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What types of bondholders impede corporate innovative activities?

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What Types of Bondholders Impede Corporate Innovative Activities?

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Abstract

This study investigates whether institutional bond blockholders (i.e., bond funds that hold more than 5% of a firm's outstanding bonds) impede firm innovative activities, and if they do, through which channels. We find that long-term bond blockholders do not discourage firms from conducting innovative activities. Short-term bond blockholders, however, significantly reduce both firm investments in R&D and the innovative quality of these investments. Furthermore, their negative impact is stronger than the negative impact of short-term stockholders. Our results cannot be fully explained by short-term bondholders' *a priori* investment preferences and are robust to possible endogeneity concerns. Overall, they suggest that the option of the 'Wall Street walk' allows bondholders to exert considerable influence on firms' risk-taking decisions.

JEL Classification: G23, G31

Keywords: Bondholder; Innovation; Investment Horizon; Wall Street Walk

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I. Introduction

It has long been recognized that debt can engender powerful managerial incentives that impact important corporate decisions (Jensen and Meckling, 1976; Jensen, 1986; Myers, 1977). More recently, considerable research has examined how banks often take an active role in monitoring clients and influencing corporate strategies (Boot, 2000; Cornaggia, Tian and Wolfe, 2013). However, thus far the literature has generally assumed that bond debt, which constitutes the bulk of corporate debt in the U.S., disciplines management only through the *ex ante* structuring of the debt contract, and relatively passive *ex post* monitoring for violations of the contract.[1] This perspective also implicitly assumes that creditors hold their investments for the duration of the loans. In truth, many corporate bondholders do have the option to sell their holdings at virtually any time before the bond matures. Many corporate bonds, especially the larger issues, are actively traded in secondary markets and the yields on these bonds are a primary component in pricing the firm's new debt issuances. Thus, a sell-off by bondholders could have a significant negative impact on a firm's cost of capital. Virtually unexplored is the question of whether the threat of this 'Wall Street walk' confers upon bondholders a more active mechanism through which they might influence corporate management.

In this paper, we focus on bondholders who hold a significant amount of a company's outstanding bonds (*i.e.*, bond blockholders). Furthermore, using data on the trading patterns of these bondholders, we are able to distinguish between dedicated long-term bondholders and more transient short-term bondholders (*i.e.*, long-term and short-term refer to how long the bondholders tend to hold the bonds, not to the maturity of the bonds). We then examine how

[1] For ways bondholders protect themselves through covenant design, see Chava, Kumar and Warga (2010) and Smith and Warner (1979); for the use of bondholder protections in the case of contract violation and bankruptcy, see Acharya, Amihud and Litov (2008) and Becker and Stromberg (2012).

bond blockholders with both short and long-term orientations impact both corporate innovative activities such as investments in R&D as well as the effectiveness of those investments.

The impact of bond blockholders on corporate innovation activities is a potentially critical issue. While innovation is imperative to the long term success of the firm, bondholders are typically regarded as being more risk-averse and having a more limited time horizon than equity holders due to the fact that debt, unlike equity, has a set maturity date and does not materially benefit from the firm's longer-term growth prospects. Indeed, it is broadly believed that bondholders may prefer that firms emphasize short term results at the expense of long term growth. Therefore, amongst the numerous possible risk taking decisions, corporate innovative activities may be particularly prone to driving a wedge between the interests of creditors and shareholders (Acharya and Subramanian, 2009).

However, not all bondholders share the same investment horizon. As such, their attitudes towards long-term risky projects, such as investments in innovation, might also differ. To the extent that dedicated long-term bondholders adopt a longer term perspective than others, their potential negative effect on corporate innovative activities could be mitigated. On the other hand, transient short-term bondholders might hold a strong preference for relatively short-term and safe investments. Furthermore, their active trading styles allow them to effectively use the threat of the Wall Street walk to push corporate management towards the investments that they prefer.

If bond blockholders 'vote with their feet' and sell off their investments in a particular firm, it could depress the prices of the existing bonds, driving up both yields on current bond issues and concomitantly expected yields on future issues. This will further drive up the firm's cost of debt and hence also its weighted average cost of capital (WACC). Furthermore, because bond markets are not quite as liquid as equity markets, the impact of a bond blockholder

dumping its securities could be even more severe than that of an equity holder exiting (Bao, Pan and Wang, 2011; Ellul, Jotikasthira and Lundbald, 2011). Thus, we believe that the option of the 'Wall Street walk' will make managers sensitive to the preferences of influential (*i.e.*, block) bondholders. This will induce managers to put relatively greater emphasis on short term results, which will translate into diminished investments in R&D. Furthermore, if the preference for short-term results also impacts the specific R&D projects selected, managers may have a preference for shorter term, low-risk/low-return innovative efforts, and hence the quality of a firm's innovative efforts may also decline.

In this paper, we present empirical evidence broadly consistent with this perspective. We find that long-term bond blockholders generally have a negligible impact on firm innovation activities. In contrast, short-term bond blockholders have a significant negative impact on both the firms' innovative expenditures and innovative efficiency (*i.e.*, numbers of patents and citations per R&D dollar). Furthermore, we show that these results are robust to alternative model specifications, sample selection procedures, and definitions of the bond blockholder.

Although theoretically intuitive, empirically isolating the impact of bond blockholders is challenging. First, short-term bond blockholders are not randomly assigned to firms. Any statistical association between the presence of short-term bond blockholders and corporate innovative activities could be driven by either the bondholders' *a priori* investment preference for firms with low innovative activities, or by unobserved firm characteristics that are correlated with both the presence of short-term bondholders and firms innovative activities. To address these concerns and establish a strong causal link between the presence of short-term bondholders and firm innovation, we adopt two parallel approaches. First, we demonstrate that short-term bond blockholders do not appear to exhibit an *ex ante* preference for firms with low levels of

investment in R&D. Second, we construct instruments for the presence of short-term bond blockholders and conduct a two-stage least squares instrumental variables (2SLS-IV) regression.[2] After accounting for unobserved factors that may be correlated with both innovative activities and bond investor preferences, we find our main results remain unchanged.

Even if short-term bond blockholders do affect corporate innovative activities, the question remains as to which channels they utilize to wield that influence. We have conjectured that their influence derives primarily from the threat of exit. However, an alternative hypothesis would be that short-term bondholders exert influence through soft communication with a firm's management. To examine this alternative explanation, we use bond's year-to-maturity as a proxy for its liquidity. Bao, Pan and Wang (2011) show that bonds with higher year-to-maturity tend to be more illiquid. While a bond sell-off will increase the firm's WACC, the consequences of a sell-off are most severe when the bonds are less liquid (Ellul, Jotikasthira and Lundblad, 2011). If bondholders exert influence over managers primarily through their market power, then we would expect the short-term bondholder effect to be more prominent for bonds that are further from maturity. Our results confirm this expectation. Curiously, we also find that long-term bond blockholders can have a positive impact on innovation when a firm's bonds are converging on maturity. Hence, long-term bondholders may actually wield some limited influence over managers, albeit via different mechanisms than short-term bond blockholders.

Finally, we investigate how equity and debt blockholders interact in affecting a firm's innovative activities. Bushee (1998) argues that short-term stockholders discourage management from investing in R&D. It is possible that the same institutions that are bond blockholders are

[2] In particular, for instruments we use (1) the firm's stock volatility and (2) a dummy variable 'Junkbond' that indicates whether the bond issuer's S&P long-term credit rating is below BBB-. These two variables are shown to be related to the presence of short-term bond blockholders but are theoretically unrelated to firms' innovation activities.

also equity blockholders, and thus the apparent influence of bond blockholders is spurious (Jiang, Li, and Shao, 2010). However, our results rule out this interpretation because the bond blockholder effect remains even after controlling for equity blockholders. Indeed, we find the negative impact of short-term bond blockholders on innovation to be almost twice as large as the negative impact of short-term equity blockholders. Furthermore, we find a negative interaction between the two, suggesting that the co-presence of short-term bond blockholders and equity blockholders has a 'super-additive' negative effect on corporate innovation.

Our paper makes several important contributions. First, this is one of the first papers to show that in addition to defensive mechanisms such as bond contract design, the option of the Wall Street walk can be just as potent a tool for bondholders as it is for shareholders, and potentially even more so. While previous research has found that the secondary market for equity can introduce market forces that influence corporate management (Maug, 1998; Edmans, Fang and Zur 2012), the potential influence of secondary markets for debt has received scant attention. Two noteworthy exceptions are a recent paper by Gande and Saunders (2012), which asked whether the secondary market for loans will dilute the monitoring incentive of creditors, and a recent study by Massa, Yasuda and Zhang (2011) which found that bondholders with short investment horizons affect firm financing decisions. These studies, in conjunction with ours, strongly indicate that secondary markets for debt can indeed influence managerial decision making. As a result, this paper also contributes more broadly to the literature on the relationship between debt and corporate governance.

Second, we contribute to the literature on the potential conflicts between bondholders and shareholders. At least in the context of innovation, we show that the distinction between a long-term and short-term investment horizon may be a more important consideration than the

distinction between debt and equity. Dedicated long-term bondholders do not pervert the incentives to innovate, and sometimes they may strengthen those incentives. Third, we also contribute to the growing literature on corporate innovation. A number of papers have already shown that capital markets can significantly influence corporate innovation. These papers mainly focus on the equity market, and suggest that shareholders' risk attitude and investment horizon have a direct impact on firm innovation.[3] By emphasizing the market power of institutional bond investors, we directly compare the influence of bond blockholders to that of equity blockholders and shed new light on the question of whether investors with different risk attitudes and investment horizons have similar impacts on firm innovation.

The remainder of this paper is organized as follows. In Section II, we survey the related literatures for this study. In Section III, we define our key variables and discuss our sample construction. In Section IV, we present our baseline results for the influence of bond blockholders on firm innovative activities. In Section V, we address alternative explanations. In Section VI, we directly test whether short-term bondholders affect a firm's innovative activities through market forces or from private persuasion. In Section VII, we compare bond blockholders to equity blockholders to examine which is more influential and whether their influences are independent or intertwined. We conclude in Section VIII.

II. Related Literatures

2.1. The Role of Bondholders in Corporate Decisions

The existing literature on bondholders in corporate decisions can be broadly classified into two main branches. The first branch, which starts with Jensen and Meckling (1976) and

[3] See, for example: Acharya and Subramanian (2009); Aghion, Reenen and Zingales (2012); Atanassov (2012); Benfratello, Schiantarelli and Sembenelli (2008); Bushee (1998); Fang, Tian and Tice (2012); Herrera and Minetti (2007); Lerner, Sorensen and Stromberg (2011); Tian and Wang (2011).

Myers (1977), focuses on the potential conflicts of interest between bondholders and shareholders. These studies implicitly assume that bondholders belong to a homogenous group that has distinctly different preferences from shareholders. The managers of the firm, ultimately responsible for shareholders, have incentives to expropriate bondholder wealth by choosing riskier investments that maximize shareholder wealth. This poses an agency problem from bondholders' perspective, known as the wealth transfer effect. Many subsequent empirical studies have confirmed this conflict and show that the wealth of bondholder is negatively affected by various corporate events such as takeovers (Billett, King and Mauer, 2004), LBOs (Warga and Welch, 2003), dividend payments (Dhillon and Johnson, 1994), spinoffs (Maxwell and Rao, 2003) and hedge fund activism (Klein and Zur, 2011).

The second branch, which implicitly assumes that bondholders are passive creditors, suggests that bondholders can protect their interests and influence management either through the predetermined bond contracts and covenants, or via creditor friendly legal systems. In this perspective, bond contract design and legal protection become the most important mechanisms through which bondholders affect corporate decisions and mitigate the potential agency problems. For example, Barnea, Haugen and Senbet (1980) argue that shorter-term debt can reduce managerial incentives to increase risk. Acharya, Amihud and Litov (2008) find that strong creditor rights in bankruptcy can reduce corporate risk-taking. Becker and Stromberg (2012) show that a legal event that limits managerial incentives to favor equity over debt for distressed firms results in increased equity issues and decreased risky investments. Armed with these legal weapons, bondholders can also affect corporate decisions in the event of covenant violations. For example, Nini, Smith and Sufi (2012) find that once a firm violates a financial

covenant in a credit agreement, its acquisitions and capital expenditures decline, and its leverage and dividend payouts are reduced sharply, as prescribed by the credit agreements.

While the impact of stockholder-versus-bondholder conflicts on corporate decisions has been extensively investigated for three decades, these studies implicitly assume that bondholders are largely passive investors and share common investment and monitoring preferences. The literature has been remarkably silent on the formal and informal post-issuance but pre-violation interactions between large institutional bondholders and corporate management. In particular, the bondholders' heterogeneous liquidity preferences, and the effect of threat-to-exit in secondary bond markets in influencing managerial risk behavior, have drawn very little attention. One prominent exception is Massa, Yasuda and Zhang (2012). They were the first to recognize institutional bondholders' potential active interaction with management and ask whether institutional bondholders influence the bond-issuing firms' financing decisions, such as leverage policies and the choice between bonds and bank loans. Like their study, ours also emphasizes that bond investors with differing liquidity preferences can have direct and yet distinct influences in corporate decisions. However, unlike their paper, we focus on stockholder/bondholder conflicts over risky investment decisions instead of financing choices. We augment the existing literature by looking into the impact of bondholders on both the level and quality of corporate risk taking decisions.

2.2 The Literature on Investors and Innovation

Our paper also relates to a growing literature which shows that capital markets can significantly influence corporate innovation. By nature, investments in innovation entail highly risky payoffs that are also usually quite distant. Depending on their risk attitudes and investment

horizons, investors can either foster or inhibit a firm's innovative activities, and this is particularly true for shareholders. For example, Tian and Wang (2011) find that shareholders' tolerance for failure can spur corporate innovation. Lerner, Sorensen and Stromberg (2011) studied leveraged buyouts and suggested that private equity funds are beneficial for corporate innovation. Aghion, Reenen and Zingales (2012) find that institutional ownership generally boosts a firm's innovative activities because institutional investors can increase managerial incentives to take risk by reducing the career risks associated with risky projects. However, shareholders are not always positively associated with innovation. Bushee (1998) first suggested that investors with short-term investment horizon impose short-term pressures on management, and hence would promote short-term performance at the expense of innovative activities. Fang, Tian and Tice (2012) find that stock liquidity could impede innovation as well because stock liquidity would facilitate hostile takeovers or attract uninformed institutional investors. Atanassov(2012), however, finds that once a state passes antitakeover laws, innovation by firms in that state declines. This evidence suggests that antitakeover laws usurp managers' incentives to invest in innovation.

In addition to shareholders, the role of creditors in innovation has also received a fair amount of attention lately, although the empirical results are equally mixed. For example, using a sample of Italian manufacturing firms, Herrera and Minetti (2007) argue that relational banks are more informed about their clients. Accordingly, they find evidence that these banks promote innovation. Benfratello, Schiantarelli and Sembenelli (2008) also find evidence that local banking development stimulates technological progress. Acharya and Subramanian (2009), however, show that creditors can negatively affect a firms' innovation through bankruptcy codes.

Based on country-level analysis, they show that creditor friendly bankruptcy codes lead to a lower absolute level of innovation by firms.

Our paper differs from these studies in two important ways. First, instead of focusing on the impact of fund availability relating to banks, we emphasize the market power of institutional bond investors in affecting firms' risk taking decisions. We are particularly interested in investigating whether bondholders can wield some influence via the threat of a 'Wall Street walk' in the secondary market. Second, we also directly compare bond blockholders to equity blockholders in this study. This enables us to better understand whether investors with different risk attitudes and investment horizon have similar impacts on firm innovation.

III. Variable Construction and Sample Description

3. 1. Data on Institutional Investors' Bond Holding

Our institutional bond holding data was derived from Lipper's eMAXX fixed income database, which contains detailed corporate and securitized bond holdings for U.S. and European institutional investors (e.g., insurance companies, mutual funds, and public pension funds). Lipper reports the quarterly holdings based on regulatory disclosure to the National Association of Insurance Commissioners (NAIC) and the Securities and Exchange Commission (SEC) for insurance companies and mutual funds respectively. For major pension funds, it is a voluntary disclosure. We collected data for the period of the first quarter of 2000 through the first quarter of 2010.

Table 1 reports the descriptive summary of this database. It covers the holding positions of 2875 distinct institutional investors (or bond funds) over 5675 fixed-income securities including both corporate bonds and securitized bonds that have complete information on total par

value and maturity.[4] Approximately 67% of the institutional investors are from the U.S., while the remaining are from the U.K. (5.1%), Switzerland (3.7%), Canada (3.6%), Germany (3.3%), France (3.1%), Spain (2.2%), and various other countries. However, not all investors are present throughout the reporting period. As Panel A details, in any given quarter there are, on average, 1297 distinct institutional investors present in this database, with the average institutional investor holding 76 different bonds with a total average par value of $368 million and an average maturity of 8.5 years. Interestingly, the median holding is a more modest 19 bonds with a par value of $11 million and an average maturity of 7.25 years.

While Panel A reports characteristics of the institutional investors of this database, Panel B reports the characteristics of the bonds they hold. On average, our data encompasses 2477 bonds per quarter, with a mean issuance of size of $347 million and an average maturity of 12 years. The variation across bonds is much less skewed than the variation across the types of institutional bondholders, as the medians in Panel B and relatively close to the means.

3. 2 Identifying Short-term and Long-term Bond Blockholders

Gaspar, Massa and Matos (2005) argue that short-term investors buy and sell their investments frequently, while long-term investors keep their positions unchanged for a considerable length of time. Following this logic, they use an investor's portfolio turnover rate to measure how frequently investors rotate their positions and name the measure *the churn rate*. In this study, we follow their methodology to measure an institutional bond investor's investment horizon. In particular, we first define bond fund *i*'s churn rate in quarter *t* as follows:

[4] Throughout this paper, we only focus on bonds that have complete information on total par value. All summary statistics on bonds reported are limited to these bonds.

$$CR_{i,t} = \frac{\sum_{j \in Q} | HoldingFV_{j,i,t} - HoldingFV_{j,i,t-1} |}{\sum_{j \in Q} \frac{HoldingFV_{j,i,t} + HoldingFV_{j,i,t-1}}{2}} \quad (1)$$

where $HoldingFV_{j,i,t}$ refers to the face value of bond *j* held by bond institutional investor *i* at the end of quarter t, and Q represents the set of bonds held by investor *i*.[5]

For each investor in quarter *t*, we then obtain its *average churn rate*, $ACR_{i,t}$, over previous four quarters (inclusive) as follows:

$$ACR_{i,t} = \frac{1}{4} \sum_{r=0}^{3} CR_{i,t-r} \quad (2)$$

ACR removes the random time variation in CR and is deemed a more reliable measure of an investor's general tendency to trade. Table 1 also reports the summary statistics of the *ACR*s of all institutional bond investors in the row labeled 'Quarterly Portfolio Turnover'. The average *ACR* of all institutional bond investors is 0.05 per quarter, suggesting that a typical bond fund trades about 5% of its portfolio every quarter. This rate is much smaller than the average portfolio turnover ratio of stock institutional investors, but is reasonably expected because the corporate bond market is less liquid than the stock market.

In each quarter, we sort all institutional bond investors into terciles based on their *ACR*s. We define those investors that have the highest *ACR*s as the short-term investors and those with the lowest *ACR*s as the long-term bond investors. Generally speaking, investors' investment horizon preference is quite stable. Panel A of Table 1 also describes the average churn rates of all bond funds that are classified as being long- and short-term investors. For long-term bond investors, their average quarterly churn rate is zero, indicating that these investors literally follow the buy-and-hold strategy and did not trade at all in the previous four quarters. On the other hand,

[5] We use the face value of the bond due to the fact that we do not have every bond's market price at the end of each quarter in our sample period.

the average quarterly churn rate of short-term investors is 0.14, indicating that these institutional investors trade at least 14% of total par value of its bond portfolio in each quarter, or approximately 64% of its portfolio in an annual basis. [6]

Naturally, not all bondholders have the same level of motivation to monitor or intervene with corporate management. Following the literature, we use 5% as a cutoff point to identify those motivated bondholders. In particular, if an institutional investor holds more than 5% of a firm's outstanding bonds, we define the investor as a bond blockholder.[7] Of all firms that issue bonds and fit our sample criteria, about 82% of them have at least one bond blockholder. If this investor is also short-term oriented, as defined above, we then classify the investor as a short-term bond blockholder. On the other hand, if this investor is long-term oriented, we then classify the investor as a long-term bond blockholder.[8]

3. 3 Measuring Corporate Innovative Activities

We examine two distinct aspects of corporate innovative activities: innovative input and innovative outputs. Specifically, we use a firm's total R&D expenditure divided by sales (*RND/Sales*) to measure its innovative input, and we use the number of patents and patent citations to measure its outputs. The patent related variables are constructed from the latest

[6] It is important to note that the "long-term" and "short-term" used in this study is defined by the bond fund's investment activities (or revealed investment horizon) and should not be confused with their preference for long-term or short-term bonds. We find that long-term and short-term bondholders defined in this study hold bonds with comparable maturities.

[7] If a firm has multiple bonds outstanding, we aggregate them all at the firm level for this calculation. In robustness checks, we also defined a bond blockholder as the one that holds more than 10% of a firm's outstanding bonds. This classification yielded substantively similar results.

[8] Our approach to identifying long term and short term bondholders differs slightly from Massa, Yasuda and Zhang's (2012) continuous measure of institutional investors' trading tendencies in two important regards. First, we focus on blockholders because we expect that they will have stronger motivations and superior abilities to monitor the firm. Second, our approach allows us to better contrast the effects of short term versus long term bond holders. Nevertheless, in unreported robustness checks, we found a strong negative relationship between Massa et al's (2012) measure and corporate innovative activities, consistent with our main results. Results are available upon request.

version of the National Bureau of Economic Research's (NBER) patent database, which was initially created by Hall, Jaffe and Trajtenberg (2001) and covers the detailed information for all patents granted by the US Patent and Trademark Office (USPTO) up to 2006. The number of patents for a firm in a specific year in this study is defined by the number of patent applications filed in that year that are eventually granted.

A simple count does not consider the quality of each patent, and hence the total patent citation number is used to capture the quality dimension. A patent's citation number indicates its technological and economic influence. In this study, the citation number of a firm in a specific year is defined as the number of citations received by this firm in subsequent years for all granted patents applied in that year. We also correct for the truncation problems in the NBER patent data when constructing these variables by following the procedure described by Hall, Jaffe and Trajtenberg (2001, 2005). Furthermore, to correct for the mechanical impact of the input (R&D expenditures) on outputs (patent count and quality), we scale both innovative output measures by its contemporaneous R&D expenditure.[9] These variables are also used by Hirshleifer, Hsu and Li (2012) to measures a firm's innovation efficiency per R&D dollar.

3.4. Control Variables

We include four sets of controls in our empirical analysis. The first set contains the firms' financial fundamentals. In particular, we include the following firm characteristics: return on assets (*ROA*); market-to-book ratio (*MB*); capital expenditure ratio (*CAPEX*); debt ratio (*LEVERAGE*); ratio of tangible asset to the total assets (*Tangibility*); and the log of annual sales

[9] For those firms that have zero R&D expenditure, we add a small number (*i.e.*, 0.1) to avoid losing observations.

(*LnSales*). These controls are constructed from the Compustat and widely used in the recent studies in corporate innovation. Please refer to the appendix for their detailed definition.

The second set of controls is related to company's shareholder ownership and composition. Aghion, Reenen and Zingales (2012) show that institutional shareholders matter greatly for corporate innovation. Hence, we use the 13F file database to construct a measure of overall institutional ownership (*IO*). Bushee (1998) argues that shareholders with different investment horizons can affect corporate innovative activities in different ways. Based on the institutional investors' portfolio and trading patterns, he identifies three types of institutional shareholders: transitional, semi-transitional and committed. Using his classification codes, we further construct two new firm-level dummy variables: *ST_EBLOCK* and *LT_EBLOCK*.[10] *ST_EBLOCK* indicates whether a firm has one or more transitional shareholders that hold more than 5% of its outstanding shares, whereas *LT_EBLOCK* indicates whether this firm has one or more committed shareholders that hold more than 5% of its outstanding shares.[11] In our later tests, we use these two dummies to control for the potential effect of shareholders with different investment horizons on innovation. They are also used to compare the shareholder effect to the bondholder effect in firms' innovative decisions.

Furthermore, we recognize that not all firms issue corporate bonds. Bonds are more likely issued from firms with large size and reasonable creditworthiness, factors that could also affect a firm's innovative activities. This potential compounding factor makes it difficult to solely attribute the observed empirical patterns to bondholder effect. The third type of control variable,

[10] We thank Dr. Bushee for generously allowing us to use this data. The data is available on his website: http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html.

[11] In unreported robustness checks, we also use the average portfolio turnover ratio of each equity institutional investors to identify whether they are short-term (*i.e.*, in the top tercile) or long-term (*i.e.*, in the bottom tercile), following the methodology of Gaspar, Massa and Matos (2005). Results are qualitatively similar.

a dummy called *WITHBOND,* attempts to control for this issue. It equals one if a firm issues corporate bond and zero if otherwise. This dummy can reasonably pick up the bond issuing effect *per se* in our panel data analysis. Finally, we also control for the competitive intensity of the firm's primary industry with a Herfindahl industry concentration index (*HINDEX*), which was computed based on the 2-digit SIC code. We also note that our models included industry and year fixed effects to capture other unobserved industry and temporal level influences.[12]

3.5 Sample Description

The final sample is an overlapping of four datasets discussed above: the Lipper's institutional bond holding dataset, the NBER patent dataset, and the Compustat, CRSP, and 13F Institutional Holdings datasets. The temporal discrepancies of the availability of these datasets impose a lower and upper limit for our final sample period. In particular, the bond holding information is not available until 2000, and the NBER patent dataset ends in year 2006. Since we further introduce a lag for the key independent variable, the final usable sample period for this study is thus 2001-2006. Following the literature, we exclude the financial firms (SIC codes between 6000 and 6999) and utility firms (SIC codes between 4900 and 4999) from the sample.[13]

Table 2 reports the summary statistics for the firm's innovative activities and control variables. Note that we set the R&D expenditure, the patent number, and the citation count to zero if a firm had no R&D or patent information available. As expected, R&D expenditures are

[12] We acknowledge that bondholders are not the only creditors for our sample of firms. In particular, we do not explicitly control for relational banks or syndicated loan lenders in our research due to data limitations. However, according to Colla, Ippolito and Li (2013), 85% of firms borrow predominantly with one type of debt. This suggests that the confounding effect of the presence of these lenders on this study is expected to be limited.

[13] Including these firms does not change our main results. Results for all firms are available upon request.

highly skewed, even after winsorizing all variables at the 1st and 99th percentiles, with many firms spending nothing on R&D and some spending quite heavily. In terms of innovative outputs, the average firm was granted 2.88 patents per year and received 5.55 citations. However, these distributions were also relatively skewed, with most firms receiving no patents and no citations but some receiving over one hundred patents and two hundred citations. In terms of the control variables, the means and distributions appear largely as expected and consistent with most literature employing large multi-industry Compustat based samples.

IV. Bond blockholders and Corporate Innovative Activities

4.1. Bond Blockholders and R&D Expenditure

To estimate whether bond blockholders affects firms' innovative expenditures, we estimate the following baseline regression model:

$$Ln(RND/Sales_{j,t}) = \alpha + \beta \times BBLOCK_{j,t-1} + \gamma Z_{j,t} + Ind_j + Year_t + \varepsilon_{j,t} \qquad (3)$$

The dependent variable is the ratio of R&D to the total sales[14] and *Z* is vector of firm level controls that may influence a firm's innovative expenditure decisions. These controls are widely used in the literature and have been discussed in Subsection 3.4. *Indj* and $Year_t$ capture industry and fiscal year fixed effects, where the industry is defined based on the 2-digit SIC code. The variable of interest, *BBLOCK*, is a dummy variable equal to one if a firm has one or more bond blockholders, as defined above, and zero otherwise.

Column (1) of Table 2 examines the impact of bond blockholders on the R&D expenditure. First, we note that the estimated coefficient for the dummy *WITHBOND* is positive and significant, suggesting that firms that issue corporate bonds are, on average, more active in

[14] In robustness tests, we also use the log of the total R&D expenditure as the dependent variable. Results are similar.

innovative investments than others. This result likely reflects the fact that most bond issuing firms are large firms with relatively stable positions. However, the estimated coefficient for having bond blockholders, *BBLOCK*, is negative and both statistically and economically significantly. This evidence suggests that the presence of bond blockholders is associated with diminished- R&D expenditures. In particular, keeping other factors at their mean levels, the presence of bond blockholders is associated with a 12% reduction in R&D expenditures.

In Column (2), we examine whether bondholders with different investment horizons have similar impacts on firm's R&D expenditures. In this model, we replace the original bond blockholder dummy with two new ones: *ST_BBLOCK* and *LT_BBLOCK*. The first dummy, *ST_BBLOCK,* takes the value of one if a firm has one or more short-term bond blockholders and zero if otherwise. The second dummy, *LT_BBLOCK*, takes the value of one if a firm has one or more long-term bond blockholders and zero if otherwise. Please refer to subsection 3.2 for the definition of long-term and short-term bond blockholders. The results indicate that bondholders with different investment horizon preferences do indeed have different statistical relationships with firm R&D expenditures. Specifically, the estimated coefficient of *ST_BBLOCK* is significantly negative at every conventional confidence level, whereas that of *LT_BBLOCK* is insignificant. Thus, it would appear that the negative impact of bond blockholders on R&D expenditures is primarily driven by the short-term bond blockholders. Columns (3) and (4) of Table 3 repeat the analysis of columns (1) and (2), respectively, on a reduced sample of firms encompassing only those firms that issue bonds. The results are substantively similar to those in columns (1) and (2).

4.2. Bond Blockholders and Innovative Efficiency

In this section, we examine the influence of bond blockholders on the firms' innovative efficiency. In particular, we adopt a similar regression model as follows:

$$Ln(Efficiency_{j,t}) = \alpha + \beta \times BBLOCK_{j,t-1} + \gamma Z_{j,t} + Ind_j + Year_t + \varepsilon_{j,t} \qquad (4)$$

We use two variables to measure the dependent variable *Efficiency*. The first one is the total patent count divided by R&D expenditures (*PATENTS/RND*), and the second one is the patent citation count divided by R&D expenditures (*CITE/RND*). Please refer to the previous section for the definition of the independent variables.

Columns (1) to (4) of Table 4 report the results when *PATENTS/RND* is used as the measure of efficiency. In Column (1), we focus on the presence of the bond blockholders in general, whereas in Column (2) we differentiate between long-term and short-term bond blockholders. The results show that there is a weak negative relationship between the presence of short-term bond blockholders and the firms' patent productivity. All else equal, the presence of short-term bond blockholders decreases a firm's patent productivity by 5%. Long-term bond blockholders, however, have no significant effect on innovative productivity. Once again, Columns (3) and (4) of Table 3 repeat the analysis of Columns (1) and (2), respectively, on a reduced sample of firms encompassing only those firms that issue bonds. On this reduced sample, the negative impact of short-term bond blockholders loses significance.

Columns (5) to (8) of Table 4 report the results for when we measure innovative efficiency with *CITE/RND*. Results are generally similar to Columns (1) through (4) with one important difference: the negative effect of short-term bond blockholders on innovative efficiency is stronger, as shown in Column (6), and remains significant in the reduced sample

encompassing only firms that issue bonds, as shown in Column (8). We believe that these stronger results likely derive from the fact that citation counts are a more accurate measure of the quality of innovative outputs than simple patent counts.

Although the impact on innovative efficiency of short-term bond blockholders is relatively modest, it is still quite interesting when considered in conjunction with the results of Table 3, which revealed that short-term bond blockholders tend to induce firms to reduce investments in R&D. If firms responded to this pressure by 'cherry-picking' their best investments in R&D, then one might expect that short-term bond blockholders would improve the overall efficiency of R&D even if they did reduce its magnitude. However, it would appear instead that the presence of short-term bond blockholders creates conditions or incentives that are generally unfavorable to firm innovative pursuits.

4.3 Robustness Checks

We conduct a number of robustness tests and present the results in Table 5. The results are presented in three panels. In each panel, we attempt to replicate the results of our three most important models: Column (2) of Table 3 which examines innovative inputs; and Columns (2) and (6) from Table 4 which examine our two different measures of innovative efficiency.

In Panel A of Table 5, we test these three models using a different estimation method. Namely, we employ a Tobit regression to help account for the fact that in all three models, the dependent variable is measured as zero for a large portion of the sample. Results are qualitatively similar, and indeed even slightly stronger for the model where we measure innovative efficiency as PATENTS/RND.

Panel B of Table 5 investigates whether our results are robust to different sample definitions. The baseline analysis includes all firms that have complete financial information in Compustat. In our robustness tests, we exclude all those firms that do not report R&D expenditures from the sample and focus only on the subsample of firms that report positive R&D expenditures. Once again, the results are quite similar. However, with the dramatically reduced sample, the negative effect of short-term bond blockholders on innovative efficiency, when measured as PATENTS/RND, loses significance. Overall, these results suggest that our results are not driven by those firms with zero innovative activities.

Finally, Panel C of Table 5 investigates whether our results are robust to our definition of a bond blockholder. Specifically, we redefine a bond blockholder as the one that holds more than 10% of the outstanding bonds of a company, instead of 5% as in the baseline specification. Once again, results remain very similar to our main results. In unreported models, we also redefined short-term bondholders as those bond funds that are in the top quintile of *ACR*s and the long-term ones as those in the bottom quintile of *ACR*s. Once again, this did not alter our results in any substantive manner.

V. Influence versus Selection

The presence of short-term bond blockholders is not random. This opens up two alternative interpretations for the results we have documented. First, the statistical relationship between the firm's innovative activities and short-term bondholders might just result from the *ex ante* investment preferences of short-term bond funds. Specifically, if short-term bond funds prefer to hold bonds from firms that have low level innovative investments, we will observe a negative relationship between these variables. Second, the relationship could be caused by other

unobservable factors that influence both the firm's innovative activities and the investment preferences of short-term bond funds. This correlation could mask the true causal relation between institutional bond holdings and corporate innovative activities, and traditional regression analysis could lead to incorrect inferences. We name the first alternative the "investment preference" hypothesis and the second the "endogeneity" problem. Both suggest that our evidence could have little to do with the influence of short-term bond blockholders on corporate management's risk taking decisions.

5.1 Testing the Investment Preference

To examine whether our results are driven by the *ex ante* investment preferences of short-term bond funds, we introduce a logistic regression model that addresses two related questions: (1) what determines a short-term bond fund's investment preferences; and (2) whether the presence of short-term bondholders is systematically affected by a firms' previous R&D expenditure. In this analysis, in addition to the firm controls used in previous tests, we also include the firm's R&D expenditure (*RND*) in the previous year. This is used to test whether a firm's historical R&D activities is one of key factors that determine short-term bond blockholders' investment preferences. The results of this analysis are provided in Table 6. Column (1) reveals that a firm's previous R&D expenditures do not appear to be related to the presence of short-term bond blockholders in the current period. Column (2) adds a dummy indicating the previous presence of long-term bond blockholders. Interestingly, this variable is strongly positively related to the presence of short-term bond blockholders in the current period. However, the effect of previous investments in R&D remains insignificant.

For reasons explained below, we also add in the following variables in Column (3): *STOCK VOLATILITY*, the standard deviation of monthly stock returns in previous 12 months; *DELAWARE*, a dummy that equals one if a company is incorporated in Delaware and zero if otherwise; *STOCK TURNOVER*, the monthly turnover ratio of a stock in previous 12months; and *JUNKBOND*, a dummy that equals one if a company's S&P long-term credit rating is below BBB-, and zero if otherwise. While all of these additional controls, other than DELAWARE, were strongly related to the presence of short-term bond blockholders, the effect of previous investments in R&D once again remains insignificant. Thus, we find no evidence that short term bond investors exhibit an *ex ante* preference for firms that tend to make minimal investments in R&D.

5.2 Addressing the Unobservable Heterogeneity

To address the possibility that both firm innovative activities and the investment preferences of short-term bond blockholders may be driven by some unobserved factor(s), we sought instruments for *ST_BBLOCK* so that we could test our models with two-stage least squares instrumental variables (2SLS IV) regressions. The four additional variables we added to Column (3) in Table 6 were chosen because we conjectured that they might be predictive of the presence of short-term bond blockholders while have little relation to future innovative pursuits, and hence they would serve as valid instruments for *ST_BBLOCK*. We discard DELAWARE because it does not meet the basic requirement of relevance. We also decide not to use STOCK TURNOVER because Fang, Tian and Tice (2012) shows that this liquidity variable could be directly related to firm's innovation decisions. We chose to retain *STOCK VOLATIILTY* and *JUNKBOND* as instruments for our 2SLS regressions because they are related to the presence of

short-term bond blockholders but do not have any strong theoretic links to firm innovation policies.

The results are reported in Table 7. Panel A reports the results for the full sample. Even after controlling for endogeneity, the results are substantively similar to our main results, with two notable exceptions. First, the magnitudes of the coefficients for *ST_BBLOCK* are substantially larger. While the significance levels are similar to our main results, this is to be expected because while 2SLS models provide a more precise estimate of the *ceteris paribus* effect of an endogenous variable on an independent variable, these methods are also much less efficient than OLS methods and produce substantially larger standard errors (Wooldridge, 2003). Second, presumably because we have a more accurate estimate for the true effect of short-term bond blockholders, we find a marginally significant positive effect for long-term bond blockholders on both innovative inputs (as measured by *RND/SALES*) and innovative efficiency (as measured by *CITE/RND*). Finally, Panel B of Table 7 repeats this analysis but limits the sample to just firms that have bonds outstanding. While the magnitudes of the coefficients on both types of bond blockholders are somewhat diminished, the results are substantively similar.

Overall, it seems that our main results are driven by neither the selection bias of short-term bond investors nor by unobserved factors correlated with both firm innovative activities and the investments preferences of short-term bond investors. Indeed, if anything, our 2SLS results suggest that any unobserved factors that may be correlated with both innovative activities and bond investor preferences may conservatively bias our main results.

VI. Additional Tests on the Market Power Hypothesis

We have documented that short-term bondholders appear to have a detrimental effect on corporate innovative activities. While we argued that the influence of these bondholder derives primarily from their market power (*i.e.*, the threat of selling their bonds and driving up bond yields for the firm), we have not provided direct evidence supporting this argument. In truth, the influence of short-term bondholders could occur not because of the market impact caused by their potential trading decisions, but also possibly because of the behind-the-scenes discussions with managers where they express their preferences and place subtle pressures on the firm's top executives. Accordingly, to test whether the influence of bond blockholders derives primarily from their market power or from a more subtle persuasion of words, we examine how the influence of the bond blockholders varies in accordance with the market liquidity of the bonds they hold.

Managers are sensitive to the preferences of bond holders because a sell-off will increase the firm's WACC. However, the consequences of a sell-off are most salient when bonds are more illiquid (Ellul, Jotikasthira and Lundblad, 2011) and when the bond's true value is less certain. Therefore, if bond holders exert influence over managers primarily through their market power, we would expect the short-term bondholder effect to be more prominent for bonds that are illiquid. Conversely, if soft persuasion is the key mechanism by which bond holders exert their influence, then we would expect the short-term bondholder effect to be present for both bonds liquid and illiquid.

To test this idea, in this study, we use bond's year-to-maturity as a proxy for its liquidity level. Bao, Pan and Wang (2011) show that bonds with higher year-to-maturity tend to be more illiquid. On the other hand, for bonds that are near maturity, bond prices become much more robust to market pressures because the bond's true value becomes much more certain over that

period. That is, if a firm appears financially stable and an existing bond is due to be repaid in the near future, investors should see little risk of default and not let the price drop appreciably.

We therefore divided our data into two sub-samples based on the proximity of the bonds to maturity. We classified a firm's bonds as being 'near maturity' if its bonds' average time-to-maturity is 2 years or less. Otherwise, we classified the firm as having debt that is far from the maturity. We then analyzed both sub-samples with our three primary models relating to innovative inputs and innovative efficiency.

The results are provided in Table 8. Several findings are worth highlighting. First, by splitting the sample into two, the significant negative effect of *ST_BBLOCK* on innovative efficiency, as measured by *PATENTS/RND*, loses significance. As this had been our weakest result for *ST_BBLOCK*, this is not overly surprising. Second, the effect of *ST_BBLOCK* on both innovative inputs (*RND/SALES*) and our more precise measure of innovative efficiency (*CITE/RND*) remains significant and negative, but only for bonds that are less liquid (i.e., bonds that are far from maturity). It is plausible that the lack of significance for *ST_BBLOCK* in the sample of firms whose bonds are relatively more liquid (i.e., close to maturity) is due to the smaller size of that sample. However, we suspect that is not the case because the estimated coefficients for the close-to-maturity subsample are considerably smaller. If short-term bondholders exert equivalent influence regardless of the liquidity of the bonds and a lack of statistical power were responsible for our result, then we would expect the coefficients to be similar across the two subsamples but that the standard errors in the smaller sample would simply be too large to obtain statistical significance. Moreover, as we discuss below, we do find statistical significance for *LT_BBLOCK* in the smaller sample. Hence, it would appear that short term bondholders exert their influence primarily through their market power.

A third noteworthy result, as mentioned above, is that we find a significant effect for *LT_BBLOCK* on both of our measures of innovative efficiency. Interestingly, however, it is a positive effect, and only for the subsample of firms with bonds close to maturity. This suggests two intriguing prospects. First, long term bond holders may truly be committed to continuing a relationship with firm for the long haul. Hence, even though innovation may be risky, they may view it as necessary in order to ensure survival and success in the long run (*i.e.,* beyond the maturity of current bond issues). Second, being committed to the firm, their influence does not derive primarily from the threat of exit via a sell-off. Their influence may be more pronounced as the debt of the firms in which they have invested approaches maturity because firms very often roll-over their debt by issuing new bonds to pay-off the old ones. Hence, the firm's top managers (e.g. CFO and CEO) start 'courting' the long-term bond holders as their debt approaches maturity in order to ensure that these 'committed' investors will roll-over their positions and buy into the new debt issue. By being responsive to the investors, the managers can help shore-up demand for the new debt issue which helps hold down the interest rates on the new issues.

VII. Bondholders Vs Stockholders

As previously noted, existing research has found that institutional shareholders can influence a firm's innovative activities (Aghion et al, 2012; Bushee 1998). Accordingly, in our final analysis, we compare the shareholder effect to the bondholder effect we have documented. The purpose of this analysis is two-fold. First, we would like to examine whether or not the effect of short-term bondholders can be subsumed by short-term shareholders. Second, assuming both types of short-term blockholders have significant independent effects, we would like to see which type has a stronger impact on the firms' innovative activities.

Panel A of Table 9 presents the results for innovative inputs (*RND/SALES*)[15]. Column (1) includes our control variables and our previously discussed (see Section 3.4) measures of short and long term equity blockholders (*ST_EBLOCK* and *LT_EBLOCK*, respectively). Similar to bond blockholders, we find that short term stock blockholders have a significant negative effect on investments in R&D while long term stock blockholders have no significant impact. Column (2) adds in our measures of short and long term bond blockholders, and the results are very similar to our main results reported in column (2) of Table 3. Specifically, even while controlling for short and long term equity blockholders, short-term bond blockholders have a significant negative effect on investments in R&D while long-term bond blockholders have no appreciable effect. Thus, it would appear that the influence of bond blockholders is independent of the influence of equity blockholders. Furthermore, the coefficient for *ST_BBLOCK* is almost twice as large as the coefficient for *ST_EBLOCK*. As both these variables are on the same scale (i.e., both are simply dummy variables indicating the presence of their respective blockholders), this would suggest that the 'dagger' wielded by bond blockholders is more menacing to managers than the 'pillow' wielded by equity blockholders (see Stewart, 1991: pp 580-581).

Column (3) adds in interactions between the bond blockholders and the equity blockholders, grouped according to their investment horizons (i.e., we include interactions for *ST_BBLOCK*ST_EBLOCK* and *LT_BBLOCK*LT_EBLOCK*). The logic behind these interactions is to examine whether the influence of either bond or equity blockholders varies in accordance to the presence of the other type of blockholder. The results reveal that there is indeed a strongly significant negative interaction between *ST_BBLOCK* and *ST_EBLOCK*. Furthermore, the coefficients for the main effects change only marginally when the interaction is introduced. These results have two interesting implications. First, short-term bond blockholders

[15] The results of Table 9 are substantively similar if we restrict the sample to just firms that issue bonds.

have a strong negative effect on investments in R&D even if short-term equity blockholders are absent, and vice versa. Second, the presence of both types has a compounding or 'super-additive' effect. Thus, while short-term bond blockholders are influential even if short-term equity blockholders are absent, they become even more influential when short-term equity blockholders are present, and vice versa. We speculate that this may occur because if one type of investor (*i.e.*, bond or equity) abandons the firm, managers may be able to mitigate damage to the WACC by leveraging the other group more. However, if both types of investors exert their market power, the firm is hit with a 'double whammy' that is almost certain to hurt the firm's cost of capital.

Panel B repeats this analysis for our two measures of innovative efficiency. For both measures, neither type of equity blockholder has a significant impact on innovative efficiency (see columns (1) and (4)), while the effect of short term bond blockholders remains negative and significant even while controlling for the equity blockholders (see columns (2) and (5)). Furthermore, the interactions produced some interesting results. First, as shown in column (3), when we measure innovative efficiency via *PATENTS/RND*, the interaction between *ST_BBLOCK* and *ST_EBLOCK* is strongly significant and negative, while the main effect for *ST_BBLOCK* loses its [marginal] significance in the presence of the interaction. This suggests that while neither type of short-term blockholder has much influence by themselves, managers are sensitive to the potentially precarious situation they are in when both primary sources of capital are readily susceptible to the deleterious effects of a large sell-off. Finally, the results are relatively similar for our preferred measure of innovative efficiency, *CITE/RND*, with the notable exception that the main effect for *ST_BBLOCK* remains significant even in the presence of the interaction. Thus, our results clearly show that the presence of short-term equity blockholders neither explains nor usurps the influence of short-term bond blockholder. Indeed, the presence of

transient equity blockholders actually accentuates the influence of bondholders. Finally, Panel C of Table 9 repeats the previous analyses using the sample of firms that issue bonds. And results remain similar.

VIII. Conclusion

In this paper, we analyze whether corporate bondholders influence corporate innovative activities and the quality of those efforts, as well as the channels through which bondholders may exert their influence. We focus on those institutional bondholders that hold significant amounts of outstanding bonds. We further distinguish short-term bond blockholders from the long-term bond blockholders based on their investment horizons, as revealed by their trading activities.

We find a strong negative relationship between the presence of short-term block bondholders and corporate innovative activities. That is, firms with short-term bond blockholders, on average, have relatively lower innovation expenditures. If they do invest in R&D activities, their innovative efficiency also tends to be lower. Furthermore, the impact of the short-term bondholders is stronger than that of short-term stockholders. On the other hand, we do not find any negative impact on firm innovation by long-term bond blockholders. In fact, under some specific conditions, such as when a firm's bonds are close to maturity, the presence of long-term bond blockholders seems to encourage a firm's risky investments in R&D. These results strongly suggest that not all bondholders impair a firm's innovative efforts. The negative effect of bondholders appears to mainly derives from the threat of exit by short-term bond blockholders in the secondary bond market.

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Appendix: Variable Definitions

Variable	Definition
Institutional Bondholders	
BBLOCK	A dummy that equals one if a firm has at least one institutional bondholder that holds more than 5% of its total outstanding bonds at the end of previous year, and zero if otherwise.
ST_BBLOCK	A dummy that equals one if a firm has at least one short-term institutional bondholder that holds more than 5% of its total outstanding bonds at the end of previous year, and zero if otherwise. An institutional bondholder is said to be short-term if its bond portfolio turnover ratio over the previous four quarters is among the top tercile of all bondholders.
LT_BBLOCK	A dummy that equals one if a firm has at least one long-term institutional bondholder that holds more than 5% of its total outstanding bonds at the end of previous year, and zero if otherwise. An institutional bondholder is said to be long-term if its bond portfolio turnover ratio over the previous four quarters is among the bottom tercile of all bondholders.
Institutional Shareholders	
IO	Institutional ownership, the ratio of shares owned by all institutional investors to the total outstanding shares of a firm.
ST_EBLOCK	A dummy that equals one if a firm has at least one short-term institutional shareholder that holds more than 5% of its total outstanding shares at the end of previous year, and zero if otherwise. We rely on Bushee's method to determine whether an institutional shareholder is short-term.
LT_EBLOCK	A dummy that equals one if a firm has at least one long-term institutional shareholder that holds more than 5% of its total outstanding shares at the end of previous year, and zero if otherwise. We rely on Bushee's method to determine whether an institutional shareholder is long-term.
Innovative Activities	
RND	Research and development expenditure in US$ million.
PATENTS	The number of patents a firm applies for in year t that are eventually granted.
CITE	The total number of subsequent citations for all patents that are applied for in year t and granted later.
PATENTS/RND	The ratio of *PATENTS* to R&D expenditure.
CITE/RND	The ratio of *CITE* to R&D expenditure.

Firm Characteristics	
ROA	The ratio of operating income before depreciation to average total assets.
SALES	Total revenue in US$ Million.
CAPEX	The ratio of capital expenditure to total assets.
LEVERAGE	The ratio of total long-term debts to total assets.
MB	The market to book ratio.
TANGIBILITY	The ratio of tangible assets to total assets.
HINDEX	The Herfindahl index for the firm's primary industry, based on sales at SIC 2-digit codes.
WITHBOND	A dummy variable that equals one if a firm issues corporate bonds, and zero if otherwise.
JUNKBOND	A dummy variable that equals one if a firm's S&P long-term credit rating is below BBB-, and zero if otherwise.
DELAWARE	A dummy variable that equals one if a firm is incorporated in Delaware, and zero if otherwise.
STOCKTUNVOER	Stock average turnover ratio in the previous year.
VOLATILITY	The standard deviation of monthly stock returns over the previous 12 months.

Table 1
Bond Funds and Bonds: Summary Statistics

This table reports the summary statistics for the basic characteristics of bond institutional investors and the bonds held by them over the period 2000Q1- 2010Q1. Our data are derived from the Lipper eMAXX fixed income database, which reports institutional bond holdings based on regulatory disclosures to the National Association of Insurance Commissioners (NAIC) and the Securities and Exchange Commission (SEC) for insurance companies and mutual funds, respectively. For major pension funds, it is a voluntary disclosure. This database contains detailed corporate and securitized bond holdings. Please refer to Subsection 3.2 for the definition of the portfolio turnover ratio for each bond institutional investor.

Panel A. Institutional Bondholders

	Mean	Std. Dev.	Min	25th	Median	75th	Max
No. of Funds Per Quarter	1,297	86	1,102	1,241	1,300	1360	1481
Portfolio Size ($Millions)	368.61	1,586.78	0	1.77	11.41	86.13	40,423.05
No. of Bonds Per Fund	76	160	1	4	19	71	2427
Portfolio's Average Maturity (Years)	8.50	5.75	0.00	4.75	7.25	10.50	99.75
Quarterly Portfolio Turnover	0.05	0.01	0.01	0.04	0.04	0.06	0.08
Turnover: Short-term Invest.	0.14	0.03	0.07	0.11	0.13	0.16	0.21
Turnover: Long-term Invest.	0.00	0.01	0.00	0.00	0.00	0.01	0.05

Panel B. Bonds Held by Institutional Investors

	Mean	Std. Dev.	Min	25th	Median	75th	Max
No. of Bonds Per Quarter	2,477	931	913	3,365	2,738	1,597	3,524
Issuance Size ($Millions)	347.13	94.66	200.35	415.74	328.02	279.08	518.58
Average Maturity (Years)	12	2	10	13	11	11	18

Table 2
Firms' Innovative Activities and Other Characteristics

This table reports summary statistics for firms' innovative activities and other firm characteristics over the sample period of 2001-2006. The sample includes all U.S. public firms that are covered by both Compustat and CRSP, excluding financial firms (SIC codes between 6000 and 6999) and utility firms (SIC codes between 4900 and 4999).All variables are winsorized at 1st and 99th percentiles. Please refer to the appendix for the definition of these variables.

R&D Activity & Quality								
	N	Mean	Std. Dev.	Min	25^{th}	Median	75^{th}	Max
RND ($Million)	19902	33.80	122.49	0.00	0.00	0.72	15.04	962.00
RND/SALES	19902	0.43	2.06	0.00	0.00	0.01	0.11	17.32
PATENTS	19902	2.88	13.00	0.00	0.00	0.00	0.00	107.00
CITE	19902	5.55	26.81	0.00	0.00	0.00	0.00	214.00
PATENTS/RND	19902	0.07	0.24	0.00	0.00	0.00	0.00	1.63
CITE/RND	19902	0.15	0.65	0.00	0.00	0.00	0.00	4.91
Other Firm Characteristics								
	N	Mean	Std. Dev.	Min	25^{th}	Median	75^{th}	Max
LOG SALES	19680	5.36	2.21	-0.87	3.94	5.42	6.85	10.47
ROA	19835	0.05	0.23	-1.00	0.01	0.10	0.17	0.44
CAPEX	19801	0.05	0.06	0.00	0.02	0.03	0.06	0.32
LEVERAGE	19838	0.16	0.20	0.00	0.00	0.09	0.26	0.92
TANGIBILITY	19875	0.24	0.22	0.01	0.07	0.17	0.34	0.89
MB	18986	3.36	3.98	0.31	1.35	2.20	3.75	28.75
IO	19902	0.45	0.32	0.00	0.15	0.44	0.72	0.95
HINDEX	19901	0.23	0.18	0.04	0.10	0.19	0.30	1.00

Table 3
Bond Blockholders and R&D Expenditure

This table reports the pooled regression results that show the impact of long-term and short-term bond blockholders on a firm's R&D expenditure level. $BBLOCK_{t-1}$ equals one if a firm has one or more institutional investors that hold 5% or more of its outstanding bonds at the end of previous year, and zero otherwise; ST_BBLOCK_{t-1} (LT_BBLOCK_{t-1}) equals one if a firm has one or more short-term (long-term) institutional investors that hold 5% or more of its outstanding bonds at the end of previous year, and zero otherwise. A bondholder is said to be short-term (long-term) if its average portfolio turnover ratio over the last four quarters is in the top (bottom) tercile of all investors. Please refer to the appendix for the definition of control variables. Results in Column (1) and (2) are for all U.S. public firms; whereas those in Column (3) and (4) are for U.S. public firms who issue bonds and whose bonds are held by institutional investors. T-statistics, reported in parentheses, are based on the robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Dependent Variable: LOG (RND/SALES)$_t$				
	Full Sample		Firms Issuing Bonds	
	(1)	(2)	(3)	(4)
$BBLOCK_{t-1}$	-0.12***		-0.13***	
	(-5.22)		(-6.19)	
ST_BBLOCK_{t-1}		-0.11***		-0.09***
		(-6.29)		(-5.38)
LT_BBLOCK_{t-1}		-0.01		-0.04
		(-0.20)		(-1.19)
ROA_t	-1.93***	-1.93***	-1.81***	-1.86***
	(-45.98)	(-45.95)	(-9.24)	(-9.38)
$CAPEX_t$	0.97***	0.98***	1.62***	1.71***
	(7.91)	(7.95)	(6.51)	(6.78)
$LEVERAGE_t$	-0.15***	-0.15***	-0.46***	-0.45***
	(-5.04)	(-4.92)	(-5.79)	(-5.61)
MB_t	0.01***	0.01***	0.02***	0.02***
	(9.34)	(9.28)	(7.28)	(7.25)
LOG_SALES_t	-0.13***	-0.13***	-0.07***	-0.08***
	(-27.74)	(-27.80)	(-8.65)	(-8.73)
$WITHBOND_t$	0.24***	0.22***		
	(10.10)	(11.99)		
$TANGIBILITY_t$	-0.59***	-0.59***	-0.54***	-0.56***
	(-16.81)	(-16.85)	(-9.79)	(-10.06)
IO_t	0.55***	0.56***	-0.21***	-0.20***
	(31.06)	(31.13)	(-4.34)	(-4.18)
$HINDEX_t$	-0.42***	-0.42***	-0.28***	-0.27***
	(-18.83)	(-18.82)	(-7.39)	(-7.06)
CONSTANT	-2.17***	-2.17***	-0.72***	-0.72***
	(-93.59)	(-93.58)	(-5.48)	(-5.26)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	18638	18638	2157	2157
R-squared	0.55	0.55	0.55	0.55

Table 4
Bond Blockholders and the Efficiency of R&D Activities

This table reports the pooled regression results that show the impact of long-term and short-term bond blockholders on the quality of a firm's R&D activities. *BBLOCK* equals one if a firm has one or more institutional investors that hold 5% or more of its outstanding bonds, and zero otherwise; *ST_BBLOCK* (*LT_BBLOCK*) equals one if a firm has one or more short-term (long-term) institutional investors that hold 5% or more of its outstanding bonds, and zero otherwise. A bondholder is said to be short-term (long-term) if its average portfolio turnover ratio over the last four quarters is in the top (bottom) tercile of all investors. Please refer to the appendix for the definition of control variables. Results in Columns (1) ,(2), (5) and (6) are for all U.S. public firms; whereas those in Columns (3), (4), (7) and (8) are for U.S. public firms who issue bonds and whose bonds are held by institutional investors. T-statistics, reported in parentheses, are based on the robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	LOG (PATENTS/RND)$_t$				**LOG (CITE/RND)$_t$**			
	Full Sample		Firms Issuing Bonds		Full Sample		Firms Issuing Bonds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BBLOCK$_{t-1}$	0.04		0.06		0.02		0.02	
	(1.35)		(1.54)		(0.54)		(0.61)	
ST_BBLOCK $_{t-1}$		-0.05*		-0.03		-0.08**		-0.07**
		(-1.95)		(-1.04)		(-2.49)		(-2.15)
LT_BBLOCK $_{t-1}$		0.04		0.04		0.11		0.10
		(-0.51)		(0.60)		(0.97)		(0.87)
CAPEX $_t$	0.17**	0.17*	0.16	0.10	0.60***	0.60***	0.86**	0.82**
	(1.97)	(1.94)	(0.52)	(0.32)	(5.15)	(5.13)	(2.08)	(1.98)
LEVERAGE $_t$	-0.20***	-0.20***	-0.03	-0.05	-0.24***	-0.24***	-0.05	-0.07
	(-8.43)	(-8.45)	(-0.30)	(-0.46)	(-7.51)	(-7.49)	(-0.35)	(-0.48)
MB $_t$	0.00***	0.00***	0.01***	0.01***	0.00***	0.00***	0.01**	0.01**
	(3.47)	(3.45)	(3.12)	(3.00)	(3.30)	(3.28)	(2.34)	(2.18)
LOG_SALES $_t$	0.01**	0.01*	0.05***	0.05***	0.02***	0.02***	0.06***	0.05***
	(2.09)	(1.95)	(4.56)	(4.22)	(4.80)	(4.63)	(4.56)	(4.09)
WITHBOND $_t$	0.04	0.10***			0.04	0.10***		
	(1.45)	(4.51)			(1.14)	(3.53)		
TANGIBILITY $_t$	0.02	0.02	0.31***	0.32***	-0.10***	-0.10***	0.23*	0.23*
	(0.68)	(0.67)	(3.11)	(3.17)	(-2.76)	(-2.76)	(1.84)	(1.88)
ROA $_t$	-0.24***	-0.24***	-0.88***	-0.83***	-0.31***	-0.31***	-1.12***	-1.08***
	(-7.84)	(-7.79)	(-5.16)	(-4.90)	(-8.04)	(-7.99)	(-5.45)	(-5.31)
IO $_t$	0.13***	0.13***	0.12	0.12*	0.18***	0.18***	0.15*	0.16*
	(8.58)	(8.67)	(1.64)	(1.72)	(9.06)	(9.16)	(1.72)	(1.84)
HINDEX $_t$	-0.01	-0.01	0.08	0.07	-0.04	-0.04	-0.03	-0.03
	(-0.43)	(-0.45)	(0.90)	(0.86)	(-1.23)	(-1.25)	(-0.25)	(-0.27)
CONSTANT	-2.35***	-2.35***	-3.01***	-2.89***	-2.28***	-2.28***	-2.70***	-2.55***
	(-103.50)	(-103.34)	(-20.59)	(-19.08)	(-94.01)	(-93.84)	(-15.89)	(-14.30)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18638	18638	2157	2157	18638	18638	2157	2157
R-squared	0.13	0.13	0.24	0.24	0.13	0.13	0.24	0.24

Table 5
Robustness Checks

Panel A reports the results using the Tobit regression model. Panel B focuses on those firms that have positive R&D expenditure. In Panel C, we redefine the bond blockholders as those that hold at least 10% or more of a firm's outstanding bonds. Please refer to appendix for the definition of key dependent and independent variables and controls. T-statistics, reported in parentheses, are based on the robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Panel A. Tobit Regression Results

	LOG (RND/SALES)$_t$	**LOG (PATENTS/RND)$_t$**	**LOG (CITE/RND)$_t$**
ST_BBLOCK $_{t-1}$	-0.11***	-0.05**	-0.08**
	(-4.40)	(-2.04)	(-2.40)
LT_BBLOCK $_{t-1}$	-0.01	0.04	0.11
	(-0.13)	(0.55)	(1.22)
ROA $_t$	-1.93***	-0.24***	-0.31***
	(-75.26)	(-9.38)	(-9.49)
CAPEX $_t$	0.98***	0.17	0.60***
	(9.17)	(1.58)	(4.44)
LEVERAGE $_t$	-0.15***	-0.20***	-0.24***
	(-5.12)	(-7.14)	(-6.47)
MB $_t$	0.01***	0.00***	0.00***
	(13.02)	(3.64)	(3.36)
LOG_SALES $_t$	-0.13***	0.01*	0.02***
	(-39.46)	(1.93)	(4.74)
WITHBOND $_t$	0.22***	0.10***	0.10***
	(9.55)	(4.66)	(3.44)
TANGIBILITY $_t$	-0.59***	0.02	-0.10**
	(-17.98)	(0.59)	(-2.39)
IO $_t$	0.56***	0.13***	0.18***
	(33.38)	(8.06)	(8.57)
HINDEX $_t$	-0.42***	-0.01	-0.04
	(-16.15)	(-0.48)	(-1.28)
CONSTANT	-2.18***	-2.35***	-2.38***
	(-3.93)	(-4.28)	(-3.37)
Year & Industry Fixed Effects	Yes	Yes	Yes
Observations	18,638	18,638	18,638
Prob > chi2	0.0000	0.0000	0.0000

Table 5 – Continued

Panel B. Firms with Positive R&D Expenditure

	LOG (RND/SALES)$_t$	**LOG (PATENTS/RND)$_t$**	**LOG (CITE/RND)$_t$**
ST_BBLOCK $_{t-1}$	-0.15***	-0.06	-0.09**
	(-5.33)	(-1.28)	(-1.99)
LT_BBLOCK $_{t-1}$	0.09	0.19	0.35
	(0.89)	(1.28)	(1.59)
ROA $_t$	-2.05***	-0.27***	-0.35***
	(-45.30)	(-6.21)	(-6.46)
CAPEX $_t$	1.48***	-0.03	0.79**
	(6.36)	(-0.13)	(2.51)
LEVERAGE $_t$	-0.01	-0.30***	-0.29***
	(-0.13)	(-5.65)	(-4.32)
MB $_t$	0.01***	0.00	0.00
	(2.84)	(1.05)	(1.04)
LOG_SALES $_t$	-0.19***	0.01	0.03***
	(-28.12)	(1.57)	(4.35)
WITHBOND $_t$	0.31***	0.14***	0.11**
	(10.98)	(3.51)	(2.33)
TANGIBILITY $_t$	-1.09***	0.27***	-0.06
	(-16.16)	(3.43)	(-0.61)
IO $_t$	0.78***	0.23***	0.31***
	(28.03)	(7.73)	(8.17)
HINDEX $_t$	-0.45***	0.02	-0.03
	(-13.33)	(0.36)	(-0.56)
CONSTANT	-0.47***	-2.04***	-1.70***
	(-8.54)	(-30.27)	(-20.06)
Observations	10150	10150	10150
R-squared	0.70	0.06	0.12

Table 5 – Continued

Panel C. Redefine Bond blockholders

	LOG (RND/SALES)$_t$	**LOG (PATENTS/RND)$_t$**	**LOG (CITE/RND)$_t$**
ST_BBLOCK $_{t-1}$	-0.09***	-0.03*	-0.05**
	(-6.69)	(-1.67)	(-2.23)
LT_BBLOCK $_{t-1}$	-0.01	0.04	0.1
	(-0.37)	(0.62)	(0.97)
ROA $_t$	-1.93***	-0.22***	-0.27***
	(-49.25)	(-7.66)	(-7.55)
CAPEX $_t$	0.99***	0.17**	0.54***
	(8.58)	(2.11)	(4.85)
LEVERAGE $_t$	-0.17***	-0.18***	-0.22***
	(-6.33)	(-8.70)	(-7.79)
MB $_t$	0.02***	0.01***	0.01***
	(12.34)	(4.27)	(4.06)
LOG_SALES $_t$	-0.10***	0.00*	0.01***
	(-28.18)	(1.85)	(4.26)
WITHBOND $_t$	0.16***	0.08***	0.07***
	(11.3)	(4.18)	(3.28)
TANGIBILITY $_t$	-0.54***	0.01	-0.08**
	(-17.07)	(0.49)	(-2.51)
IO $_t$	0.49***	0.12***	0.16***
	(31.50)	(8.86)	(9.28)
HINDEX $_t$	-0.35***	0.00	-0.02
	(-18.17)	(-0.14)	(-0.86)
CONSTANT	-1.23	-1.98	-1.88
	(-1.28)	(-0.60)	(-0.40)
Observations	22,444	22,444	22,444
R-squared	0.66	0.15	0.14

Table 6
The Determinants of Short-Term Bond Blockholders: Logistic Regression

This table reports the pooled logistic regression results that show how various firm characteristics affect the presence of short-term bond blockholders. The dependent variable, *ST_BBLOCK*, is equal to one if a firm has one or more short-term institutional investors that hold 5% or more of its outstanding bonds, and zero otherwise. Please refer to appendix for the definition of other variables. T-statistics, reported in parentheses, are based on the robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Dependent Variable: ST_BBLOCK$_t$		
	(1)	(2)	(3)
RND $_{t-1}$	0.02	0.02	0.02
	(1.05)	(0.99)	(0.03)
ROA $_{t-1}$	-0.68***	-0.67***	-0.85***
	(-2.99)	(-2.95)	(-3.62)
CAPEX $_{t-1}$	-0.37	-0.33	0.04
	(-0.68)	(-0.62)	(0.07)
LEVERAGE $_{t-1}$	1.94***	1.94***	2.10***
	(17.12)	(17.08)	(17.74)
MB $_{t-1}$	-0.02***	-0.02***	-0.02***
	(-3.17)	(-3.00)	(-3.27)
LOG_SALES $_{t-1}$	0.46***	0.45***	0.39***
	(34.60)	(33.78)	(25.82)
TANGIBILITY $_{t-1}$	-0.02	0.00	-0.05
	(-0.12)	(0.02)	(-0.35)
IO $_{t-1}$	1.45***	1.45***	1.39***
	(16.45)	(16.41)	(14.89)
HINDEX $_{t-1}$	-0.07	-0.09	-0.20*
	(-0.63)	(-0.78)	(-1.67)
LT_BBLOCK $_{t-1}$		1.66***	1.59***
		(7.45)	(7.22)
STOCK VOLATILITY $_{t-1}$			-1.41***
			(-3.60)
DELAWARE $_{t-1}$			-0.02
			(-0.50)
STOCK TURNOVER $_{t-1}$			0.37***
			(4.34)
JUNKBOND $_{t-1}$			-0.24**
			(-2.12)
CONSTANT	-5.20***	-5.14***	-5.00***
	(-15.71)	(-15.58)	(-13.21)
Observations	17813	17813	17447
Pseudo R2	0.37	0.38	0.40

Table 7
Addressing Endogeneity: 2SLS Results

This table reports the 2-stage OLS regression results to address the potential endogeneity problem in our study. Specifically, we use two instrumental variables to identify the possible causal relationship between the presence of short-term bond blockholders and the firm's R&D activities and quality: the standard deviation of monthly stock returns in previous year (*STOCK VOLATILITY*), and a dummy that indicates whether a firm's S&P credit rating is below BBB- (*JUNKBOND*). Please refer to appendix for the definition of control variables. Panel A reports the results for all U.S. public firms, whereas Panel B reports results for U.S. public firms who issue bonds and whose bonds are held by institutional investors. T-statistics, reported in parentheses, are based on the robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Panel A: Total Sample

	LOG (RND/SALES)$_t$	**LOG (PATENTS/RND)$_t$**	**LOG (CITE/RND)$_t$**
Instrumented ST_BBLOCK$_{t-1}$	-29.57**	-9.78*	-18.33**
	(-2.01)	(-1.76)	(-1.98)
LT_BBLOCK$_{t-1}$	5.31*	1.79	3.40*
	(1.69)	(1.62)	(1.73)
ROA$_t$	-1.29***	-0.04	0.09
	(-3.25)	(-0.26)	(0.36)
CAPEX$_t$	0.71	0.04	0.43
	(0.90)	(0.13)	(0.86)
LEVERAGE$_t$	0.07	-0.12	-0.09
	(0.25)	(-1.25)	(-0.49)
MB$_t$	0.00	0.00	-0.01
	(-0.22)	(-0.47)	(-0.76)
LOG_SALES$_t$	-0.39***	-0.08	-0.14
	(-2.78)	(-1.55)	(-1.57)
WITHBOND$_t$	19.57*	6.49*	12.08*
	(1.92)	(1.78)	(1.88)
TANGIBILITY$_t$	-0.83***	-0.05	-0.25
	(-2.81)	(-0.47)	(-1.33)
IO$_t$	1.59***	0.46**	0.80**
	(2.93)	(2.38)	(2.34)
HINDEX$_t$	-0.53**	-0.04	-0.10
	(-2.03)	(-0.49)	(-0.62)
CONSTANT	-0.09	-1.76***	-0.79**
	(-0.19)	(-10.21)	(-2.56)
Year & Industry Fixed Effects	Yes	Yes	Yes
Observations	17754	17754	17754
Prob F>0	0.001	0.001	0.001

Table 7- Continued

Panel B. Firms with Bonds

	LOG (RND/SALES)$_t$	**LOG (PATENTS/RND)$_t$**	**LOG (CITE/RND)$_t$**
Instrumented ST_BBLOCK$_{t-1}$	-3.48***	-0.79***	-1.06**
	(-6.56)	(-2.60)	(-2.58)
LT_BBLOCK$_{t-1}$	0.49**	0.16*	0.25*
	(2.52)	(1.75)	(1.88)
ROA$_t$	-0.87	-0.61***	-0.80***
	(-1.49)	(-2.74)	(-2.96)
CAPEX$_t$	0.83	-0.09	0.58
	(0.62)	(-0.21)	(1.00)
LEVERAGE$_t$	-1.15***	-0.21	-0.27
	(-3.11)	(-1.40)	(-1.42)
MB$_t$	-0.01	0.01	0.00
	(-0.55)	(0.96)	(0.09)
LOG_SALES$_t$	-0.30***	0.00	-0.01
	(-6.45)	(-0.12)	(-0.31)
TANGIBILITY$_t$	-0.80**	0.26**	0.16
	(-2.50)	(2.13)	(1.05)
IO$_t$	0.32	0.23**	0.31**
	(1.38)	(2.37)	(2.54)
HINDEX$_t$	-0.17	0.10	0.00
	(-0.79)	(0.97)	(0.01)
CONSTANT	1.08**	-2.25***	-1.60***
	(2.17)	(-8.92)	(-4.57)
Year & Industry Fixed Effects	Yes	Yes	Yes
Observations	2,154	2,154	2,154
Prob F>0	0.001	0.001	0.001

Table 8
Natural Experiment on the Market Power Hypothesis

This table reports the pooled regression results that show how the impact of short-term bondholders on both the magnitude and the quality of a firm's R&D activities varies with bond's year-to-maturity (a proxy for bond liquidity). We divide all firms that issue bonds into two groups: *Far From Maturity Firms* and *Near Maturity Firms.* The first group includes all firms whose outstanding bonds expire in more than 2 years; and the second group includes all firms whose outstanding bonds expire within 2 years. Please refer to the appendix for the definition of variables used in this analysis. T-statistics, reported in parentheses, are based on the robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	LOG(RND/SALES)$_t$		**LOG(PATENTS/RND)$_t$**		**LOG(CITE/RND)$_t$**	
	Firms Far From Maturity	Firms Near maturity	Firms Far From Maturity	Firms Near maturity	Firms Far From Maturity	Firms Near maturity
ST_BBLOCK_{t-1}	-0.09***	-0.01	-0.04	0.07	-0.08**	-0.04
	(-5.25)	(-0.18)	(-1.24)	(0.79)	(-2.16)	(-1.15)
LT_BBLOCK_{t-1}	-0.03	-0.15	0.03	1.18***	0.09	0.19**
	(-1.10)	(-1.03)	(0.46)	(6.50)	(0.85)	(2.43)
ROA_t	-1.95***	-1.35***	-0.87***	-0.83	-1.21***	-0.19
	(-8.94)	(-2.91)	(-4.76)	(-1.04)	(-5.35)	(-0.70)
$CAPEX_t$	1.77***	0.65	0.17	-1.47	0.87**	-0.06
	(6.79)	(0.52)	(0.53)	(-0.80)	(2.03)	(-0.08)
$LEVERAGE_t$	-0.44***	-0.67**	-0.02	-0.29	-0.08	-0.01
	(-5.14)	(-2.19)	(-0.15)	(-0.60)	(-0.56)	(-0.08)
MB_t	0.02***	0.01*	0.01***	0.01	0.01**	0.00
	(6.94)	(1.91)	(2.79)	(0.70)	(2.23)	(-0.57)
LOG_SALES_t	-0.07***	-0.11***	0.06***	-0.07	0.06***	-0.04*
	(-8.06)	(-3.30)	(4.79)	(-1.51)	(4.30)	(-1.77)
$TANGIBILITY_t$	-0.58***	-0.38	0.31***	0.60	0.23*	0.27
	(-10.01)	(-1.06)	(2.99)	(1.42)	(1.73)	(1.38)
IO_t	-0.19***	-0.45**	0.14*	-0.26	0.17*	0.00
	(-3.71)	(-2.51)	(1.82)	(-1.10)	(1.78)	(0.02)
$HINDEX_t$	-0.30***	-0.09	0.15	-0.49**	-0.02	-0.11
	(-7.16)	(-0.80)	(1.63)	(-2.28)	(-0.17)	(-1.29)
CONSTANT	-0.72***	-0.71*	-3.02***	-1.40***	-2.62***	-2.07***
	(-5.03)	(-1.85)	(-19.17)	(-2.91)	(-13.58)	(-8.86)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1978	179	1978	179	1978	179
R-squared	0.54	0.65	0.24	0.48	0.24	0.38

Table 9
Short-Term Bondholders Vs Short-Term Shareholders

This table reports the pooled regression results that show the interactions between long-term and short-term bond blockholders and long-term and short-term stock blockholders in terms of their influence on a firm's R&D activities (Panel A) and quality (Panel B). *ST_BBLOCK* (*LT_BBLOCK*) equals one if a firm has one or more short-term (long-term) institutional investors that hold 5% or more of its outstanding bonds, and zero otherwise. A bondholder is said to be short-term (long-term) if its average portfolio turnover ratio over the last four quarters is in the top (bottom) tercile of all investors. *ST_EBLOCK* (*LT_EBLOCK*) equals one if a firm has one or more short-term (long-term) institutional investors that hold 5% or more of its outstanding common shares, and zero otherwise. We use Bushee's (1998) method to determine whether an institutional shareholder is short-term or long-term. Please refer to appendix for the definition of control variables. Results in Panel A and B are for all U.S. public firms; whereas those in Panel C are for U.S. public firms who issue bonds and whose bonds are held by institutional investors. T-statistics, reported in parentheses, are based on the robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Panel A: R&D Expenditure Level

Dependent Variable: LOG (RND/SALES)$_t$			
	(1)	(2)	(3)
ST_BBLOCK$_{t-1}$		-0.11***	-0.09***
		(-6.28)	(-4.69)
LT_BBLOCK$_{t-1}$		-0.01	0.03
		(-0.32)	(0.39)
ST_EBLOCK$_{t-1}$	-0.06***	-0.06***	-0.05***
	(-6.32)	(-6.32)	(-5.32)
LT_EBLOCK$_{t-1}$	0.01	0.01	0.01
	(0.77)	(0.81)	(0.85)
*ST_BBLOCK$_{t-1}$ *ST_EBLOCK$_{t-1}$*			-0.11***
			(-4.20)
*Lt_BBLOCK$_{t-1}$ *LT_EBLOCK$_{t-1}$*			0.10
			(-1.12)
ROA$_t$	-1.93***	-1.93***	-1.93***
	(-45.94)	(-45.88)	(-45.87)
CAPEX$_t$	0.98***	0.98***	0.98***
	(7.97)	(7.96)	(7.97)
LEVERAGE$_t$	-0.14***	-0.14***	-0.14***
	(-4.70)	(-4.67)	(-4.58)
MB$_t$	0.01***	0.01***	0.01***
	(9.18)	(9.13)	(9.12)
LOG_SALES$_t$	-0.13***	-0.13***	-0.13***
	(-27.95)	(-28.02)	(-28.06)
WITHBONDS$_t$	0.13***	0.21***	0.21***
	(10.62)	(11.50)	(11.60)
TANGIBILITY$_t$	-0.60***	-0.60***	-0.60***
	(-16.91)	(-16.94)	(-16.96)
IO$_t$	0.59***	0.59***	0.59***
	(29.90)	(29.99)	(29.88)
HINDEX$_t$	-0.42***	-0.42***	-0.42***
	(-18.76)	(-18.79)	(-18.78)
CONSTANT	-2.18***	-2.17***	-2.17***
	(-117.01)	(-116.80)	(-116.74)
Year & Industry Fixed Effects	Yes	Yes	Yes
Observations	18,638	18638	18638
R-squared	0.65	0.65	0.65

Table 9- Continued

Panel B. R&D Efficiency

	LOG(PATENTS/RND)$_t$			**LOG(CITE/RND)$_t$**		
	(1)	(2)	(3)	(4)	(5)	(6)
ST_BBLOCK$_{t-1}$		-0.05*	-0.03		-0.08**	-0.06*
		(-1.96)	(-0.97)		(-2.49)	(-1.71)
LT_BBLOCK$_{t-1}$		0.04	0.05		0.11	0.12
		(0.51)	(0.50)		(0.97)	(0.76)
ST_EBLOCK$_{t-1}$	0.01	0.01	0.01	0.00	0.00	0.00
	(0.89)	(0.91)	(0.93)	(0.32)	(0.35)	(0.36)
LT_EBLOCK$_{t-1}$	0.00	0.00	0.00	0.00	0.00	0.01
	(-0.36)	(-0.35)	(0.34)	(-0.00)	(0.02)	(0.47)
*ST_BBLOCK$_{t-1}$ *ST_EBLOCK$_{t-1}$*			-0.10***			-0.09**
			(-3.12)			(-2.16)
*Lt_BBLOCK$_{t-1}$ *LT_EBLOCK$_{t-1}$*			0.05			0.04
			(-0.31)			(-0.17)
ROA$_t$	-0.24***	-0.24***	-0.24***	-0.31***	-0.31***	-0.31***
	(-7.80)	(-7.76)	(-7.73)	(-8.02)	(-7.97)	(-7.95)
CAPEX$_t$	0.17*	0.17*	0.17**	0.60***	0.60***	0.60***
	(1.96)	(1.95)	(1.96)	(5.14)	(5.14)	(5.14)
LEVERAGE$_t$	-0.20***	-0.20***	-0.20***	-0.24***	-0.24***	-0.23***
	(-8.44)	(-8.42)	(-8.33)	(-7.50)	(-7.47)	(-7.41)
MB$_t$	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(3.47)	(3.44)	(3.43)	(3.30)	(3.28)	(3.27)
LOG_SALES$_t$	0.01**	0.01*	0.01*	0.02***	0.02***	0.02***
	(2.00)	(1.86)	(1.78)	(4.76)	(4.59)	(4.53)
WITHBONDS$_t$	0.07***	0.10***	0.11***	0.05***	0.10***	0.10***
	(4.85)	(4.48)	(4.57)	(2.83)	(3.53)	(3.60)
TANGIBILITY$_t$	0.02	0.02	0.02	-0.10***	-0.10***	-0.10***
	(0.67)	(0.66)	(0.64)	(-2.76)	(-2.76)	(-2.78)
IO$_t$	0.13***	0.13***	0.13***	0.18***	0.18***	0.18***
	(7.23)	(7.29)	(7.16)	(8.01)	(8.08)	(7.99)
HINDEX$_t$	-0.01	-0.01	-0.01	-0.04	-0.04	-0.04
	(-0.43)	(-0.44)	(-0.44)	(-1.23)	(-1.25)	(-1.25)
CONSTANT	-2.35***	-2.35***	-2.35***	-2.38***	-2.38***	-2.37***
	(-127.49)	(-127.19)	(-127.30)	(-102.34)	(-101.98)	(-102.00)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,638	18638	18638	18,638	18638	18638
R-squared	0.13	0.13	0.13	0.13	0.13	0.14

Table 9- Continued

Panel C. Firms with Bonds

	LOG (RND/SALES)$_t$		**LOG(PATENTS/RND)$_t$**		**LOG(CITE/RND)$_t$**	
	(1)	(2)	(3)	(4)	(5)	(6)
ST_BBLOCK$_{t-1}$	-0.09***	-0.08***	-0.03	-0.00	-0.07**	-0.03
	(-5.36)	(-4.62)	(-1.11)	(-0.10)	(-2.17)	(-0.78)
LT_BBLOCK$_{t-1}$	-0.04	-0.02	0.04	0.06	0.09	0.12
	(-1.35)	(-0.47)	(0.59)	(0.55)	(0.83)	(0.75)
ST_EBLOCK$_{t-1}$	-0.01	-0.01	0.05**	0.05*	0.02	0.02
	(-0.43)	(-0.37)	(1.98)	(1.95)	(0.50)	(0.49)
LT_EBLOCK$_{t-1}$	-0.05***	-0.03	-0.06*	0.04	-0.05	0.09
	(-2.65)	(-0.78)	(-1.76)	(0.62)	(-1.30)	(1.19)
*ST_BBLOCK$_{t-1}$*ST_EBLOCK$_{t-1}$*		-0.03		-0.14**		-0.21**
		(-0.71)		(-2.03)		(-2.45)
*Lt_BBLOCK$_{t-1}$ *LT_EBLOCK$_{t-1}$*		-0.04		-0.04		-0.07
		(-0.63)		(-0.28)		(-0.33)
ROA$_t$	-1.86***	-1.86***	-0.80***	-0.80***	-1.07***	-1.07***
	(-9.45)	(-9.45)	(-4.71)	(-4.71)	(-5.20)	(-5.21)
CAPEX$_t$	1.71***	1.70***	0.09	0.08	0.81**	0.80*
	(6.76)	(6.77)	(0.28)	(0.25)	(1.97)	(1.93)
LEVERAGE$_t$	-0.44***	-0.44***	-0.04	-0.04	-0.06	-0.05
	(-5.54)	(-5.52)	(-0.40)	(-0.38)	(-0.41)	(-0.39)
MB$_t$	0.02***	0.02***	0.01***	0.01***	0.01**	0.01**
	(7.13)	(7.11)	(2.87)	(2.89)	(2.08)	(2.12)
LOG_SALES$_t$	-0.08***	-0.08***	0.04***	0.04***	0.05***	0.05***
	(-8.79)	(-8.81)	(3.64)	(3.74)	(3.71)	(3.83)
TANGIBILITY$_t$	-0.57***	-0.57***	0.32***	0.32***	0.23*	0.22*
	(-10.15)	(-10.17)	(3.17)	(3.15)	(1.84)	(1.82)
IO$_t$	-0.17***	-0.17***	0.11	0.12	0.18*	0.19**
	(-3.31)	(-3.28)	(1.44)	(1.52)	(1.94)	(2.04)
HINDEX$_t$	-0.27***	-0.27***	0.08	0.08	-0.02	-0.03
	(-6.99)	(-7.01)	(0.92)	(0.90)	(-0.22)	(-0.26)
CONSTANT	-0.71***	-0.72***	-2.83***	-2.88***	-2.53***	-2.60***
	(-5.16)	(-5.26)	(-18.58)	(-18.67)	(-14.08)	(-14.19)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,157	2,157	2,157	2,157	2,157	2,157
R-squared	0.55	0.55	0.25	0.25	0.24	0.24

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