Stock Returns and the Competitive Effects of Debt [1]

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Jan 2024

Abstract

Prior research shows that firms with higher industry-adjusted debt lose market share to their rivals and are forced to retrench in periods of negative shocks even if they are efficient. We examine the economic magnitude of this effect on stock returns using recessions as a negative exogenous shock. Firms with high relative-to-industry debt experience economically and statistically significant negative abnormal returns during recessions after controlling for their CAPM beta. This result is stronger in low product differentiation industries where real competitive effects of debt are expected to be more pronounced. Furthermore, debt-induced market share losses are a determinant of returns in low product differentiation industries. One implication of our study is that CFOs and investment bankers should be aware of the impact of the competitive effects of debt on stock returns when they make capital structure decisions.

JEL classifications: G32; G33; G14
Keywords: Product market competition; financial leverage; stock returns; competitive effects

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1. Introduction

A seminal paper by Bolton and Scharfstein (1990) shows that low debt firms with deep pockets have an incentive to compete aggressively in the product market so that future funding is not extended to their higher debt rivals. This can induce the exit of higher debt firms even if they are profitable. An attempt to force exit is more likely to happen during events that make higher debt firms vulnerable to binding credit constraints and default. Using individual industries, several empirical papers find evidence that firms with higher industry-adjusted debt lose market share to their rivals and are forced to retrench even if higher debt firms are efficient. This has been shown to happen during times when the vulnerability of higher debt firms rises.[2] What is unexplored is whether the competitive effects of debt affect stock returns. The goal of this paper is to examine the magnitude of the competitive effects of debt for a broad range of industries across the business cycle using stock returns for high debt firms and their low debt rivals.

We follow other studies looking at the real effects of debt and use recessions as periods when higher debt firms are vulnerable to competitive effects. Recessions are ideal for several reasons. First, Bernanke and Gertler (1995) and Bernanke, Gertler, and Gilchrist (1996) suggest that credit constraints are tighter during recessions than during non-recession periods in general. Second, Bernanke and Gertler (1989) argue that external financing premiums will rise more for firms with marginal credit quality (higher debt firms) as the economy moves into a recession. This will make financial constraints more likely to bind for firms with lower credit quality and they may have difficulty obtaining credit to finance inventories or investment and may be forced to retrench or default.[3] This makes it more likely that lower debt firms will behave more aggressively towards higher debt rivals during recessions. Third, the onset, timing, and severity of recessions is hard to predict (Estrella and Mishkin (1998)) and, therefore, recessions likely create an unexpected shift in the vulnerability of high debt firms to competitive attacks.[4]

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[2] These real effects have been documented in the supermarket industry (Chevalier (1995a) and (1995b)), the trucking industry (Zingales (1998)), the discount department store industry (Khanna and Tice (2000) and (2005)), the computer disk drive industry (Lerner (1995)), and manufacturing industries (Campello (2003)).
[3] See Kashyap, Lamont and Stein (1994), Khanna and Tice (2005), and Dimitrov and Tice (2006).
[4] Estrella and Mishkin (1998) test the hypothesis that stock prices can work as a leading indicator for a recession and find that stock prices can at best, anticipate recessions for a few months.

Our sample covers five U.S. recessions with the first recession in the sample beginning in January 1980 and the fifth (and last) recession in our sample ending in June 2009. Recessions adversely affect stock returns in general due to a negative and unexpected shock to firm cash flows. Since firms with higher debt levels are vulnerable to competitive attacks from lower debt rivals, the loss in their market share and the resulting larger drop in cash flows should lead to lower stock returns for higher debt firms during recessions after adjusting for the financial leverage effects of debt on beta.

Consistent with this expectation, we find that during economic contractions, the returns of firms with leverage above their industry median drop significantly more (41.11 basis points per month) than the returns of firms with leverage below their industry median after controlling for firm beta.[5] Given that the average recession in our sample is 11.20 months and the pre-recession period is 6 months, this result translates to a difference in compounded returns of approximately 7.31% over an average economic contraction.[6] This is an economically significant effect. Lower returns during recessions for higher debt firms (after controlling for beta) are consistent with competitive effects of debt as high debt firms are more vulnerable to competitive attacks during recessions. It does not appear that firms with high debt relative to their industry are efficiently downsizing during recessions as their abnormal stock returns are lower, not higher, during economic contractions.

As a contrast, we compare abnormal stock returns in recession periods to normal times. We do not expect competitive attacks to be likely during normal times when the level of cash flows is high enough to cover interest payments. Contrasting recessions to normal times also helps us control for unobservable variables that might make the returns for firms with high versus low industry-adjusted debt differ. Consistent with weaker competitive effects during normal times, we find that the returns of firms with

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[5] Following Hou and Robinson (2006), we include firm size, firm book-to-market ratio, the stock's CAPM beta, and the industry Herfindahl index as control variables that predict stock returns. Since we examine stock returns across the business cycle, we also run our estimations using a stock's conditional beta calculated based on methodology recommended by Lewellen and Nagel (2006).

[6] Recession month identifies a month as belonging to a recession as defined by NBER. Estrella and Mishkin (1998) show that stock returns are a leading indicator for a recession, with a leading period ranging from three to nine months. We flag months in the six-month period prior to the start of a recession as a pre-recession month to capture the stock market's expectation of future predatory attempts once the recession kicks in.

leverage above their industry median are similar to the returns of firms with leverage below their industry during non-contractionary periods after controlling for beta.

To further refine our tests, we use the degree of product differentiation as a second layer of contrast to identify environments where the competitive effects of debt should be more prevalent. As shown in Chamberlin (1933) and discussed in Hoberg and Phillips (2016), high product differentiation reduces competition and is positively related to pricing power. In the presence of high product differentiation, high debt firms have an ability to set high product markups during recessions as they seek to cover their debt obligations during periods of low firm cash flows (e.g., Chevalier and Scharfstein (1996); Klemperer (1987); Klemperer (1995)). However, in the presence of low product differentiation, when high debt firms increase markups in recessions to cover their debt obligations, low debt firms need not increase markups by as much, or may even decrease markups in an attempt to gain market share or force the exit of a high debt competitor when high debt firms are vulnerable (e.g., Khanna and Tice (2005) and Khanna and Schroder (2010)). Hence, we expect the competitive effects of debt to be more pronounced for firms operating in industries with low product differentiation.

We use lagged industry level R&D intensity to sort industries into high and low product differentiation categories based on the findings in Hoberg and Phillips (2016) that firm investment in R&D is associated with subsequent product differentiation from competitors. We use industry level R&D intensity rather than firm level R&D intensity as it should be less endogenous to an individual firm. One additional advantage of using R&D intensity as a measure of product differentiation is that Chan, Lakonishok, and Sougiannis (2001) find that firms investing in R&D (or firms with a higher R&D intensity) have similar stock returns as those not investing in R&D (or firms with a lower R&D intensity). Hence, R&D intensity is not expected to be correlated with our dependent variable, stock returns.

Based on our above arguments, we expect to see a larger difference in abnormal returns between competitors with high and low levels of industry-adjusted debt in low R&D intensity industries during economic contractions. Our results are consistent with this expectation. Specifically, in the sub-sample of firms in industries with low levels of lagged R&D intensity, we find that the monthly stock returns of firms with debt levels above their industry-median drop 43.01 basis points more than those of firms with debt levels below their industry median during economic contractions, after controlling for beta and other variables that predict returns. Given that the average recession period in our sample is 11.20 months and the pre-recession period is 6 months, this translates into a difference in returns of approximately 7.66% over an average economic contraction. In contrast, in the sub-sample of industries with high product differentiation based on R&D intensity, the monthly stock returns of firms with above-industry-median debt drop only 9.28 basis points more (statistically insignificant) during economic contractions than the monthly stock returns of firms with below industry median debt levels. During non-economic contractions, the returns of high and low industry-adjusted debt firms are similar in both high and low product differentiation industry sub-samples. This too is expected since competitive attacks are unlikely in normal times.

To more definitively establish that competitive effects of debt are driving our results, we run tests to establish a link between stock returns and real effects. We first show that firms with high industry-adjusted debt have a significant drop in industry-adjusted sales growth immediately following recessions in the sub-sample of firms operating in low product differentiation industries (low R&D intensity) but not in the sub-sample of firms operating in high product differentiation industries (high R&D intensity). Next, we link these real effects to stock returns. We find that leverage-induced real effects predict the stock returns for firms in low product differentiation industries. Specifically, we find that a one standard deviation change in leverage-related sales growth leads to a statistically significant change in monthly stock returns of 23.87 basis points in the same direction. These findings confirm that the real consequences induced by competitive effects of debt are associated with the abnormal stock returns that we document.

Our paper makes the following contributions. Prior empirical papers in the product market competition literature focus on documenting the real competitive effects of debt. The focus of this paper is to document the magnitude of abnormal stock returns linked to the competitive effects of debt. The only paper we are aware of that examines stock returns and debt levels in a somewhat related setting is Opler and Titman (1994). They find that financial distress has a negative effect on industry-adjusted sales growth, profitability, and stock returns of single-segment firms during periods of negative industry shocks. We build on their work by designing a differentiating test to explicitly examine the competitive effects of debt on stock returns across the business cycle and high vs. low product differentiation environments. We also link industry-adjusted relative debt levels, real firm behavior, and stock returns in a product market setting.[7]

A relatively new body of research explores the effect of product market competition on stock returns (e.g., Bustamante (2015), Carvalho (2015), Carlson, Dockner, Fishner, and Giammarino (2014), and Hoberg and Phillips (2010b)). It should be noted that in the real options model of Carlson, Dockner, Fisher, and Giammarino (2014) and Bustamante (2015) systematic risk is endogenous. In our setting, we hold systematic risk fixed and focus on changes in stock returns during recessions due to market share changes caused by the competitive effects of debt. There is an ongoing debate about whether financial constraints and target leverage are cyclical (Gomes, Yaron, and Zhang (2006)) or countercyclical (Halling, Yu, and Zechner (2016)). We focus on the competitive effects of lower debt firms against higher debt rival firms in recessions conditional on firm capital structure immediately prior to a recession.

In Section 2, we describe our data sources and sample selection procedure. In Section 3, we provide the summary statistics of our sample and discuss our main empirical tests. In Section 4, we examine the link between product market real effects and stock returns. In Section 5, we discuss tests shown in the Appendix to rule out alternative explanations. We conclude the paper in Section 6.

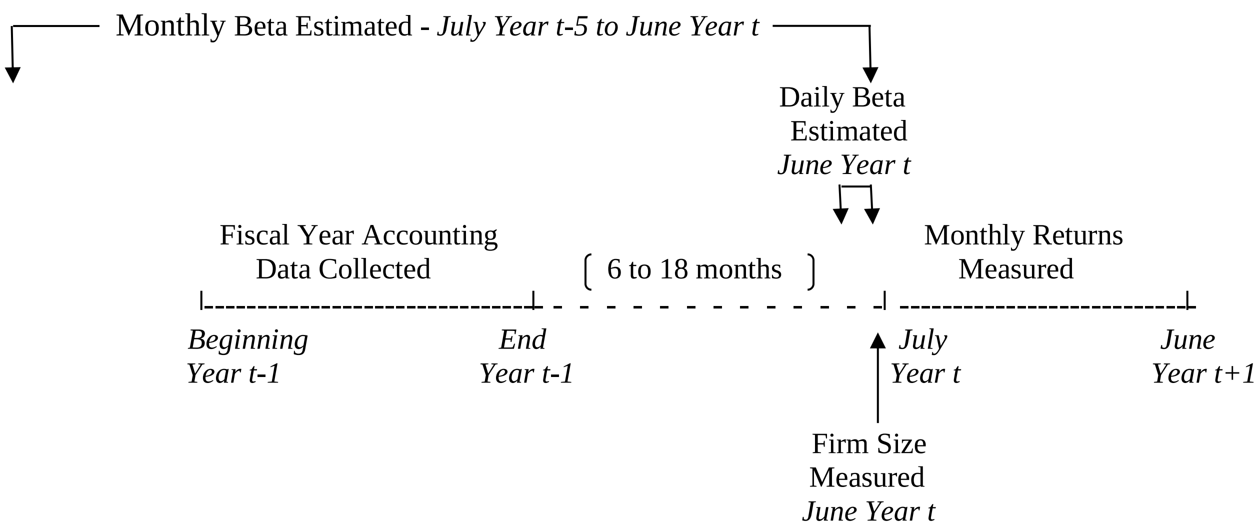
2. Data sources, sample selection, variable construction, and empirical setup

We obtain monthly stock returns and accounting information for firms using the merged Center for Research in Security Prices (CRSP) and COMPUSTAT Fundamentals Annual databases available on WRDS. We require that our sample firms be headquartered in the United States of America (based on Compustat item FIC). The COMPUSTAT segment database begins in 1978. According to the NBER,

[7] Our study has other differences as well. We identify a firm as high or low debt based on the industry's leverage ratio rather than pooling firms across industries and time as in Opler and Titman (1994). This enables us to better test competitive effects of debt by comparing the stock returns of an aggressive competitor (firm with low relative to industry debt) versus the returns of a weaker competitor (firm with high relative to industry debt) during economic contractions.

there have been five recessions in the U.S. during the interval of 1978 through 2010. The first of these recessions begins in January 1980 and the last one ends in June 2009. We collect monthly stock returns during and around these five recessions. To ensure that firm-level accounting information is already incorporated into stock prices, we match the accounting information for any fiscal year ending in calendar year *t-1* (1977-2008) to monthly stock returns from July of year *t* to June of year *t+1* (e.g., Fama and French (1992)). In other words, the end of a firm's fiscal year will be six to eighteen months before we begin collecting their monthly returns to make sure that financial statement data was available to investors when we begin collecting returns. Monthly stock returns are collected from July 1978 through June 2010. Figure 1 demonstrates the baseline empirical methodology using a time line:

Figure 1



We next identify the main industry in which a firm operates each year. In our baseline tests, we use the three-digit historical primary SIC code (based on Compustat item SICH) to define the main industry of a firm for each year.[8] Since Compustat reports the historical SICs beginning in 1987, for firm-year data collected during 1977-1986, we use COMPUSTAT segment data to identify the three-digit SIC code of the

[8] Kahle and Walkling (1996) recommend the use of historical SIC instead of the header SIC to identify the main industry of a firm as industries in which firms operate varies over time. As a robustness test, we use the Hoberg and Phillips (2010a) text based network industry (TNIC) classifications as a definition of product market space. Our inferences remain unchanged with the use of TNIC classification of industries.

segment with the highest sales in a year to categorize the main industry of the firm. Following Fama and French (1992) and Hou and Robinson (2006), we exclude financials (SIC codes 6000 to 6999) and regulated utilities (SIC codes 4900 to 4939) to arrive at our initial sample of firms. We exclude financials from our sample because leverage of financial firms has a different interpretation. We exclude utilities as the rate of return they are allowed to make is set by regulating bodies which would affect their stock returns.

We compute firm leverage as the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year *t-1*. We find industry-adjusted leverage by subtracting the industry-median leverage from firm leverage. We require that at least three firms exist in the three-digit SIC code for a given year. Consistent with Fama and French (1992) and Hou and Robinson (2006), we measure firm size as the logarithm of the market value of equity measured at June of year *t*. The book-to-market ratio is calculated as the book value of equity (Compustat BE) divided by the market value of equity (Compustat CSHO multiplied by PRCC_F) for the fiscal year ending in calendar year *t-1*. We measure industry concentration as the Compustat sales-based Herfindahl index of the three-digit SIC industry of the firm for year *t-1*.[9]

We use two estimates of a stock's beta in our tests. For our first measure, we use a minimum of 24 (and up to 60) monthly returns prior to July of year *t*. We regress monthly stock returns on the contemporaneous and lagged monthly market returns for the CRSP value-weighted market portfolio. The monthly return beta is then estimated as the sum of the coefficients on the contemporaneous and lagged market returns. One concern is that the parameters of the CAPM model may change over time if vulnerable firms are increasing their debt levels prior to recessions. If so, betas estimated with a lag of two to five years before the recession are likely to be stale. To address this issue, we calculate the conditional CAPM beta using daily stock return data for June of year *t* which is the month before portfolio formation. By using stock returns over a more recent time period we are better able to capture recent shifts in leverage. We

[9] As a robustness test, instead of using SIC codes to measure industry concentration, we use TNIC industry based Herindahl index and find qualitatively similar results.

follow the approach advocated by Lewellen and Nagel (2006) and include four lags of market returns in the daily return beta estimation.[10]

Since we examine the effect of leverage on stock returns and link leverage induced real effects (such as sales growth) to stock returns we seek to retain a consistent set of firms across these tests. Therefore, we eliminate firm-years with less than $20 million in sales. We note that this data requirement probably biases the sample towards larger firms, where we expect the effects of customer or competitor driven losses to be less likely. We obtain qualitatively similar results if we include firms with sales less than $20 million into our sample.

2.1. Business cycles

To identify macroeconomic shocks after 1978, we obtain business cycle data from the National Bureau of Economic Research (NBER) *Business Cycle Expansions and Contractions* available at http://www.nber.org/cycles.html. We identify months during our sample period that fall into a period identified as an economic contraction by NBER. We create a 'recession month' indicator variable, which is set to one if the month is part of a contraction and zero otherwise. Further, since stock prices are forward looking, it is likely that the effects of predatory behavior during recessions are reflected in stock returns in the period immediately preceding a recession. In fact, Estrella and Mishkin (1998) show that stock returns are a leading indicator for recessions with a leading period ranging from three to nine months. To capture this effect, we create a 'pre-recession month' indicator variable, which is set to one for months that belong to the six-month period prior to the start of an economic contraction and zero otherwise. There are five recessions during our sample period. The first of these recessions begins in January 1980 and the last one ends in June 2009. The average length of a recession in our sample is 11.2 months.

2.2. Measure of product differentiation

For our second layer of contrast, we compare environments with different degrees of product differentiation. We use firm level R&D intensity measured as the ratio of lagged firm R&D expenditures

[10] Per Lewellen and Nagel (2006), we include four lags of market returns imposing a constraint that lags 2 – 4 have the same slope. For more details see equation 7 on page 298 of their paper.

(Compustat XRD) to sales (Compustat SALE).[11] Firms engage in R&D investment to develop new products, and this in turn increases product differentiation (e.g., Titman and Wessels, 1988, Farrell and Shapiro, 1988; Cohen and Klepper, 1996; Allen and Phillips, 2000; Lin and Saggi, 2002). This is supported most recently by Hoberg and Phillips (2016), who find evidence that firm investment in R&D is associated with subsequent product differentiation from competitors.

Firm-level investment in R&D is a strategic decision made by the firms' managers and thus might be correlated with a firm's returns in a manner that might yield spurious results. We, therefore, use industry-level rather than firm-level R&D intensity as a firm has less control over industry-level R&D intensity. Using the firm-level measures described above, we compute the industry median R&D intensity by the industry for each year using a three-digit SIC code classification (or TNIC). We then rank the industries and establish a particular percentile threshold level to separate the low and high product differentiation industries. Industries with R&D intensity above the percentile threshold are classified as high product differentiation industries, and those with R&D intensity below the threshold level are classified as low product differentiation industries. We report results based on tercile and quartile threshold points.

One advantage of using R&D intensity as a measure of product differentiation is that R&D intensity is not expected to be correlated with our variable of interest, stock returns. In fact, Chan, Lakonishok and Sougiannis (2001) find that firms investing in R&D (or firms that have a higher R&D intensity) have similar stock returns to those not investing in R&D (or have low R&D intensity).

3. Descriptive statistics and stock returns regressions

3.1. Descriptive statistics

In Appendix Table AI of the Appendix we report the frequency distributions of firm-years in our sample with positive lagged R&D intensity (R&D expenses/sales in year t-1) across each of the 49 two-digit Fama-French (1997) industries. We find wide variation in R&D intensity across industries. For

[11] Following Loughran and Ritter (1997), Fee, Hadlock, and Thomas (2006), and Kale and Shahrur (2007), missing values of R&D expenditures on Compustat are treated as zero.

example, industries such as computers, measuring and control equipment, pharmaceuticals, medical equipment, and defense rely heavily on R&D activities. In contrast, firms in industries such as retailing, restaurants, hotels, and motels, transportation, and precious metals have a low reliance on R&D activities.[12]

Table I contains the descriptive statistics of the key variables used in this study. The average return during a recession month is -0.254% and during a pre-recession month is 0.383% (Panel A). Across all months in our sample, the average monthly return is found to be 1.393% (Panel A). The mean (median) book leverage for our overall sample of firms (see Panel A) is 0.246 (0.223) while the mean (median) industry-adjusted leverage is 0.036 (0.001). The mean (median) market beta for the overall sample of firms (see Panel A) is found to be 1.183 (1.102) using monthly returns to estimate beta and 0.960 (0.840) using daily returns. The descriptive statistics for other variables are generally consistent with the extant literature.

In Panel B we compare the attributes of firms operating in high vs. low R&D intensity industries based on industry R&D intensity tercile threshold points. We find that the average monthly return for firms operating in industries with high lagged R&D intensity is 1.573% while the average monthly return for firms operating in industries with low lagged industry R&D intensity is 1.301%. In Panel C, we present similar results when we split firms based on quartile threshold points. Specifically, we find that the average monthly return for firms operating in industries with high lagged industry R&D intensity is 1.624% while the average monthly return for firms operating in industries with low lagged industry-level R&D intensity 1.316%. The mean value of industry-adjusted leverage for the high industry R&D intensity vs. low industry R&D intensity firms is 0.063 vs. 0.023 in Panel B and 0.078 vs. 0.022 in Panel C.

3.2. Relation between industry-adjusted leverage and stock returns

For our baseline model we use a panel data design as this methodology provides the best opportunity to examine the relationship between industry-adjusted financial leverage and stock returns across the business cycle. The baseline model is defined as follows:

[12] Financial and utility firms do not appear in our final sample though we present descriptive statistics in Table AI.

$$\textit{Monthly Return}_{i,t,s} = \alpha_0 + \alpha_1 \textit{ Ind. Adj. Leverage}_{i,t-1} + \alpha_2 \textit{ Recession or Pre-Recession Month}_{t,s}$$
$$+ \alpha_3 [\textit{Recession or Pre-Recession Month}_{t,s}] \ X \ [\textit{Ind. Adj. Leverage}_{i,t-1}] + \alpha_4 \textit{Log(Size)}_{i,t}$$
$$+ \alpha_5 \textit{Log(Book-to-Market)}_{i,t-1} + \alpha_6 \textit{Beta}_{i,t-1} + \alpha_7 \textit{Herfindahl}_{i,t-1} + \textit{Calendar Yr Dummies} + \varepsilon_{i,t,s} \quad (1)$$

where t represents the year, s represents the month of the year (1 to 12), and i represents the firm. Following Hou and Robinson (2006), we include firm size, firm book-to-market ratio, the stock's beta, and the industry Herfindahl index as control variables that predict stock returns. Since we examine stock returns across the business cycle, we also run our estimations using a stock's conditional beta calculated based on methodology recommended by Lewellen and Nagel (2006). We include calendar year fixed effects to control for constant time effects and we cluster standard errors by year to control for non-constant time effects in the data. Clustering standard errors by time is prudent when potential standard error biases from time effects are a key concern provided there are a moderate number of time periods.[13]

Table II shows the results of the panel data estimations which examine the relation between industry-adjusted leverage and stock returns for the overall sample of firms. All continuous independent variables are winsorized at the 1st and 99th percentiles to minimize the effect of outliers on our results. Columns 1 – 4 show estimation results with the use of monthly return betas while columns 5 – 6 show results using daily return betas. In Column 1, where we report coefficients based on an estimation that does not include indicator variables for recessionary periods we find that industry-adjusted leverage is negatively but insignificantly related to stock returns after controlling for beta. This negative relation is in line with Dimitrov and Jain (2008). We find that the coefficients on our control variables are similar to those found

[13] See Section 2 and Section 5.1 in Petersen (2009). For asset pricing regression specifications with a suspected time effect (such as ours), the Fama MacBeth method or panel data clustering by time will minimize a downward bias in estimated standard errors caused by a time effect (residuals of a given time period are correlated across different firms). When clustering by time in regressions with returns on the left hand side and persistent firm-level variables on the right hand side, Petersen shows that the downward bias in standard error estimates is small when the number of time period clusters is moderate. We have 32 year clusters in our sample. He reports a bias in the standard error estimates of only 3% with 40 annual time clusters. Though the Fama-MacBeth method results in unbiased standard errors in the presence of time effects, it is not as useful for examining the effect of industry-adjusted leverage on stock returns across the business cycle as recession and non-recession months need to be estimated separately. Nevertheless, we also use the Fama-MacBeth estimation methodology as an additional test to verify that our results are robust to the possibility of cross-correlated error terms since this is a key concern in asset pricing settings.

in the literature. Specifically, we find that firm size is negatively related to stock returns, firm book-to-market ratio is positively related to stock returns, and beta is uncorrelated with stock returns (e.g., Fama and French (1992)). Finally, we find that firms in concentrated industries exhibit lower returns (e.g., Hou and Robinson (2006)) but we find this relation to be statistically insignificant.

In Column 2, we report coefficients obtained from a model that includes indicator variables to capture recession months and pre-recession months and interaction terms between these two variables and industry-adjusted leverage. Column 3 shows the regression results for Equation (1). As expected, recessions and periods that immediately precede recessions negatively affect stock returns. In recession (pre-recession) months, stock returns are, on average, 248 (206) basis points lower than during normal months for firms with the median level of debt in their industry (see column 2). Consistent with competitive effects of debt, the coefficient on the interaction terms between the economic contractions indicator variables and industry-adjusted leverage are negative and statistically significant (both in columns 2 and 3). The effects are also economically significant. For example, in Column 3, increasing industry-adjusted leverage by one standard deviation decreases monthly returns by 36.86 basis points during economic contractions. These findings are consistent with negative competitive effects of debt as firms with high leverage relative to their industry experience lower returns during economic contractions. However, as expected, we find that the returns of high debt and low debt firms are similar during normal times. This is expected if competitive effects of debt matter during periods of negative macroeconomic shocks.

In column 4, instead of using a continuous leverage variable, we create an indicator variable which is set to one if the leverage of the firm is above its industry median and zero otherwise. Hence, with the indicator variable approach, we are able to compare the stock returns of the more aggressively financed firms, which have debt above their industry median, to their more conservatively financed rival firms with debt at or below their industry median. We find that the interaction term between the indicator variable for recession or pre-recession months and the dummy variable for above industry-median leverage is negative and significant. During economic contractions, firms with above industry median leverage experience monthly returns that drop 41.11 basis points more than their rival firms in the below industry median leverage group. Given that the average recession in our sample is 11.20 months and the pre-recession period is 6 months, this result translates to a difference in compounded returns of approximately 7.31% over an average economic contraction. Once again, we find that the returns of high and low debt firms are similar during normal times.

In columns 5 and 6, when we replace the monthly return beta with a daily return beta, we find qualitatively similar results. Increasing industry-adjusted leverage by one standard deviation decreases monthly returns by 36.45 basis points during economic contractions (Column 5). Also, firms with above industry median leverage experience monthly returns that drop 40.20 basis points more than their rival firms in the below industry median leverage sample during economic contractions (column 6). Hence, the economic effect of industry-adjusted leverage is found to be quite similar with the use of a daily return beta. Since betas estimated with more recent stock returns are likely to capture the recent changes in firm leverage we include daily return betas in all future estimations in the paper.

In summary, we compare and contrast stock returns of firms and their competitors with varying industry-adjusted debt levels during normal periods and during recessions to see if there is evidence consistent with competitive effects of debt reflected in stock returns. We expect stock returns to reflect higher debt firms losing market share to lower debt rivals during recessions as stock returns should adjust to the real competitive effects of debt. The finding of lower returns during recessions (after controlling for beta) for firms with high industry-adjusted debt is consistent with competitive effects of debt. The finding of similar returns during normal times (after controlling for beta) for firms with high versus low industry-adjusted debt is expected as prior research did not find evidence of real competitive effects of debt in normal times. Since stock returns respond to real effects, we would not expect to observe differences in stock returns in normal times. In the next section we add another layer of contrast which enables us to re-run our tests on sub-samples where the competitive effects of debt should be the strongest and the weakest.

3.3. Relation between industry-adjusted leverage and stock returns by product differentiation

In this section, we investigate whether the competitive effects of debt are more evident in the stock returns of the sub-sample of firms operating in industries with a low degree of product differentiation. As

Hoberg and Phillips (2016) point out, low product differentiation increases competition and is negatively related to pricing power. Hence, we expect the interaction term between industry-adjusted leverage and recession or pre-recession months to be more negative for firms in the low product differentiation sub-sample compared to firms in the high product differentiation sub-sample.

Hoberg and Phillips (2016) find evidence that firm investment in R&D is associated with subsequent product differentiation from competitors. Hence, we use lagged industry level R&D intensity to sort industries into high and low product differentiation industries. We use industry level R&D intensity rather than firm level R&D intensity as it should be less endogenous to an individual firm. One additional advantage of using R&D intensity as a measure of product differentiation is that Chan, Lakonishok, and Sougiannis (2001) find that firms investing in R&D or firms that have a higher R&D intensity have similar stock returns as those not investing in R&D (or who have a lower R&D intensity). Hence, R&D intensity is not expected to be correlated with our dependent variable, stock returns.

Although a stock's beta should capture the systematic components of financial risk and business risk, there may be measurement error in beta. We already include industry-adjusted leverage in the specification but we also add industry-adjusted business risk to the model as a control variable. To measure business risk, we follow Dimitrov and Tice (2006) and use the coefficient of variation of the quarterly cash flows. We calculate quarterly cash flows as the quarterly operating income (Compustat OIBDPQ) divided by the quarterly revenues (Compustat REVTQ) over lagged eight quarters for each firm.

We also include industry median leverage and industry median business risk in all specifications where we compare and contrast low vs. high industry R&D intensity sub-samples. The inclusion of these variables controls for the possibility that lower returns during recessions to firms with higher industry-adjusted debt in the low R&D intensity sub-sample may be attributable to a higher average level of financial risk or business risk for the industries in which these firms operate. We alter the baseline model in Equation 1 and estimate the following model:

$$
\begin{aligned}
&\textit{Monthly Return}_{i,t,s} = \alpha_0 + \alpha_1\, \textit{Ind. Adj. Leverage}_{i,t-1} + \alpha_2\, \textit{Recession or Pre-Recession Month}_{t,s} \\
&+ \alpha_3\, [\textit{Recession or Pre-Recession Month}_{t,s}]\ X\ [\textit{Ind. Adj. Leverage}_{i,t-1}] + \alpha_4\, \textit{Log(Size)}_{i,t} \\
&+ \alpha_5\, \textit{Log(Book-to-Market)}_{i,t-1} + \alpha_6\, \textit{Beta}_{i,t-1} + \alpha_7\, \textit{Herfindahl}_{i,t-1} + \alpha_8\, \textit{Ind. Adj. Cash. Flow. Vol}_{i,t-1} \\
&+ \alpha_9\, \textit{Ind. Median Leverage}_{i,t-1} + \alpha_{10}\, \textit{Ind. Median Cash. Flow. Vol}_{i,t-1} \\
&+ \textit{Calendar Yr Dummies} + \varepsilon_{i,t,s} \qquad (2)
\end{aligned}
$$

where *t* represents the year, *s* represents the month of the year (1 to 12), and *i* represents the firm. For easier interpretation of the economic magnitude of our results, we use the indicator variable approach for leverage that takes a value of one if firm financial leverage is above its industry median and zero otherwise. We categorize firms that belong in the top tercile of industry R&D intensity as high product differentiation firms and the remaining firms as low product differentiation firms. As a robustness check we also use a quartile threshold point.

We report results from estimations of Eq. (2) in Table III. In Column 1 and 2 we present results for high vs. low product differentiation firms based on tercile thresholds of industry R&D intensity. We find that the coefficient on the interaction term between the recession or the pre-recession month dummy and the above industry median leverage dummy is statistically insignificant for the sample of high product differentiation firms (Column 1). Consistent with competitive effects of debt, the interaction term is negative and statistically significant for sample of low product differentiation firms (Column 2). In terms of economic magnitude, the monthly returns drop 43.01 basis points more for firms with leverage above their industry median than for firms with leverage at or below their industry median during recession or pre-recession months in the low product differentiation sub-sample. This translates into a difference in returns of approximately 7.66% across an average economic contraction. Columns 3 and 4 contain similar results as reported in Columns 1 - 4 but are based on quartile threshold points. Once again we find that the interaction term is negative and significant only for the low product differentiation firms in Column 4.

We find that industry median leverage and industry median cash flow volatility are statistically insignificant indicating that higher average leverage and higher average business risk for the low R&D group are not driving the finding of lower returns during economic downturns for firms with high relative-to-industry debt. Finally, the coefficient on firm-level industry-adjusted cash flow volatility is insignificant. This is expected if beta captures the systematic components of business risk.

In summary, in Table III we show that unexpected economic downturns affect the returns of the high and low debt firms differently depending on whether they produce goods with a low or a high degree of product differentiation. In particular, high relative debt firms making products with low product differentiation are more negatively affected during economic downturns than high relative debt firms producing products with high product differentiation. These results are consistent with competitive effects of debt being more intense in low product differentiation environments. We also find that returns are similar for high versus low debt relative-to-industry debt firms during normal periods in high and low product differentiation sub-samples. Both findings are expected.

An argument could be made that the Hoberg and Phillips (2010a) and Hoberg and Phillips (2016) TNIC classification scheme is a better measure to capture relatedness between firms which will give a more accurate representation of the firm's product market space than SIC codes. The TNIC industry classification method is based on firm pairwise similarity scores obtained from textual analysis of product descriptions in 10K reports.[14] We estimate Equation 2 again using the Hoberg and Phillips (2010a) TNIC industries in Table IV. One drawback to using TNIC industries is that they are available for a relatively short period of time as they do not start until 1996. In our context, this leads to a data constraint as we can only examine returns from July 1997 through June 2010 which covers only two recessions instead of the five recessions we capture if we use SIC codes. Nevertheless, when using TNIC industries, the coefficient on the interaction term between the recession or pre-recession month indicator remains negative and significant in the low industry R&D intensity sub-samples. The magnitude of the coefficients are similar to those obtained when we used the SIC definition of industries as in Table III.

[14] See Hoberg and Phillips (2010a) for a detailed description of this classification scheme.

Next we do a robustness check and allow the slopes on control variables to vary over the business cycle. To do this we augment Equation (2) by adding interaction terms between our control variables and business cycle measures. In other words, we run an interaction expanded regression. First, since firms with higher business risk may be more vulnerable during economic downturns we include an interaction term between industry-adjusted cash flow volatility (our proxy for business risk) and the recession or pre-recession month dummy. Further, since firms with a high equity beta may have higher (lower) returns during up (down) market periods we include an interaction of the daily return beta and the economic downturn dummy. Furthermore, since small (value) stocks might be more susceptible to recessions, we include an interaction term between recession/pre-recession month indicator and size (book-to-market ratio). We also include an interaction of the Herfindahl Index and an economic downturn dummy to account for the possibility that competitive dynamics in oligopolistic industries might vary across the business cycle. The results from this interaction-expanded regression are shown in Table V. The introduction of the new interaction terms does not change the main findings of the paper. Specifically, the interaction term between above industry-median leverage and recession or pre-recession month indicator in the low product differentiation sub-samples (Columns 2 and 4) remains negative and statistically significant, and the above industry-median leverage dummy remains insignificant.

3.4. Fama-MacBeth estimations

Panel data estimations provide an advantageous framework to explore the relation between industry-adjusted leverage and stock returns across the business cycle. It is well known that panel data standard error estimates may be underestimated if observations for different firms within the same month are correlated. Since we include year fixed effects, cluster by year, and have a moderate number of years in our sample (32 years), we expect any bias in the standard errors to be small (see footnote 14). Nevertheless, in order to test if the predicted relationships are robust to this type of correlation, we estimate Fama-MacBeth regressions of monthly stock returns on industry-adjusted leverage and our set of control variables. We separate each month for which we measure stock returns into periods of economic downturns (months coded as recessions or pre-recessions) and normal periods (months that are neither recessions nor pre-recessions). There are 86 months classified as economic downturns and 298 months classified as normal periods. To test our hypotheses, we perform Fama-MacBeth estimations in four different subsamples: firms producing goods with low vs. high product differentiation during economic contractions and firms producing goods with low vs. high product differentiation during normal periods.

The Fama-MacBeth estimates are reported in Table VI. The reported coefficients and standard errors are the time series averages from the monthly cross-sectional regressions. In column 2 (6), we find that in the low R&D sub-sample based on tercile (quartile) points, firms with leverage above the industry median experience returns that are 40.63 (36.16) basis points lower than the returns to firms with leverage below the industry median during economic contractions. This translates into a drop of approximately 7.22% (6.41%) across an average recession in our sample. As expected, the above industry-median leverage dummy is insignificant in the low R&D sub-sample of firms during normal periods (columns 4 and 8). The size effect and the book-to-market effect (control variables) are significant in the directions found by prior research during the non-recession periods for both high and low product differentiation industries. They are insignificant predictors of returns during recession periods.

In sum, we find that firms with high debt relative to their industry counterparts and who produce goods with low product differentiation are subject to greater value losses as a result of competitive pressures during economic contractions. These value losses are economically significant. Since the Fama-MacBeth methodology is designed to estimate unbiased standard errors in the presence of time effects and generates estimates similar to those generated using panel data with time dummies and time clustered standard errors, we conclude that the results obtained using panel data analysis are robust to time effects.

3.5. Can a mechanical leverage effect explain our results?

One potential concern with the documented results is that we may simply be capturing a mechanical leverage effect. To highlight this concern, consider the stock's levered beta which is the product of the unlevered beta and an elasticity parameter with the following functional form: $\beta_L = \beta_U \times \left[1 + \frac{D}{E} \times (1 - tax\ rate)\right]$ where D and E are the market value of debt and equity respectively, and tax rate is the average tax rate of the firm. During good times the market value of equity goes up and *D/E* falls assuming there is no change in the amount of debt or equity. If the value of *E* is infinitely large then the elasticity parameter would be very close to one and the levered beta equals the unlevered beta. This in turn leads to similar returns for high and low debt firms during good times. During bad times the market value of equity falls and the elasticity parameter grows and is above one. This would cause the levered and unlevered beta to diverge and the returns for high and low debt firms to diverge.

To more formally investigate this argument, we perform several tests. First, we note that the conditional levered beta is a control variable in all our regressions. The conditional beta should capture the systematic component of financial and operating leverage. We measure conditional levered beta using daily returns for the month before portfolio formation (in June of year *t*) per the methodology of Lewellen and Nagel (2006). As a robustness check, we examine if there is divergence in the betas of above versus below median debt firms during economic contractions and convergence in normal times. The average conditional beta used in the regressions for high versus low debt firms are 1.01 versus 1.02 during economic contraction months while the average conditional betas for high versus low debt firms are 0.933 versus 0.951 during normal period months. Hence, the conditional betas for above versus below median debt firms are similar to each other during economic contractions and during normal times, which does not support the mechanical effects of debt argument highlighted above.

Second, we examine the *D/E* ratio used in the monthly return regressions for the economic contraction months and the normal period months.[15] We calculate an average *D/E* during normal periods of 0.773 and an average *D/E* during economic contractions of 0.761 for our sample firms. In other words, we find that the mean *D/E* for economic contraction months is quite similar in magnitude to the mean *D/E* for normal period months. This finding suggests that similar returns to high and low debt firms during normal periods are unlikely to be driven by the change in the elasticity parameter.

[15] We use the book value of debt as a proxy for the market value of debt in this calculation.

Third, we note that the interaction term between the above industry median leverage dummy variable and the recession or pre-recession month indicator variable is found to be insignificant in the high product differentiation sub-samples, i.e. high lagged R&D intensity. We are not aware of any theory that explains why a mechanical leverage effect exists in the sub-sample of low product differentiation firms but does not exist in the subsample of high product differentiation firms. Fourth, we show in Section 3.6 that the interaction term between the above industry median leverage dummy variable and the recession or pre-recession month indicator variable is generally insignificant for non-bank dependent firms. Again, it is hard to envision why a mechanical leverage effect exists in the sub-sample of bank dependent firms but does not exist for firms that are not bank dependent firms.

3.6. Relation between industry-adjusted leverage and stock returns by financial constraints

In this section, we investigate the role of financial constraints in explaining the relation between industry-adjusted leverage and stock returns. Financially constrained firms are less likely to have access to external capital markets and may be unable to raise financing during economic downturns. Therefore, the competitive effects of taking on high debt should be prominent in the sample of firms that are financially constrained. Based on extant literature, we use the bank dependency of the firm as a proxy for financial constraints (e.g., Faulkender and Petersen, 2006; Dimitrov and Tice, 2006; Houston and James, 2001; Kashyap, Lamont, and Stein, 1994). Firms that are bank dependent would find it harder to access public bond markets and are more likely to be financially constrained. We categorize a firm as bank dependent if they do not have a bond rating on Compustat. Then, we divide our sample into bank dependent and non-bank dependent firms and investigate the relation between industry-adjusted leverage and stock returns in the two samples. We further split the bank dependent and non-bank dependent firms into high and low product differentiation sub-samples based on lagged R&D intensity measured at the industry level. We report the results for bank dependent vs. non-bank dependent firms in Table VII.

For the sample of bank dependent firms (Panel A), the coefficient on the interaction term between the recession or pre-recession month indicator and the above industry-median leverage dummy is negative and significant for the low industry R&D sub-sample. Specifically, the coefficient on the interaction term for the low R&D intensity sub-sample based on tercile threshold points is a negative 48.83 basis points per month (Column 2). This translates into returns that drop 8.74% more for firms with above industry median-leverage than for firms with below industry median leverage across an average economic downturn. In contrast, the coefficient on the interaction term for the high R&D intensity sub-sample based on tercile points is found to be a negative 16.57 basis points per month and is statistically insignificant (Column 1). The coefficient on the interaction term for the low R&D intensity sub-sample based on quartile threshold points (Columns 4) is a negative 41.89 basis points per month. The coefficient is insignificant in the high R&D intensity sub-sample (Column 3). For the sample of non-bank dependent firms (Panel B), the coefficient on the interaction term is found to be statistically insignificant in the both the low R&D and the high R&D intensity sub-samples. As predicted, the competitive effects of taking on high debt are more prominent in the sample of firms that are financially constrained when operating in low product differentiation environments.

4. Link between real effects and stock returns

In this section we examine two issues related to the real effects of product market competition. First, we examine whether the real effects of debt that have been documented by others (loss in market share) exist in our sample and are stronger in the sub-sample of firms producing goods with low product differentiation. Second, we explore whether the well-documented real effects attributed to debt in a product market setting can be directly linked to our stock return results. Showing this link is another way to rule out alternative hypotheses for the differences in return that we report across the business cycle for firms with different debt levels.

4.1. Documenting real effects

If competitive effects are behind our stock return findings we should observe differences in real effects in our sample. We predict that firms that are most vulnerable during bad times, i.e. firms with high industry-adjusted debt that produce low product differentiation goods, should experience lower industry-adjusted sales growth during economic contractions. We use Equation (3) to investigate the real competitive effects of debt in our sample:

$$\textit{Ind. adjusted sales growth}_{i,\,t\text{-}1 \text{ to } t} = \beta_0 + \beta_1 \textit{Ind. Adj. Leverage}_{i,\,t\text{-}1} + \beta_2 \textit{ Recession}_t + \beta_3 [\textit{Recession}_t] * [\textit{Ind. Adj. Leverage}_{i,t\text{-}1}] + \beta_4 \textit{ Recession}_{t\text{-}1} + \beta_5 [\textit{Recession}_{t\text{-}1}] * [\textit{Ind. Adj. Leverage}_{i,t\text{-}1}] + \beta_6 \textit{ Ind. adjusted operating profit}_{i,t\text{-}1} + \beta_7 \textit{ Cash to Assets}_{i,t\text{-}1} + \beta_8 \textit{ Log[Assets}_{i,t\text{-}1}] + \beta_9 \textit{ Ind. adjusted capital expenditure}_{i,t\text{-}1} + \textit{Firm fixed effects} + \textit{Calendar Yr Dummies} + \varepsilon_{i,t} \quad (3)$$

To estimate this equation, we use the same set of firms that we use in our returns tests. We measure industry-adjusted leverage at the end of the firm fiscal year which ends in calendar year *t-1* (1977 – 2008 as in our returns tests). We measure the annual sales growth as the rate of growth in firm sales (Compustat SALE) from the firm fiscal year which ends in calendar year *t-1* to the firm fiscal year which ends in calendar year *t*. We then compute the industry-adjusted sales growth by subtracting the industry median sales growth from the firm level variable and this becomes our dependent variable. Consistent with Dimitrov and Tice (2006), we include industry-adjusted operating profitability, cash-to-assets, logarithm of firm assets, and the industry-adjusted capital expenditure as control variables in all our real effects estimations. We measure operating profitability as the ratio of operating income before depreciation (Compustat OIBDP) to sales (Compustat SALE), cash-to-assets as the ratio of cash and marketable securities (Compustat CHE) to total assets (Compustat AT), and capital expenditure as the ratio of capital expenditures (Compustat CAPX) to total assets (Compustat AT). All control variables are based on accounting information for the firm fiscal year which ends in calendar year *t-1* (as in the case of leverage). We measure the number of recession months during calendar year *t* and *t-1* based on the NBER *Business Cycle Expansions and Contractions* data. We include contemporaneous (year *t*) and lagged (year *t-1*) recession variables as we do not know if competitive effects on sales growth will lag recessions or will occur contemporaneously with recessions. This approach is consistent with Campello (2003) who also uses both contemporaneous and lagged recession variables in examining real effects. We create an indicator variable $\textit{Recession}_t$ ($\textit{Recession}_{t-1}$), which is set to one if five or more months in the year *t* (*t-1)* are months of economic contraction, and zero otherwise.[16] To test if real effects are more evident in firms with low product differentiation, we run this equation on low and high product differentiation sub-samples.

In Table VIII, we report results based on panel estimations of Equation (3). All continuous independent variables are winsorized at the 1st and 99th percentiles to minimize the effect of outliers on our results. All specifications contain firm fixed effects and a time trend. As in our returns tests, we break our sample of firms into those with low product differentiation and high product differentiation and expect that the coefficient on the interaction term between industry-adjusted leverage and the recession dummy would be more negative in the sub-sample of firms with low product differentiation. Consistent with our expectation, the coefficient on the interaction term between industry-adjusted leverage and lagged recession year $Recession_{t-1}$ is found to be negative for firms in the low lagged industry R&D intensity sub-samples (Columns 2 and 4). Based on the coefficient in Column 2, an increase in industry-adjusted leverage of one standard deviation results in a statistically significant drop in industry-adjusted sales growth of .89% in lagged recession years ($Recession_{t-1}$). Given that the average industry-adjusted sales growth in the regression sample in Column 2 is 3.27% the above documented results are economically significant. In contrast, the coefficient on this interaction term is found to be statistically insignificant in the high lagged industry R&D intensity sub-samples (Columns 1 and 3). In summary, in this section we show that high-debt firms operating in industries with low product differentiation experience a loss in market share (through lower industry-adjusted sales growth) during economic contractions. This finding is consistent with prior studies and with competitive effects of debt.

4.2. Linking sales growth effects to stock returns

The previous section shows that high debt firms in low product differentiation environments suffer higher sales losses during economic downturns than high debt firms in high product differentiation environments. We build on the prior literature by linking market share effects caused by the competitive effects of debt to stock returns. We use the estimations based on Equation (3) in Section 4.1 to decompose

[16] If we instead use six or more months to identify economic contractions we obtain qualitatively similar results.

industry-adjusted sales growth of a firm from year *t-1* to *t* into three components: (i) sales growth attributed to industry-adjusted leverage, (ii) sales growth attributed to control variables, and (iii) sales growth unexplained by the model. Specifically, we define component (i) as [β_1*$Ind.\ Adj.\ Leverage_{i,\ t-1}$ + β_3* $Ind.\ Adj.\ Leverage_{i,t-1}$*$Recession_t$ + β_5 $Ind.\ Adj.\ Leverage_{i,t-1}$*$Recession_{t-1}$]. We define (ii) as the predicted value of industry-adjusted sales growth based on the Equation (3) minus the component (i) as defined above. Finally, component (iii) is simply the residual from Equation (3). We then link these three components into the monthly returns database following the same procedures described in Figure 1. We estimate a regression model of monthly stock returns from July *t* to June *t+1* as a function of these three components in addition to the control variables for returns such as a recession or pre-recession month indicator variable, industry-adjusted cash flow volatility, industry median leverage, industry cash flow volatility, size, book-to-market ratio, beta, industry Herfindahl index, and calendar year dummies.

The results are shown in Table IX. We use industry-adjusted sales growth from year *t-1* to year *t* predicted by industry-adjusted leverage $_{t-1}$ as the independent variable of interest. In the low lagged industry R&D intensity sub-samples defined by tercile and quartile threshold points (Columns 2 and 4 respectively), we find that the portion of the industry-adjusted sales growth predicted by leverage is significantly and positively related to stock returns. A one standard deviation change in leverage-related sales growth is associated with a change in monthly returns of 23.87 (23.04) basis points in the same direction.[17] In the high industry R&D sub-samples defined by tercile and quartile threshold points (Columns 1 and 3), we find that the effect of industry-adjusted sales growth predicted by leverage on stock returns is much smaller and statistically insignificant. In summary, these results show that the real effects shown in Table VIII are linked to stock returns, as predicted by our competitive effects hypothesis.

5. Ruling out alternative explanations and additional tests

We consider several confounding factors that could spuriously explain our results. First, in section A.1 of the appendix we consider the possibility that debt overhang effects explain our finding of a more

[17] In the low lagged R&D intensity samples in Columns 2 and 4, the standard deviation of the industry-adjusted sales growth predicted by leverage is 0.0141 and 0.0139 respectively.

negative relation between relative to industry leverage and stock returns during recessionary periods in low product differentiation environments. Second, in Section A.2 of the appendix we consider the possibility that customers (particularly of durable goods) are reluctant to do business with a high debt firm since a firm default or likely default would pose significant threats to the continued availability of warranty and servicing requirements. Third, in Section A.3 of the appendix we address the concern that higher debt firms may simply be weaker firms in general. When the economy contracts high debt firms may lose market share and experience lower stock returns if they are less efficient firms. Fourth, in Section A.4 of the appendix we control for the possibility that some low product differentiation firms may have a local monopoly. If a firm has a local monopoly, then it may be difficult for a customer to switch to a rival's product. Finally, in Section A.5 of the appendix we adjust our leverage measure for the cash holdings of the firm since firms could be holding cash reserves for precautionary reasons such as to be prepared during periods of unexpected negative shocks. The above tests, which are explained in detail in our internet appendix, allow us to eliminate the possibility that confounding factors might be driving the results documented in this paper.

6. Concluding comments

In this study, we examine the economic impact of the competitive effects of debt using stock returns. Our sample includes firms in a broad cross section of industries across several business cycles. In particular, we examine the effect of macroeconomic shocks on the stock returns of firms with varying relative-to-industry debt levels and varying levels of product differentiation. Consistent with competitive effects of debt, we find that firms with high relative-to-industry debt experience economically and statistically significant negative abnormal returns during economic contractions after controlling for their CAPM beta and other variables that predict stock returns. This effect is stronger in low product differentiation industries where real competitive effects of debt are expected to be more pronounced. The documented effects are economically significant. Additionally, we show that firms with high industry-adjusted debt have a larger drop in industry-adjusted sales growth immediately following recessions in the sub-sample of low product differentiation industries. Finally, we show that these leverage-induced real effects can explain stock returns in the sub-sample of industries with low product differentiation.

Overall, our paper builds upon prior literature by showing that real competitive effects of debt (measured using industry-adjusted sales growth) have an economically large effect on stock returns. Our results should be of interest to investment bankers advising firms on capital structure decisions and to chief financial officers of firms as the results show that firm capital structure decisions have a significant effect on stock returns. Our results should also be of interest to active money managers who do not hold diversified portfolios since we find that industry-adjusted leverage predicts abnormal stock returns. Since firms with higher debt than their competitors have similar returns in normal times but lower returns in recessions, active money managers can lower their downside volatility without sacrificing returns by underweighting firms with above median debt in their industry.

Table I: Univariate Statistics of Sample

This table presents the univariate statistics for firms in our sample. Financial firms and utility firms are not included. Monthly return is as reported by the CRSP database for July of year t to June of year t+1 (July 1978 through June 2010). Book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977-2008). Ind. adjusted leverage is calculated as the firm leverage minus the industry-median leverage. To compute industry-median leverage, we require that at least three firms exist in the three-digit SIC code for the year under consideration. Log(B/M) is calculated as the logarithm of the book value of equity (Compustat BE) divided by the market value of equity (Compustat CSHO multiplied by PRCC_F) for the fiscal year ending in calendar year t-1. Log(Size) is measured as the logarithm of the market value of equity measured at June of year t. Monthly return beta is the pre-ranking beta estimated by regressing a minimum of 24 (and up to 60) monthly returns prior to July of year t on the contemporaneous and lagged monthly market returns on CRSP value-weighted market portfolio. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. Recession month is any month that belongs to an economic contraction as identified by NBER. Pre-recession month is any month that belongs to the six-month period prior to the start of an economic contraction as identified by the NBER.

Panel A: Recession months and pre-recession months

	N	Mean	Median	Std. Dev	N	Mean	Median	Std. Dev	N	Mean	Median	Std. Dev
	Recession months				*Pre-recession months*				*Overall sample*			
Monthly return (%)	139,964	-0.254	-0.820	19.500	77,444	0.383	0.000	18.556	1,023,040	1.393	0.161	17.095
Book Leverage	141,632	0.246	0.226	0.197	78,542	0.253	0.236	0.196	1,035,884	0.246	0.223	0.201
Ind. adjusted leverage	141,632	0.034	0.000	0.175	78,542	0.029	0.000	0.174	1,035,884	0.036	0.001	0.178
Log (Size)	140,844	5.187	5.081	2.100	78,045	5.007	4.829	2.086	1,029,644	5.176	5.043	1.997
Log (B/M)	137,235	-0.480	-0.435	0.852	75,789	-0.426	-0.356	0.838	997,923	-0.520	-0.476	0.806
Monthly return beta	141,680	1.216	1.141	0.695	78,572	1.211	1.139	0.680	1,036,380	1.183	1.102	0.735
Daily return beta	140,189	1.093	0.944	1.847	77,625	0.889	0.743	1.700	1,025,341	0.960	0.840	1.880
Herfindahl index	141,680	0.214	0.175	0.151	78,572	0.210	0.167	0.147	1,036,380	0.210	0.168	0.147

Panel B:Industry R&D intensity (top tercile vs. rest)

	N	Mean	Median	Std. Dev	N	Mean	Median	Std. Dev
	Top tercile R&D intensity				*Rest*			
Monthly return (%)	347,482	1.573	0.124	18.847	675,558	1.301	0.176	16.119
Book Leverage	351,757	0.175	0.133	0.180	684,127	0.283	0.263	0.202
Ind. adjusted leverage	351,757	0.063	0.007	0.169	684,127	0.023	0.000	0.182
Log (Size)	349,647	5.373	5.229	1.935	679,997	5.075	4.948	2.021
Log (B/M)	341,466	-0.755	-0.706	0.793	656,457	-0.397	-0.355	0.785
Monthly return beta	351,889	1.426	1.299	0.837	684,491	1.059	1.017	0.642
Daily return beta	348,851	1.192	1.049	1.999	676,490	0.840	0.742	1.804
Herfindahl index	351,889	0.168	0.125	0.125	684,491	0.232	0.195	0.153

Panel C: Industry R&D intensity (top quartile vs. rest)

	N	Mean	Median	Std. Dev	N	Mean	Median	Std. Dev
	Top quartile R&D intensity				*Rest*			
Monthly return (%)	255,509	1.624	0.000	20.355	767,531	1.316	0.248	15.861
Book Leverage	258,807	0.154	0.091	0.180	777,077	0.277	0.257	0.199
Ind. adjusted leverage	258,807	0.078	0.011	0.170	777,077	0.022	0.000	0.179
Log (Size)	257,216	5.382	5.224	1.925	772,428	5.107	4.982	2.016
Log (B/M)	251,496	-0.850	-0.798	0.801	746,427	-0.408	-0.370	0.776
Monthly return beta	258,927	1.546	1.430	0.881	777,453	1.062	1.022	0.635
Daily return beta	256,585	1.278	1.147	2.108	768,756	0.854	0.755	1.785
Herfindahl index	258,927	0.134	0.104	0.096	777,453	0.236	0.198	0.153

Table II: Relation between industry-adjusted leverage and stock returns

This table presents the regression results for the relation between industry-adjusted leverage and stock returns for our overall sample of firms. The dependent variable is the monthly stock return (in %) as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Financial firms and utility firms are not included. Book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977-2008). To calculate industry-median leverage, we require that at least three firms exist in the three-digit SIC code for the year under consideration. Ind. adjusted leverage is calculated as the book leverage of a firm minus the industry-median leverage. Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. Recession month is an indicator variable set to 1 if the month belongs to an economic contraction as identified by NBER and 0 otherwise. Pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Log(Size) is the logarithm of the market value of equity measured at June of year t. Log(B/M) is the logarithm of the book value of equity (Compustat BE) divided by the market value of equity (Compustat CSHO multiplied by PRCC_F) for the fiscal year ending in calendar year t-1. Monthly return beta is the pre-ranking beta estimated by regressing a minimum of 24 (and up to 60) monthly returns prior to July of year t on the contemporaneous and lagged monthly market returns on CRSP value-weighted market portfolio. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	(1)	(2)	(3)	(4)	(5)	(6)
Ind. adjusted leverage	-0.3981	0.0387	0.0398		0.0462	
	(0.243)	(0.283)	(0.283)		(0.281)	
Above industry-median leverage				-0.0523		-0.0552
				(0.077)		(0.077)
Recession month		-2.4843***				
		(0.737)				
Recession month * Ind. adjusted leverage		-1.9156***				
		(0.468)				
Pre-recession month		-2.0619***				
		(0.613)				
Pre-recession month * Ind. adjusted leverage		-2.3414***				
		(0.531)				
Recession or Pre-recession month			-2.3211***	-2.1668***	-2.3154***	-2.1646***
			(0.609)	(0.605)	(0.607)	(0.602)
Recession or pre-recession month*Ind. adjusted leverage			-2.0711***		-2.0475***	
			(0.417)		(0.400)	
Recession or pre-recession month* Above industry-median leverage				-0.4111***		-0.4020***
				(0.105)		(0.102)
Log(Size)	-0.0978**	-0.0973**	-0.0973**	-0.0959**	-0.0977**	-0.0964**
	(0.043)	(0.043)	(0.043)	(0.044)	(0.045)	(0.046)

Log(B/M)	0.3319***	0.3285***	0.3288***	0.3370***	0.3150***	0.3234***
	(0.102)	(0.102)	(0.102)	(0.100)	(0.113)	(0.112)
Monthly return beta	0.1007	0.0969	0.0974	0.0942		
	(0.160)	(0.160)	(0.161)	(0.161)		
Daily return beta					-0.0002	-0.0007
					(0.041)	(0.041)
Herfindahl index	-0.4167	-0.4186	-0.4187	-0.4174	-0.4860	-0.4834
	(0.252)	(0.249)	(0.249)	(0.250)	(0.305)	(0.307)
Constant	5.8092***	5.7952***	5.7947***	5.8195***	5.9370***	5.9606***
	(0.253)	(0.249)	(0.250)	(0.247)	(0.258)	(0.261)
Calendar year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	987,414	987,414	987,414	987,414	983,537	983,537
R-squared	0.01	0.01	0.01	0.01	0.01	0.01

Table III: Relation between industry-adjusted leverage and stock returns by industry R&D intensity – SIC codes

This table presents the regression results for the relation between the above industry-median leverage dummy and stock returns sorted by lagged industry level R&D Intensity (R&D expenses/sales in calendar year t-1). The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt divided by the book value of assets for the fiscal year ending in calendar year t-1 (1977-2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. To calculate industry-median leverage, we require that at least three firms exist in the three-digit SIC code for the year under consideration. Recession or pre-recession month is an indicator variable set to 1 for months that belong to periods classified as an economic contraction by NBER or for months that belong to the six-month period prior to the start of an economic contraction and set to 0 otherwise. Ind. adjusted cash flow volatility is the cash flow volatility of the firm minus the industry median cash flow volatility. Cash flow volatility of the firm is calculated as the coefficient of variation of the quarterly operating cash flows divided by quarterly revenues over lagged eight quarters. Size is the logarithm of the market value of equity measured at June of year t. Log(B/M) is the logarithm of the book-to-market ratio. Book-to-market ratio is calculated as the book value of equity divided by the market value of equity for the fiscal year ending in calendar year t-1. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. Reported results are for industries whose median lagged R&D intensity is in the (i) top tercile vs. the remaining industries and (ii) top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1^{st} and 99^{th} percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

	(1)	(2)	(3)	(4)
Dependent variable: monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above industry-median leverage	-0.0351	-0.0952	-0.0667	-0.0740
	(0.129)	(0.082)	(0.145)	(0.083)
Recession or Pre-recession month	-2.833***	-1.874***	-3.117***	-1.899***
	(0.844)	(0.636)	(0.915)	(0.659)
Recession or pre-recession month* Above industry-median leverage	-0.0928	-0.4301**	-0.0183	-0.4028**
	(0.185)	(0.162)	(0.249)	(0.148)
Ind. adjusted cash flow volatility	-0.0249	0.0042	-0.0343*	0.0081
	(0.018)	(0.017)	(0.020)	(0.015)
Industry median leverage	-0.8061	-0.2469	-0.2199	-0.2403
	(1.494)	(0.473)	(1.245)	(0.446)
Industry median cash flow volatility	-0.5030	0.3026*	-0.5338	0.2620*
	(0.389)	(0.165)	(0.351)	(0.151)
Log(Size)	-0.1423**	-0.0487	-0.1734**	-0.0497
	(0.061)	(0.039)	(0.072)	(0.039)
Log(B/M)	0.4788***	0.3275***	0.4495***	0.3388***
	(0.104)	(0.080)	(0.116)	(0.078)
Daily return beta	-0.0041	-0.0051	0.0012	-0.0061
	(0.053)	(0.036)	(0.053)	(0.035)
Herfindahl index	-0.8173**	0.0858	-1.4793***	0.1069
	(0.387)	(0.196)	(0.526)	(0.198)
Constant	6.5639***	5.5123***	6.4782***	5.6867***
	(0.364)	(0.214)	(0.406)	(0.212)
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	296,245	554,256	224,449	626,376
R-squared	0.01	0.01	0.01	0.01

Table IV: Relation between industry-adjusted leverage and stock returns by industry R&D intensity - (TNIC)

This table presents the regression results for the relation between above- industry-median leverage and stock returns when using the text-based network industry classifications developed by Hoberg and Phillips (2010a). The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1997 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt divided by the book value of assets for the fiscal year ending in calendar year t-1 (1996 – 2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. We only use the firms in the same TNIC to compute industry median. Recession month is an indicator variable set to 1 if the month belongs to period classified as an economic contraction by NBER and 0 otherwise. Recession or pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Ind. adjusted cash flow volatility is the cash flow volatility of the firm minus the industry median cash flow volatility. Cash flow volatility of the firm is calculated as the coefficient of variation of the quarterly operating cash flows divided by quarterly revenues over lagged eight quarters. Log(Size) is the logarithm of the market value of equity measured at June of year t. Log(B/M) is the logarithm of the book-to-market ratio. Book-to-market ratio is calculated as the book value of equity divided by the market value of equity for the fiscal year ending in calendar year t-1. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). TNIC based Herfindahl index is the Herfindahl index calculated by Hoberg and Phillips (2010a) for the TNIC industry for the fiscal year ending in calendar year t-1. Reported results are for industries whose median lagged R&D intensity (R&D expenses/sales in calendar year t-1) is in the (i) top tercile vs. the remaining industries and (ii) top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1^{st} and 99^{th} percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote *p*<0.01, p<0.05, and p<0.1 respectively.

	(1)	(2)	(3)	(4)
Dependent variable: monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above industry-median leverage *(TNIC)*	0.0071	-0.0223	0.0333	-0.0177
	(0.097)	(0.133)	(0.146)	(0.117)
Recession or Pre-recession month	-4.7067***	-2.7410**	-4.8959***	-2.9177**
	(0.845)	(1.065)	(0.927)	(0.974)
Recession or pre-recession month* Above industry-median leverage (*TNIC*)	0.0914	-0.4880**	0.1920	-0.4711**
	(0.122)	(0.188)	(0.192)	(0.159)
Ind. adjusted cash flow volatility	-0.0310	0.0196	-0.0313	0.0135
	(0.028)	(0.019)	(0.027)	(0.020)
Industry median leverage (*TNIC*)	-1.3694	0.3393	-0.6782	0.1231
	(1.535)	(0.753)	(2.262)	(0.835)
Industry median cash flow volatility	-0.5309	0.1617	-0.3944	-0.0184
	(0.424)	(0.371)	(0.420)	(0.336)
Log(Size)	-0.2502**	-0.1301*	-0.3082***	-0.1264*
	(0.091)	(0.062)	(0.095)	(0.061)
Log(B/M)	0.4203**	0.2795**	0.4005**	0.3092**
	(0.139)	(0.125)	(0.144)	(0.120)
Daily return beta	-0.0315	0.0226	-0.0328	0.0161
	(0.096)	(0.086)	(0.091)	(0.087)
TNIC based Herfindahl index	-1.1064*	-0.3635	-1.6625*	-0.3097
	(0.530)	(0.236)	(0.811)	(0.229)
Constant	6.6448***	6.2168***	7.1479***	6.0943***
	(0.597)	(0.404)	(0.605)	(0.404)
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	138,778	269,655	101,774	306,659
R-squared	0.01	0.01	0.01	0.01

Table V: Interaction expanded regressions for relation between industry-adjusted leverage and stock returns by lagged industry R&D intensity

This table presents results for the interaction-expanded regression models showing the relation between above industry-median leverage dummy and stock returns by lagged industry level R&D intensity (R&D expenses/sales in calendar year t-1). The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977-2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. To calculate industry-median leverage, we require that at least three firms exist in the three-digit SIC code for the year under consideration. Recession or pre-recession month is an indicator variable set to 1 for months that belong to periods classified as an economic contraction by NBER or for months that belong to the six-month period prior to the start of an economic contraction and set to 0 otherwise. Ind. adjusted cash flow volatility is the coefficient of variation of firm quarterly operating profit margin over eight lagged quarters where quarterly operating cash flows are defined as Compustat quarterly OIBDP and quarterly revenue is defined as Compustat quarterly REVTQ. Log(Size) is the logarithm of the market value of equity measured at June of year t. Log(B/M) is the logarithm of the book-to-market ratio. Book-to-market ratio is calculated as the book value of equity (Compustat BE) divided by the market value of equity (Compustat CSHO multiplied by PRCC_F) for the fiscal year ending in calendar year t-1. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. Reported results are for industries whose median lagged R&D intensity is in the (i) top tercile vs. the remaining industries and (ii) top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1^{st} and 99^{th} percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote p<0.01, p<0.05, and p<0.1 respectively.

	(1)	(2)	(3)	(4)
	Ind. R&D intensity		Ind. R&D intensity	
Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above industry-median leverage	-0.0341	-0.0999	-0.0518	-0.0804*
	(0.130)	(0.081)	(0.144)	(0.042)
Recession or Pre-recession month	-4.0319***	-2.3816***	-4.4957***	-2.5784***
	(1.004)	(0.530)	(1.148)	(0.249)
Recession or pre-recession month* Above industry-median leverage	-0.1218	-0.4095**	-0.1423	-0.3729***
	(0.190)	(0.159)	(0.229)	(0.096)
Ind. adjusted cash flow volatility	-0.0323*	-0.0126	-0.0442**	-0.0063
	(0.017)	(0.017)	(0.019)	(0.015)
Industry median leverage	-2.2921	-0.2960	-2.4926	-0.3264
	(1.785)	(0.558)	(1.957)	(0.215)
Industry median cash flow volatility	-0.2991	0.1828	-0.2252	0.0935
	(0.406)	(0.165)	(0.335)	(0.134)
Log(Size)	-0.1728**	-0.0533	-0.2100**	-0.0579***
	(0.070)	(0.045)	(0.082)	(0.013)
Log(B/M)	0.4925***	0.3606***	0.4459***	0.3754***
	(0.119)	(0.089)	(0.127)	(0.035)
Daily return beta	0.0444	0.0129	0.0464	0.0138
	(0.045)	(0.032)	(0.042)	(0.016)
Herfindahl index	-0.7150	-0.0784	-1.5204**	-0.0333
	(0.502)	(0.183)	(0.647)	(0.132)
Recession or pre-recession month*Ind. adjusted cash flow volatility	0.0412	0.1023**	0.0547	0.0895**

	(0.069)	(0.049)	(0.072)	(0.037)
Recession or pre-recession month*Industry median leverage	7.9423**	0.2657	12.8576**	0.4373
	(3.165)	(1.201)	(5.617)	(0.493)
Recession or pre-recession month*Industry median cash flow volatility	-0.8737	0.6556	-1.2636*	0.9159***
	(0.708)	(0.468)	(0.666)	(0.337)
Recession or pre-recession month * Log(Size)	0.1589	0.0215	0.1828	0.0394
	(0.106)	(0.106)	(0.118)	(0.030)
Recession or pre-recession month * Log(B/M)	-0.1212	-0.1605	-0.0498	-0.1781**
	(0.160)	(0.176)	(0.149)	(0.083)
Recession or pre-recession month * Daily return beta	-0.3034*	-0.0970	-0.3153*	-0.1042***
	(0.153)	(0.117)	(0.183)	(0.037)
Recession or pre-recession month * Herfindahl index	-0.9529	0.7610	-0.4873	0.6355**
	(1.030)	(0.595)	(1.024)	(0.318)
Constant	6.7650***	5.6041***	6.7251***	5.8119***
	(0.403)	(0.249)	(0.443)	(0.224)
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	296,245	554,256	224,449	626,376
R-squared	0.01	0.01	0.01	0.01

Table VI: Fama Macbeth estimations

This table presents the Fama-Macbeth estimation results for the relation between industry-adjusted leverage and stock returns by lagged industry R&D intensity. The reported coefficients and standard errors are the time series averages from the monthly cross-sectional regressions. The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt divided by the book value of assets for the fiscal year ending in calendar year t-1 (1977-2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. To calculate industry-median leverage, we require that at least three firms exist in the three-digit SIC code for the year under consideration. Recessions or pre-recessions are months that either belong to periods classified as an economic contraction by NBER or months in the six-month period prior to the start of an economic contraction. Ind. adjusted cash flow volatility is the cash flow volatility of the firm minus the industry median cash flow volatility. Cash flow volatility of the firm is calculated as the coefficient of variation of the quarterly operating cash flows divided by quarterly revenues over lagged eight quarters. Size is the logarithm of the market value of equity measured at June of year t. Book-to-market ratio is calculated as the book value of equity divided by the market value of equity for the fiscal year ending in calendar year t-1. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. Reported results are for industries whose median lagged R&D intensity (R&D Expenses/Sales in calendar year t-1) is in the (i) top tercile vs. the remaining industries and (ii) top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

Panel A: Industry R&D Intensity	Top tercile	Rest	Top tercile	Rest	Top quartile	Rest	Top quartile	Rest
Dep. variable: Monthly returns July $_t$ to June $_{t+1}$	Recessions or pre-recessions	Recessions or pre-recessions	Non-recessions	Non-recessions	Recessions or pre-recessions	Recessions or pre-recessions	Non-recessions	Non-recessions
Above industry-median leverage	-0.1630	-0.4063**	0.0336	-0.0618	-0.0419	-0.3616**	0.0702	-0.0422
	(0.186)	(0.179)	(0.090)	(0.065)	(0.259)	(0.170)	(0.125)	(0.064)
Ind. adjusted cash flow volatility	-0.0655	0.0377	0.0155	-0.0200	0.0363	0.0328	0.1182	-0.0114
	(0.089)	(0.046)	(0.035)	(0.016)	(0.488)	(0.043)	(0.194)	(0.015)
Ind. median leverage	-3.2398	-0.1486	0.1451	0.0048	3.0178	-0.1489	1.4105	0.0172
	(2.215)	(0.707)	(1.156)	(0.350)	(7.431)	(0.659)	(2.641)	(0.333)
Industry median cash flow volatility	0.4390	-0.1073	-0.5608	0.2559	5.9396	0.1165	-1.0666	0.1593
	(0.948)	(0.472)	(0.354)	(0.196)	(5.235)	(0.428)	(1.054)	(0.188)
Log(Size)	0.0184	0.0127	-0.1614**	-0.0626	-0.0414	0.0278	-0.1676**	-0.0709
	(0.143)	(0.112)	(0.063)	(0.050)	(0.156)	(0.111)	(0.076)	(0.050)
Log(B/M)	0.1787	0.1354	0.3488***	0.3259***	0.2180	0.1423	0.3229***	0.3327***
	(0.236)	(0.180)	(0.094)	(0.069)	(0.240)	(0.177)	(0.123)	(0.067)
Daily return beta	-0.0871	-0.0303	0.0929**	0.0309	0.0124	-0.0408	0.0804	0.0336
	(0.135)	(0.119)	(0.040)	(0.030)	(0.144)	(0.117)	(0.050)	(0.030)
Herfindahl index	-0.1903	0.9227**	-1.0019***	0.0087	-0.4775	0.8133*	-1.6168**	0.0429
	(0.679)	(0.449)	(0.346)	(0.178)	(2.177)	(0.419)	(0.798)	(0.163)
Constant	0.7568	0.0325	3.2030***	2.0493***	-1.1426	-0.0799	3.2258***	2.1140***
	(1.291)	(1.075)	(0.613)	(0.387)	(2.315)	(1.055)	(0.794)	(0.389)
Number of groups	86	86	298	298	86	86	298	298

Table VII: Relation between industry-adjusted leverage and stock returns bank dependent vs. non-bank dependent firms

This table presents the regression results for the relation between above industry median leverage and stock returns for bank dependent (panel A) and non-bank dependent firms (panel B). Firms are bank dependent (non-bank dependent) if they do not (do) have a bond rating on Compustat. The dependent variable is the monthly stock return as reported by CRSP for July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt divided by the book value of assets for the fiscal year ending in calendar year t-1 (1977-2008). To calculate industry-median leverage, we require at least three firms in the three-digit SIC code for the year under consideration. Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. Recession month is an indicator variable set to 1 if the month belongs to period classified as an economic contraction by NBER and 0 otherwise. Pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Ind. adjusted cash flow volatility is the cash flow volatility of the firm minus the industry median cash flow volatility. Firm cash flow volatility is calculated as the coefficient of variation of the quarterly operating cash flows divided by quarterly revenues over lagged eight quarters. Size is the market value of equity measured at June of year t. Book-to-market ratio is calculated as the BV of equity/MV of equity for the fiscal year ending in calendar year t-1. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. Reported results are for sub-samples of industries whose median lagged R&D intensity is in the (i) top tercile vs. the remaining industries and (ii) top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote *p*<0.01, p<0.05, and p<0.1 respectively.

Panel A: Bank dependent firms only	Ind. R&D intensity		Ind. R&D intensity	
Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above-industry median leverage	-0.0840	-0.1470*	-0.0906	-0.1313
	(0.128)	(0.082)	(0.142)	(0.079)
Recession or Pre-recession month	-2.8872***	-1.7331***	-3.147***	-1.774***
	(0.849)	(0.609)	(0.905)	(0.636)
Recession or pre-recession month* Above-industry median leverage	-0.1657	-0.4883**	-0.2143	-0.4189**
	(0.222)	(0.194)	(0.280)	(0.171)
Ind. adjusted cash flow volatility	-0.0272	0.0036	-0.0379*	0.0090
	(0.018)	(0.017)	(0.020)	(0.016)
Ind. median leverage	-1.2537	-0.2670	-0.3347	-0.2541
	(1.479)	(0.458)	(1.264)	(0.438)
Industry median cash flow volatility	-0.5356	0.2659*	-0.5469	0.2208
	(0.391)	(0.151)	(0.377)	(0.139)
Log(Size)	-0.1969***	-0.0902*	-0.2231**	-0.0941**
	(0.070)	(0.046)	(0.082)	(0.046)
Log(B/M)	0.4393***	0.3227***	0.4004***	0.3277***
	(0.110)	(0.068)	(0.129)	(0.065)
Daily return beta	-0.0017	-0.0036	0.0043	-0.0050
	(0.047)	(0.027)	(0.049)	(0.027)
Herfindahl index	-0.8660**	0.0794	-1.3264**	0.0913
	(0.399)	(0.204)	(0.558)	(0.200)
Constant	6.5947***	5.2477***	6.6079***	5.3978***
	(0.371)	(0.255)	(0.411)	(0.244)
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	246,683	411,721	193,472	464,932
R-squared	0.01	0.01	0.01	0.01

Panel B: Non-Bank dependent firms only				
	Ind. R&D intensity		Ind. R&D intensity	
Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above-industry median leverage	-0.0876	-0.0114	-0.5244**	0.0238
	(0.159)	(0.096)	(0.249)	(0.098)
Recession or Pre-recession month	-2.2931**	-2.3869**	-3.0939*	-2.3435**
	(1.027)	(0.900)	(1.564)	(0.906)
Recession or pre-recession month* Above-industry median leverage	-0.2372	-0.2169	0.8487	-0.3173
	(0.311)	(0.236)	(0.822)	(0.221)
Ind. adjusted cash flow volatility	0.0283	0.0043	0.0287	0.0034
	(0.058)	(0.038)	(0.074)	(0.035)
Ind. median leverage	-0.1964	-0.2399	-0.7543	-0.2371
	(1.436)	(0.851)	(1.774)	(0.781)
Industry median cash flow volatility	-0.1429	0.4492	-0.1203	0.4237
	(0.434)	(0.333)	(0.423)	(0.315)
Log(Size)	-0.1432	0.0191	-0.2054**	0.0196
	(0.093)	(0.077)	(0.094)	(0.076)
Log(B/M)	0.4182**	0.2907*	0.3848*	0.3166**
	(0.150)	(0.144)	(0.199)	(0.138)
Daily return beta	0.0027	-0.0016	-0.0069	-0.0026
	(0.121)	(0.098)	(0.135)	(0.092)
Herfindahl index	-1.2563**	-0.0106	-2.4387**	0.0411
	(0.571)	(0.399)	(0.906)	(0.422)
Constant	7.6774***	5.7298***	7.7790***	5.9318***
	(0.630)	(0.539)	(0.869)	(0.480)
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	49,562	142,859	30,977	161,444
R-squared	0.01	0.01	0.01	0.01

Table VIII: Real effects of leverage by industry level R&D intensity

This table presents the regression results for the relation between industry-adjusted leverage and industry-adjusted sales growth by industry lagged R&D intensity. The sample period is 1977 – 2008. The dependent variable is the industry-adjusted sales growth which is the annual sales growth for the firm minus the industry median sales growth. Sales growth is measured based on sales (Compustat SALE) for the firm fiscal year ending in calendar year *t-1* and for the fiscal ending in calendar year *t*. Ind. adjusted leverage is calculated as the book leverage of a firm minus the industry-median leverage. Book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977 – 2008). To calculate industry-median leverage, we require that at least three firms in the three-digit SIC code for the year under consideration. Recession $_{t-1}$ (Recession $_t$) is an indicator variable set to 1 if five or more months in calendar year t-1 (t) are classified as recessionary by NBER and 0 otherwise. Operating profitability is the ratio of operating income before depreciation (Compustat OIBDP) to sales (Compustat SALE). Cash to assets is the ratio of cash and marketable securities (Compustat CHE) to book value of total assets (Compustat AT). Log(Assets) is the logarithm of the book value of assets (Compustat AT). Capital expenditure is the ratio of capital expenditure (Compustat CAPX) to book value of total assets (Compustat AT). All control variables are based on accounting information for fiscal year ending in calendar t-1. Reported results are for industries whose median lagged R&D intensity is in the (i) top tercile vs. the remaining industries and (ii) top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain firm fixed effects and a time trend. Heteroskedasticity robust standard errors are reported in the parentheses. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

Dependent variable:	Ind. R&D intensity		Ind. R&D intensity	
Ind. adjusted sales growth $_{t-1 \text{ to } t}$	Top tercile	Rest	Top quartile	Rest
Ind. adjusted leverage	-0.1229***	-0.0653***	-0.1550***	-0.0587***
	(0.028)	(0.017)	(0.036)	(0.016)
Recession $_{t-1}$	-0.0129**	-0.0136***	-0.0175**	-0.0122***
	(0.005)	(0.003)	(0.007)	(0.003)
Recession $_{t-1}$ * Ind. adjusted leverage	0.0134	-0.0500***	0.0380	-0.0449***
	(0.037)	(0.018)	(0.050)	(0.017)
Recession $_t$	-0.0073	-0.0016	-0.0076	-0.0008
	(0.005)	(0.003)	(0.007)	(0.003)
Recession $_t$ * Ind. adjusted leverage	0.0534*	0.0190	0.0943**	0.0139
	(0.032)	(0.021)	(0.042)	(0.020)
Ind. adjusted operating profit	-0.1751***	-0.1110***	-0.1860***	-0.1030***
	(0.027)	(0.032)	(0.028)	(0.032)
Cash to assets	0.2165***	0.2469***	0.2275***	0.2314***
	(0.029)	(0.029)	(0.032)	(0.026)
Log(Assets)	-0.0826***	-0.0727***	-0.0903***	-0.0694***
	(0.006)	(0.005)	(0.007)	(0.004)
Ind. adjusted capital expenditure	-0.0838	0.3545***	-0.1245	0.3281***
	(0.071)	(0.041)	(0.090)	(0.039)
Constant	0.4176***	0.3851***	0.4807***	0.3688***
	(0.026)	(0.022)	(0.029)	(0.020)
Time trend	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	31,470	60,776	23,079	69,167
Adjusted R-Squared	0.06	0.04	0.07	0.03

Table IX: Relation between real effects and stock returns by industry level R&D intensity

This table presents regression results for the relation between real effects and stock returns. In the first stage (unreported), industry-adjusted sales growth is regressed on industry-adjusted leverage, recession indicator variables, interaction terms between industry-adjusted leverage and recession indicator variables, and other control variables. Based on this regression, we calculate the portion of industry-adjusted sales growth predicted by industry-adjusted leverage, the portion predicted by other control variables, and the residual from the model. The predicted values and the residual from the first stage model are included as explanatory variables in the second stage regressions. In the second stage (reported), the dependent variable is the monthly stock return from July of year t to June of year t+1 (July 1978 – June 2010). Ind. adjusted cash flow volatility is the cash flow volatility of the firm minus the industry median cash flow volatility. Cash flow volatility of the firm is calculated as the coefficient of variation of the quarterly operating cash flows divided by quarterly revenues over lagged eight quarters. Size is the logarithm of the market value of equity measured at June of year t. Book-to-market ratio is calculated as the book value of equity divided by the market value of equity for the fiscal year ending in calendar year t-1. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. Reported results are for industries whose median lagged R&D intensity is in the (i) top tercile vs. the remaining industries and (ii) top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Standard errors are bootstrapped based on 500 replications and reported in the parentheses. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

Dependent variable: Stock returns July $_t$ to June $_{t+1}$	Ind. R&D intensity		Ind. R&D intensity	
	Top tercile	Rest	Top quartile	Rest
Ind. adjusted sales growth $_{t-1\ to\ t}$ predicted by ind. adjusted leverage $_{t-1}$	5.7547	16.9273***	6.5498	16.5749***
	(3.675)	(2.275)	(4.471)	(2.022)
Ind. adjusted sales growth $_{t-1\ to\ t}$ predicted by controls $_{t-1}$	-1.7123***	-3.6183***	-1.5031**	-3.7742***
	(0.556)	(0.505)	(0.603)	(0.472)
Residual from the model	-2.5438***	-3.6651***	-2.3897***	-3.8411***
	(0.570)	(0.516)	(0.615)	(0.478)
Recession or pre-recession month	-2.7861***	-2.0370***	-3.0291***	-2.0463***
	(0.153)	(0.086)	(0.196)	(0.087)
Ind. adjusted cash flow volatility	-0.0302*	-0.0011	-0.0397**	0.0035
	(0.018)	(0.016)	(0.019)	(0.015)
Ind. median leverage	-1.0885**	-0.9948***	-0.1553	-1.0094***
	(0.538)	(0.234)	(0.943)	(0.218)
Industry median cash flow volatility	-0.4033**	0.2618*	-0.4223**	0.2216*
	(0.174)	(0.144)	(0.198)	(0.129)
Log (Size)	-0.2761***	-0.3359***	-0.2877***	-0.3494***
	(0.051)	(0.044)	(0.058)	(0.040)
Log (B/M)	0.3012***	0.0948*	0.2661***	0.0967**
	(0.069)	(0.050)	(0.085)	(0.045)
Daily return beta	0.0092	0.0157	0.0135	0.0136
	(0.022)	(0.017)	(0.026)	(0.015)
Herfindahl index	-0.8067***	0.0774	-1.4659***	0.1003
	(0.276)	(0.140)	(0.426)	(0.134)
Constant	7.2110***	7.0981***	6.9610***	7.3489***
	(0.387)	(0.315)	(0.447)	(0.279)
Calendar year dummies	Yes	Yes	Yes	Yes
R-squared	0.01	0.01	0.01	0.01
Observations	292,446	546,253	221,393	617,306

Internet Appendix for

"Stock Returns and the Competitive Effects of Debt"

A.1. Alternative explanation: Debt overhang

In this section, we consider the possibility that debt overhang effects are a better explanation for our finding of a more negative relation between relative-to-industry leverage and stock returns during recessionary periods in low product differentiation environments than competitive effects of debt. Debt overhang theory suggests that high debt would lead to sub-optimal investment decisions (or underinvestment) and that the extent of this underinvestment problem is particularly severe for firms with high growth options (e.g., Myers (1977)). Chen and Manso (2016) argue that the debt overhang problem is magnified in recessions due to a larger wealth transfer from debtholders to shareholders. To test the debt overhang theory, we divide our sample in two groups: firms that lie above vs. below the sample median book-to-market ratio. We then run our baseline estimation for high vs. low book-to-market firms as the book-to-market ratio is inversely related to growth opportunities. Under debt overhang theory, we expect a more negative relation between industry-adjusted leverage and stock returns during economic contractions in the low book-to-market firms (i.e., high debt overhang group). The results for these estimations are reported in Appendix Table AII. We find that the coefficient on the interaction of the above industry-median leverage dummy variable and the recession or pre-recession indicator variable is more negative in the high book-to-market sub-sample than in the low book-to-market sub-sample. This is opposite to the prediction from the debt overhang theory of a more negative relation in the low book-to-market group. This suggests that our results are not driven by debt overhang associated with high debt firms.

A.2. Alternative explanation: Customer warranty concerns

As pointed out in Titman (1984), customers, particularly of durable goods, are reluctant to do business with a high debt firm since a firm default or likely default would pose significant threats to the continued availability of warranty and servicing requirements. Campello and Fluck (2006) argue that warranty and servicing requirements are expected to be higher in durable goods industries and that the excessive use of debt hinders the sales growth of firms particularly in durable goods industries during recessions. To investigate whether warranty and servicing concerns are driving our results instead of competitive effects of debt, we first sub-divide our sample of firms as belonging to durable goods and non-durable goods industries. Sharpe (1994) and Campello and Fluck (2006) segregate manufacturing industries into durable vs. non-durable goods industries based on the covariance of the industry sales growth and the gross national product. Consistent with their definitions, we consider only manufacturing industries, i.e. firms with two-digit SIC codes between 20 and 39, in this section. The following two-digit SIC codes are considered as durable goods industries: 24, 25, 30, and 33-37. All other manufacturing industries are considered as non-durable goods industries: 20-23, 26-29, 31-32, 38, and 39.

As argued above, customer warranty concerns should be prevalent in the durable goods sub-sample. Since non-durable goods are less likely to have customer warranty concerns, the dominant effect should be attributable to competitive effects of debt. Therefore, the differentiating test for the competitive effects of debt hypothesis is to examine the results for the non-durable goods sub-sample across high product differentiation and low product differentiation environments. We report results for the non-durable goods sub-sample in Appendix Table AIII. If competitive effects of debt are prevalent, we expect to find a larger drop in returns for firms with high relative-to-industry debt in the sub-samples with low product differentiation, i.e. low industry lagged R&D intensity. The empirical results confirm these predictions. The coefficient on the interaction term of above industry-median leverage and the recession or pre-recession dummy variable is significant only in the sub-sample with low product differentiation (Columns 2 and 4) while it is insignificant in the sub-sample of high product differentiation (Columns 1 and 3). Overall, it is reassuring to note that even after eliminating firms likely to have customer warranty concerns from the sample our results supporting competitive effects of debt continue to hold.

A.3. Are high debt firms simply weak firms?

In this section, we address the concern that higher debt firms may simply be weaker firms in general. When the economy contracts high debt firms may lose market share and experience lower stock returns if they are less efficient firms. This is because less efficient firms may be forced to retrench or exit a market when a recession hits since the market accommodates less firms when demand is low. To address this concern, we include proxies for firm efficiency and profitability in our regressions. In particular, we include the industry-adjusted operating profit margin to capture profitability and industry-adjusted total asset turnover to capture efficiency. We further interact each variable with the recession indicator variables to explore how efficient and profitable firms behave during recessions. The results are reported in Table AIV. In the low product differentiation sub-sample (Columns 2 and 4), the coefficient on the interaction of above industry-median leverage dummy variable and the recession or pre-recession indicator variable remains negative and significant at the 1% level. The economic magnitude remains similar to what was reported in Table III. The coefficient on the interaction term remains statistically insignificant for the high product differentiation sub-samples (Columns 1 and 3).

A.4. Local monopolies

In this section, we control for the possibility that some low product differentiation firms may have a local monopoly. If a firm has a local monopoly, then low R&D intensity does not necessarily mean that it is to switch to a lower cost rival's product. We investigate if our results supportive of competitive effects of debt continue to hold after we drop industries likely to have local monopolies from our sample.[18]

We identify all SIC codes that are likely to include local monopolies [(eating places (5812); nursing homes (8051); retail (5000 to 5999); railroad transportation (4011); local and suburban transit (4111); local passenger transportation (4119); taxicabs (4121); intercity and rural bus transportation (4131); terminal and service facilities for motor vehicle transportation (4173); hotels and motels (7011); personal services (7200 to 7299)]. We re-run the baseline specifications excluding these industries. The results are shown in Table AV. The coefficients on the interaction term between the recession or pre-recession month indicator and the above industry-median leverage dummy remains negative when industries with potential local monopolies are dropped. Specifically, the coefficient on the interaction term in the low product

[18] We thank Murillo Campello for suggesting this test.

differentiation sub-samples (Columns 2 and 4) are negative and significant even after eliminating local monopolies from our sample. They are also of similar magnitude to those documented in Table III.

A.5. Role of cash holdings

Firms could be holding cash reserves for precautionary reasons such as to be prepared during periods of negative shocks (e.g., Opler, Pinkowitz, Stulz, and Williamson (1999) and Fresard (2010)). To control for the possibility that some firms may be able to sustain high leverage without any adverse effects because they have high cash holdings, we use a measure of book leverage adjusted for cash holdings. We implement this by computing the cash-adjusted leverage of the firm. Specifically, we calculate the cash-adjusted book leverage as the sum of debt in current liabilities and long-term debt (Compustat DLC and DLTT) minus the cash holdings of the firm (Compustat CH) divided by the book value of assets (Compustat AT). We redefine the industry-adjusted leverage measures based on the cash-adjusted book leverage of the firm and repeat the main analysis in the paper. In unreported results, we find that the mean (median) cash to assets ratio of our sample firms is 8.18% (3.63%) and the mean (median) cash-adjusted book leverage of our sample firms is 16.43% (17.35%). The industry-adjusted leverage based on the cash-adjusted book leverage measure has a mean (median) of 1.81% (0.00%).

We present results using the cash adjusted leverage measure in Table AVI. The coefficients on the interaction term between the recession or pre-recession month indicator and the above industry median leverage dummy is negative and significant only in the low industry median R&D intensity sub-samples. In contrast, the coefficient on the interaction term for the high industry median R&D intensity sub-sample is found to be insignificant. Overall, our results are qualitatively similar when we specifically adjust our leverage measure for the cash holdings of the firm.

Table AI: Number of firm-years with positive R&D intensity by Fama-French industries

This table provides the frequency distributions of firm-years in our sample with positive R&D intensity (R&D expenses/sales) across each of the 49 two-digit Fama-French (1997) industries. R&D intensity is calculated from Compustat items for year t-1 (1977-2008).

Fama-French industry	% with positive R&D
Computers	95.62%
Measuring and Control Equipment	95.37%
Medical Equipment	91.65%
Electronic Equipment	89.48%
Pharmaceutical Products	88.11%
Defense	87.25%
Computer Software	80.40%
Electrical Equipment	79.94%
Machinery	79.27%
Chemicals	77.91%
Automobiles and Trucks	73.49%
Aircraft	67.16%
Recreation	63.76%
Rubber and Plastic Products	60.13%
Consumer Goods	56.19%
Business Supplies	53.67%
Shipbuilding, Railroad Equipment	52.21%
Shipping Containers	49.07%
Tobacco Products	47.67%
Construction Materials	44.82%
Steel Works Etc	41.72%
Textiles	35.26%
Fabricated Products	34.45%
Food Products	33.98%
Agriculture	31.78%
Business Services	28.14%
Non-Metallic and Industrial Metal Mining	23.50%
Other	15.39%
Communication	14.22%
Beer & Liquor	13.84%
Healthcare	13.27%
Candy & Soda	12.69%
Wholesale	12.35%
Petroleum and Natural Gas	12.18%
Apparel	11.70%
Coal	10.79%
Printing and Publishing	9.09%

Construction	8.62%
Personal Services	7.30%
Entertainment	6.17%
Trading	4.71%
Retail	2.74%
Restaurants, Hotels, Motels	2.72%
Real Estate	2.28%
Insurance	1.98%
Transportation	1.39%
Precious Metals	0.83%
Banking	0.77%
Utilities	0.57%

Table AII: Debt overhang

This table presents the regression results for the relation between above (below) industry-median leverage and stock returns by firm book-to-market ratio. The dependent variable is the monthly stock return as reported by the CRSP database from July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt divided by the book value of assets in calendar year t-1 (1977-2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. Recession month is an indicator variable set to 1 if the month belongs to period classified as an economic contraction by NBER and 0 otherwise. Pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Ind. adjusted cash flow volatility is the cash flow volatility of the firm minus the industry median cash flow volatility. Cash flow volatility of the firm is calculated as the coefficient of variation of the quarterly operating cash flows (Compustat quarterly OIBDP) divided by quarterly revenues (Compustat quarterly REVTQ) over lagged eight quarters. Size is the logarithm of the market value of equity measured at June of year t. Log(B/M) is the logarithm of the book-to-market ratio. Book-to-market ratio is calculated as the book value of equity (Compustat BE) divided by the market value of equity (Compustat CSHO multiplied by PRCC_F) for the fiscal year ending in calendar year t-1. Daily return beta is the pre-ranking beta estimated using daily returns in June of year t per Lewellen and Nagel (2006). Herfindahl index is the sales-based Herfindahl index of the three-digit SIC industry for the fiscal year ending in calendar year t-1. *Diff* presents the *p*-values based on a one-sided t-test for the difference between above vs. below median sub-samples. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

	Book-to-market		Book-to-market	
Dep. variable: Monthly Returns July $_t$ to June $_{t+1}$	Above median	Below median	Above median	Below median
Above industry-median leverage	-0.0373	-0.1164		
	(0.101)	(0.094)		
Recession or Pre-recession month	-1.9658***	-2.4346***	-2.1762***	-2.4764***
	(0.647)	(0.615)	(0.684)	(0.598)
Recession or pre-recession month* Above industry-median leverage	-0.5102***	-0.1812		
	(0.179)	(0.144)		
Ind. adjusted leverage			-0.0303	-0.3133
			(0.385)	(0.386)
Recession or Pre-recession month * Ind. Adjusted leverage			-2.4373***	-1.4178***
			(0.613)	(0.458)
Ind. adjusted cash flow volatility	-0.0028	-0.0086	-0.0026	-0.0081
	(0.018)	(0.018)	(0.018)	(0.018)
Ind. median leverage	-1.2100	-1.5478*	-1.3154	-1.6900*
	(0.813)	(0.830)	(0.865)	(0.885)
Industry median cash flow volatility	-0.4893	-0.1542	-0.4928	-0.1625
	(0.302)	(0.275)	(0.300)	(0.278)
Log(Size)	-0.1441***	-0.0265	-0.1445***	-0.0298
	(0.052)	(0.042)	(0.052)	(0.042)
Log(B/M)	0.4286**	0.3713**	0.4282**	0.3524**
	(0.169)	(0.140)	(0.170)	(0.145)
Daily return beta	0.0239	-0.0275	0.0243	-0.0278
	(0.037)	(0.055)	(0.037)	(0.055)
Herfindahl index	-0.1529	-0.4053	-0.1492	-0.3949
	(0.173)	(0.343)	(0.172)	(0.340)
Constant	7.0224***	4.9461***	7.0269***	4.9254***
	(0.360)	(0.341)	(0.348)	(0.338)
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	424,787	426,038	424,787	426,038
R-squared	0.01	0.01	0.01	0.01

Table AIII: Customer warranty concerns

This table presents the regression results for the relation between industry-adjusted leverage and stock returns in non-durable goods industries. Only manufacturing industries are considered. To identify durable and non-durable industries we use definitions provided by Sharpe (1994). The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977-2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. Recession month is an indicator variable set to 1 if the month belongs to period classified as an economic contraction by NBER and 0 otherwise. Pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Ind. adjusted cash flow volatility is the cash flow volatility of the firm minus the industry median cash flow volatility. Control variables are consistent with those in Equation 2 of the paper. Reported results are for industries whose median lagged R&D intensity is in the top tercile vs. the remaining industries as well as industries whose median lagged R&D intensity is in the top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote *p*<0.01, p<0.05, and p<0.1 respectively.
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	(1)	(2)	(3)	(4)
	Ind. R&D intensity		Ind. R&D intensity	
Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above industry-median leverage	0.0269	-0.1524**	0.0164	-0.1365**
	(0.150)	(0.069)	(0.161)	(0.060)
Recession or Pre-recession month	-2.0361**	-1.498***	-2.3950**	-1.468***
	(0.901)	(0.169)	(1.075)	(0.152)
Recession or pre-recession month* Above industry-median leverage	-0.0854	-0.3402**	-0.1510	-0.2536*
	(0.285)	(0.162)	(0.354)	(0.150)
Control variables	Yes	Yes	Yes	Yes
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	76,111	140,445	58,589	157,789
R-squared	0.01	0.01	0.01	0.01

Table AIV: Weak firms

This table presents the regression results for the relation between above (below) industry-median leverage and stock returns sorted by lagged industry R&D intensity. The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977-2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. Recession month is an indicator variable set to 1 if the month belongs to period classified as an economic contraction by NBER and 0 otherwise. Pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Ind. Adjusted operating profit margin is the firm operating profit margin (Compustat EBIT) divided by sales (Compustat REVT) adjusted for the industry operating profit margin. Ind. Adjusted TAT is the firm total asset turnover (Compustat REVT) divided by book value of assets (Compustat AT) adjusted for the industry total asset turnover. Control variables are consistent with those in Equation 2 of the paper. Reported results are for industries whose median lagged R&D intensity is in the top tercile vs. the remaining industries as well as industries whose median lagged R&D intensity is in the top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

	(1)	(2)	(3)	(4)
	Ind. R&D intensity		Ind. R&D intensity	
Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above industry-median leverage	-0.0376	-0.0460	-0.0734	-0.0240
	(0.128)	(0.083)	(0.138)	(0.083)
Recession or Pre-recession month	-2.8542***	-1.8649***	-3.1765***	-1.8876***
	(0.855)	(0.634)	(0.946)	(0.655)
Recession or pre-recession month* Above industry-median leverage	-0.0997	-0.4280***	-0.0189	-0.4159***
	(0.197)	(0.153)	(0.247)	(0.138)
Ind. Adjusted operating profit margin	-0.0122	-0.0250	-0.0184	-0.0191
	(0.011)	(0.027)	(0.012)	(0.026)
Recession or Pre-recession month * Ind. Adjusted operating profit margin	0.0138	-0.0433	0.0173	-0.0137
	(0.020)	(0.104)	(0.020)	(0.096)
Ind. Adjusted TAT	0.2421	0.2644***	0.1907	0.2757***
	(0.172)	(0.045)	(0.189)	(0.044)
Recession or Pre-recession month * Ind. Adjusted TAT	-0.4819	-0.0774	-0.3526	-0.1290
	(0.410)	(0.117)	(0.463)	(0.118)
Control variables	Yes	Yes	Yes	Yes
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	296,153	554,095	224,369	625,879
R-squared	0.01	0.01	0.01	0.01

Table AV: Local monopolies

This table presents the regression results for the relation between above industry-median leverage and stock returns by lagged industry R&D intensity. In all tests we exclude industries that are likely to be dominated by local monopolies. The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977-2008). Above industry-median leverage is an indicator variable set to 1 if the book leverage of firm is above its industry median and 0 otherwise. To calculate industry-median leverage, we require that at least three firms exist in the three-digit SIC code for the year under consideration. Recession month is an indicator variable set to 1 if the month belongs to period classified as an economic contraction by NBER and 0 otherwise. Pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Control variables are consistent with those in Equation 2 of the paper. Reported results are for industries whose median lagged R&D intensity is in the top tercile vs. the remaining industries as well as industries whose median lagged R&D intensity is in the top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

	(1)	(2)	(3)	(4)
	Ind. R&D intensity		Ind. R&D intensity	
Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above industry-median leverage	-0.0351	-0.1016	-0.0667	-0.0713
	(0.129)	(0.096)	(0.145)	(0.096)
Recession or Pre-recession month	-2.8334***	-1.841***	-3.1170***	-1.878***
	(0.844)	(0.597)	(0.915)	(0.647)
Recession or pre-recession month* Above industry-median leverage	-0.0928	-0.4623**	-0.0183	-0.4245**
	(0.185)	(0.186)	(0.249)	(0.163)
Control variables	Yes	Yes	Yes	Yes
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	296,245	407,870	224,449	479,666
R-squared	0.01	0.01	0.01	0.01

Table AVI: Cash-adjusted leverage measures

This table presents the regression results for the relation between industry-adjusted leverage and stock returns. The dependent variable is the monthly stock return as reported by the CRSP database for July of year t to June of year t+1 (July 1978 – June 2010). Cash-adjusted book leverage is the sum of debt in current liabilities and long-term debt (Compustat DLC plus DLTT) minus cash holdings (Compustat CH) divided by the book value of assets (Compustat AT) for the fiscal year ending in calendar year t-1 (1977-2008). Above industry-median leverage (*cash adjusted*) is an indicator variable set to 1 if the cash-adjusted book leverage of firm is above its industry median and 0 otherwise. Ind. median leverage (*cash adjusted*) is the industry median level of the cash-adjusted book leverage. Recession month is an indicator variable set to 1 if the month belongs to period classified as an economic contraction by NBER and 0 otherwise. Pre-recession month is an indicator variable set to 1 for months that belong to the six-month period prior to the start of an economic contraction and 0 otherwise. Control variables are consistent with those in Equation 2 of the paper. Reported results are for industries whose median lagged R&D intensity is in the top tercile vs. the remaining industries as well as industries whose median lagged R&D intensity is in the top quartile vs. the remaining industries. All continuous independent variables are winsorized at the 1st and 99th percentile levels. All specifications contain calendar year dummies. Heteroskedasticity robust standard errors that are clustered by year are reported in the parentheses. The symbols ***, **, and * denote *p*<0.01, p<0.05, and p<0.1 respectively.

	(1)	(2)	(3)	(4)
	Ind. R&D intensity		Ind. R&D intensity	
Dependent variable: Monthly returns July $_t$ to June $_{t+1}$	Top tercile	Rest	Top quartile	Rest
Above industry-median leverage *(Cash adjusted)*	-0.1595	-0.0892	-0.2628	-0.0569
	(0.153)	(0.083)	(0.189)	(0.080)
Recession or Pre-recession month	-3.1794***	-1.903***	-3.5804***	-1.925***
	(0.851)	(0.646)	(0.930)	(0.666)
Recession or pre-recession month* Above industry-median leverage (*Cash adjusted*)	0.3154	-0.466***	0.5434	-0.439***
	(0.238)	(0.164)	(0.325)	(0.148)
Control variables	Yes	Yes	Yes	Yes
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	276,524	510,990	211,909	575,605
R-squared	0.01	0.01	0.01	0.01

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