. H. Meckling (1976). Theory of the firm: managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics 3*(4), 78–79.

Jones, J. S., W. Y. Lee, and G. A. McBrayer (2015). Spillover valuation effects and credit rating changes. *Working Paper*.

Jorion, P. and G. Zhang (2007a). Good and bad credit contagion: Evidence from credit default swaps. *Journal of Financial Economics 84*(3), 860–883.

Jorion, P. and G. Zhang (2007b). Information effects of bond rating changes: The role of the rating prior to the announcement. *The Journal of Fixed Income 16*(4), 45–59.

Jorion, P. and G. Zhang (2009). Credit contagion from counterparty risk. *The Journal of Finance 64*(5), 2053–2087.

Jorion, P. and G. Zhang (2010). Information transfer effects of bond rating downgrades. *Financial Review 45*(3), 683–706.

Kahle, K. M. and R. A. Walkling (1996). The impact of industry classifications on financial research. *Journal of Financial and Quantitative Analysis 31*(3), 309–335.

Kisgen, D. J. (2006). Credit ratings and capital structure. *The Journal of Finance 61*(3), 1035–1072.

Kisgen, D. J. (2007). The influence of credit ratings on corporate capital structure decisions. *Journal of Applied Corporate Finance 19*(3), 65–73.

Kisgen, D. J. (2009, 12). Do firms target credit ratings or leverage levels? *Journal of Financial and Quantitative Analysis 44*, 1323–1344.

Kisgen, D. J. and P. E. Strahan (2010). Do regulations based on credit ratings affect a firm's cost of capital? *The Review of Financial Studies*, pp. 4324–4347.

Kjenstad, E. and X. Su (2012). Product market predatory threats and the use of performance-sensitive debt. *Working paper*.

Kjenstad, E. C. and X. Su (2013). Predatory threats and contractual constraints of debt. *Western Finance Association Conference Paper 2013*.

Klock, M. S., S. A. Mansi, and W. F. Maxwell (2005). Does corporate governance matter to bondholders? *The Journal of Financial and Quantitative Analysis 40*(4), 693–719.

Lang, L. H. and R. Stulz (1992). Contagion and competitive intra-industry effects of bankruptcy announcements: An empirical analysis. *Journal of Financial Economics 32*(1), 45–60.

Leary, M. T. and M. R. Roberts (2005). Do firms rebalance their capital structures? *The journal of finance 60*(6), 2575–2619.

Leary, M. T. and M. R. Roberts (2014). Do peer firms affect corporate financial policy? *The Journal of Finance 69*(1), 139–178.

Longstaff, F. A., S. Mithal, and E. Neis (2005). Corporate yield spreads: Default risk or liquidity? new evidence from the credit default swap market. *The Journal of Finance 60*(5), 2213–2253.

MacKay, P. and G. M. Phillips (2005). How does industry affect firm financial structure? *Review of Financial Studies 18*(4), 1433–1466.

Morellec, E., P. Valta, and A. Zhdanov (2014). Financing investment: The choice between bonds and bank loans. *HEC Paris Research Paper No. FIN-2013-1010*.

Ortiz-Molina, H. (2006). Top management incentives and the pricing of corporate public debt. *The Journal of Financial and Quantitative Analysis 41*(2), pp. 317–340.

Ortiz-Molina, H. and G. M. Phillips (2014). Real asset illiquidity and the cost of capital. *Journal of Financial and Quantitative Analysis 49*, 1–32.

Paligorova, T. and J. Yang (2014). Corporate governance, product market competition and debt financing. *Bank of Canada Working Paper, No. 2014-5*.

Phillips, G. M. (2013). Discussion of a measure of competition based on 10-k filings. *Journal of Accounting Research 51*(2), 437–447.

Platt, K. (2015). Industry contagion in bond yield spreads. *Working Paper*.

Roberts, M. R. and T. M. Whited (2012). Endogeneity in empirical corporate finance.

Schmidt, K. M. (1997). Managerial incentives and product market competition. *The Review of Economic Studies 64*(2), 191–213.

Schott, P. K. (2010). U.s. manufacturing exports and imports by sic and naics category and partner country, 1972-2005. *Working paper. Yale School of Management*.

Schweitzer, R., S. H. Szewczyk, and R. Varma (2001). The effect of bank debt downgrades on stock prices of other banks. *Financial Review 36*(4), 139–156.

Shleifer, A. and R. W. Vishny (1992). Liquidation values and debt capacity: A market equilibrium approach. *The Journal of Finance 47*(4), 1343–1366.

Slovin, M. B., M. E. Sushka, and J. A. Polonchek (1992). Informational externalities of seasoned equity issues: Differences between banks and industrial firms. *Journal of Financial Economics 32*(1), 87–101.

Standard & Poor's (2011). Guide to credit rating essentials: What are credit ratings and how do they work?

Valta, P. (2012). Competition and the cost of debt. *Journal of Financial Economics 105*(3), 661–682.

Valta, P. and L. Fresard (2013). Competitive pressure and corporate investment: Evidence from trade liberalization. *Working paper*.

Warr, R. S., W. B. Elliott, J. Koter-Kant, and O. Oztekin (2012). Equity mispricing and leverage adjustment costs. *Journal of Financial and Quantitative Analysis 47*(3), 589–616.

Zaima, J. K. and J. McCarthy (1988). The impact of bond rating changes on common stocks and bonds: Tests of the wealth redistribution hypothesis. *Financial Review 23*(4), 483–498.