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ESSAYS ON OWNERSHIP STRUCTURE AND CORPORATE POLICIES

by

DOOCHEOL MOON

A dissertation submitted to the Graduate Faculty in Business in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

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Abstract

ESSAYS ON OWNERSHIP STRUCTURE AND CORPORATE POLICIES

by

DOOCHEOL MOON

Advisor: Professor Kishore Tandon

The first essay investigates the implications of the free cash flow hypothesis in corporate capital structure policy. It is hypothesized that associations between ownership structure and leverage vary with the extent of the overinvestment problem, which depends on growth opportunities and free cash flow. The results indicate that relations between ownership structure and leverage are stronger for low-growth firms and of the greatest significance for low-growth firms with large free cash flow. The results also suggest that firms with large free cash flow have higher levels of leverage, and firm size affects associations between ownership structure and leverage.

The second essay examines the effect of managerial ownership on the level and structure of firm investments. The results suggest that the presence of managerial risk aversion due to underdiversification affects the firm's investment policy. When capital expenditure and R&D expenditure are used as proxies for the level of firm investments, both firm investments first increase significantly as managerial ownership rises; however, levels of R&D expenditure decline as ownership increases further. The proportion of R&D expenditure to total firm investments, a measure of the firm's investment structure, first increases and then declines with managerial ownership. As their ownership rises, managers tend to spend less on R&D expenditure to decrease firm

risk. Further tests to address the effect of the overinvestment problem on firm investments find that the subject of overinvestment may be capital expenditure and not R&D expenditure.

The third essay investigates the effect of growth opportunities on associations between managerial ownership and dividend payouts. It is hypothesized that substitutability between managerial ownership and dividend payouts is pronounced for low-growth firms. The results indicate that dividend payouts are negatively related with managerial ownership for low-growth firms, while there are no significant relations between dividend payouts and managerial ownership for high-growth firms. The results also suggest that share repurchases, in addition to dividends, can control the overinvestment problem, and the disciplinary role of dividend payouts to restrain managerial expansionary tendencies is stronger for low-growth firms.

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This dissertation is dedicated to my loving family. The words are not enough to describe the importance of my family's presence with their being on my side, and limitless understanding and support all the time during the course of my doctoral studies. I am so grateful to them for their patience, support and love.

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Essay I

The Impact of Equity Ownership on Capital Structure under the Free Cash Flow Hypothesis

1. Introduction

Agency theories suggest that when managers insulate themselves from internal and external firm governance mechanisms, they have incentives to pursue their own interests at the expense of shareholders (Jensen and Meckling, 1976). Jensen (1986) discusses agency conflicts between shareholders and managers that exist over the disposition of free cash flow. The underlying premise is that managers tend to spend free cash flow on wasteful projects, because their compensation and perquisites increase with investments. The overinvestment problem would be mitigated by increased leverage that restrains managerial unprofitable expansionary tendencies by limiting financial resources available to managers in the future (Jensen, 1986; Stulz, 1990). However, managers in firms characterized by severe agency problems have little incentives to pay out free cash flow with the increase in leverage. The effect that disciplinary devices to control these agency conflicts have on leverage has been the subject of a number of empirical studies. These studies find evidence that managers systematically make suboptimal decisions about capital structure, and suggest that ownership structure helps in aligning managerial interests with those of shareholders.

In this study, I examine the implications of the free cash flow hypothesis in capital structure policy and focus specifically on cross-sectional relations between ownership structure and leverage.[1,2] Given the severity of the overinvestment problem,

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[1] There are a number of studies that investigate the free cash flow hypothesis. One strain of empirical work examines whether the effect of the firm's growth opportunities is the primary explanation for stock price reaction to firm investment announcements. Studies in this vein look at going-private transactions (Lehn and Poulsen, 1989) and tender offers (Lang, Stulz, and Walkling, 1991; Smith and Kim, 1994; Harford, 1999). Another strain looks at dividend change announcements in determining whether the

relations between ownership structure and leverage may be conditioned on the existence of growth opportunities and free cash flow. This research examines how the sensitivity of relations between ownership structure and leverage varies cross-sectionally with growth opportunities and free cash flow.

Tests using a sample of 14,788 observations for 4,829 firms for the 1994 to 1998 period indicate that the sensitivity of ownership structure to leverage varies directly with the relative abundance of growth opportunities and free cash flow. The results also reveal that managerial ownership aligns the interests of shareholders and managers through eliciting increased leverage, while institutional investors impose their managerial preferences through the governance process and encourage firms to preserve borrowing capacity.

Two other features distinguish this study. First, I suggest an alternative measure of the firm's free cash flow, which Jensen (1986) defines as cash flow left after firms have invested all available positive NPV projects. While Lehn and Poulsen (1989) and Chaplinsky and Niehaus (1993) suggest the measures of free cash flow net of interest expenses, I employ a free cash flow measure gross of interest expenses because such a measure is less dependent on the firm's capital structure. I find that firms with the

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dividend change provides information about changes in the managerial misuse of free cash flow (Lang and Litzenberger, 1989; Yoon and Starks, 1995).

[2] Another approach to the implications of the free cash flow hypothesis in corporate capital structure policy is to study specific events that affect capital structure. This is the approach taken by Denis and Denis (1993). They examine the impact of highly leveraged transactions on managerial discretion over investment policy using 39 proposed leveraged recapitalization, and find that increased debt significantly decreases undistributed cash flow.

potential overinvestment problem have higher levels of leverage, consistent with the free cash flow hypothesis.

Second, I examine a relatively large sample of firms of all sizes, while most previous cross-sectional studies have focused on large (or manufacturing) firms, thus limiting them to relatively small samples. I find evidence that firm size affects relations between ownership structure and leverage. When firms in the sample are divided by asset size into quartiles, the impact of managerial ownership on leverage is concentrated for large firms (i.e., firms in the top quartile), while the role of institutional ownership is more pronounced for small firms (i.e., firms in the bottom quartile).

The rest of the paper is organized as follows. Section 2 presents hypotheses relating ownership, leverage, growth opportunities, and free cash flow. Section 3 explains the empirical framework while Section 4 describes the data and the sample characteristics. The empirical results are presented in Section 5 and Section 6 concludes.

2. Ownership Structure, Leverage, and Free Cash Flow Theory

Capital structure policy has been viewed as an internal control mechanism that can reduce agency conflicts between shareholders and managers. Jensen (1986) argues that managers with substantial free cash flow tend to invest it in wasteful projects rather than pay it out to shareholders, since they are rewarded for expanding firm size. These unnecessary investments lead to poor performance, creating conflicts between the expansionary-minded managers and shareholders seeking to maximize the value of their

shares. Jensen emphasizes the disciplinary role of leverage that restrains managerial unprofitable expansionary tendencies. The required payments under leverage contracts reduce the control managers have over the firm's cash flow and thus the incentives to engage in non-optimal activities.[3]

Why would managers in firms characterized by severe agency problems have incentives to pay out free cash flow with the increase in leverage? The leverage choice itself is subject to the agency problem between shareholders and managers. As pointed out by Zwiebel (1996), the free cash flow hypothesis requires disciplinary devices that lead managers to use more leverage.[4] On the other hand, disciplinary devices, in addition to leverage, can control the overinvestment problem, implying that leverage and disciplinary devices serve as alternative mechanisms for mitigating agency conflicts of free cash flow.

Agency theories suggest that equity ownership is an obvious mechanism aligning managerial interests with those of shareholders. Jensen and Meckling (1976) argue that managerial equity ownership reduces managerial incentives to engage in nonoptimal behavior. As managerial ownership increases, managers bear more of the wealth effects of their divergent behaviors. If managers make suboptimal decisions

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[3] Building on Jensen (1986), Stulz (1990) assumes that managers want to invest all available funds even if paying out cash is better for shareholders. Leverage reduces free cash flow and thus alleviates the overinvestment problem. The cost of leverage in his model is that debt payments may reduce the funds available for profitable investment and induce the underinvestment problem.

[4] The agency literature provides several control mechanisms to alleviate agency conflicts between shareholders and managers. While the focus of this paper is managerial and institutional equity ownership, previous studies have also identified managerial compensation policy, board characteristics such as size and outsider representation, the managerial labor market, and the market for corporate control (see Agrawal and Knoeber, 1996).

about capital structure, one should observe significant cross-sectional relations between managerial ownership and leverage. While previous studies have provided evidence consistent with this view, the direction of relations between them is not clear. One strain of research finds a significantly positive cross-sectional relation, suggesting that managers whose financial incentives are closely related to shareholders take more leverage (Kim and Sorensen, 1986; Mehran, 1992; Berger, Ofek, and Yermack, 1997). Using different data sources, sample periods, and methodology, another strain of research finds a significantly negative relation, contending that the disciplinary pressures of leverage and managerial ownership are substitutes (Friend and Lang, 1988; Jensen, Solberg, and Zorn, 1992; Chen and Steiner, 1999).

The literature concerning the role of institutional investors suggests that institutional investors serve as an alternative mechanism to control the overinvestment problem (Shleifer and Vishny, 1986; Pound, 1988). Institutional investors have greater expertise in gathering and interpreting information on firms, and have more incentives to closely oversee managerial activities with an increase in their equity ownership.[5] While institutional investors can exercise their influence through eliciting higher leverage to control the overinvestment problem, they can also pressure managers through the governance process. For example, institutional investors seek to increase

[5] On the other hand, institutional investors dissatisfied with managerial or stock performance may simply sell their share holdings. Bathala, Moon, and Rao (1994) point out that this has become increasingly difficult for many institutions. First, due to their sizable equity ownership, institutional investors must accept substantial discounts in order to liquidate their significant holdings. Second, many institutions, especially pension funds, are heavily invested in index funds. Therefore, that pension fund performance depends on the performance of the firms making up the index and it is in the interest of pension funds to actively monitor the firms in the index.

their oversight on firms through making the boards more independent. Though there is limited evidence on the association between institutional ownership and leverage, possible exceptions are Grier and Zychowicz (1994) and Bathala, Moon, and Rao (1994). They find a negative relation between institutional ownership and leverage, suggesting that institutional ownership and leverage serve as substitutes in controlling managerial self-interest and that institutional investors impose their managerial preferences through the governance process.

There is yet another aspect to be considered in relations between ownership structure and leverage. If one assumes, as suggested by Jensen (1986) and Stulz (1990), that managers receive utility from increasing firm size, the control function of leverage on the firm's potential overinvestment problem varies with the firm's growth opportunities. Shareholders tolerate low leverage from a firm with large growth opportunities, since they know that the firm has many positive NPV investments, which increase firm value. In contrast, shareholders would demand high leverage from a firm with few growth opportunities, since the firm is likely to invest unprofitably and firm value is discounted based on the expected agency costs.[6] Regardless of the specific direction of relations between ownership structure and leverage, ownership structure

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[6] Several previous studies have emphasized the distinct role of growth opportunities in their analysis. McConnell and Servaes (1995) investigate relations between firm value and leverage for low- and high-growth firms. They find that for high-growth firms, value is negatively related with leverage, whereas for low-growth firms, it is positively related. Lang, Ofek, and Stulz (1996) examine the effects of growth opportunities on relations between leverage and future investments. They find a strong negative relation between leverage and future investments, but the negative relation holds only for low-growth firms. Jung, Kim, and Stulz (1996) suggest that conflict of interests over financing policy is more likely to occur for low-growth firms. They find that low-growth firms issue equity, even if they have unused debt capacity. These firms invest more than similar debt-issuing firms, indicating that managerial discretion leads certain firms to issue equity when debt issuance would have better consequences for firm value.

would be more important for firms with higher divergence of interest between shareholders and managers. The following hypothesis applies.

Hypothesis 1: Other things equal, the relative influence of ownership structure on leverage varies directly with the firm's growth opportunities, being greater for firms with relatively few growth opportunities.

While the extent of the overinvestment problem is aggravated by few growth opportunities, divergence of interests between shareholders and managers is most severe in the presence of large free cash flow. Therefore, one can expect agency conflicts over the distribution of free cash flow to be most severe in combinations of few growth opportunities and large free cash flow, as does the disciplinary role of ownership structure in capital structure policy. At the other extreme, firms with high growth prospects and small free cash flow would be least severe in their overinvestment problem.

Hypothesis 2: Other things equal, the influence of ownership structure on leverage varies with both growth opportunities and free cash flow, and is greatest for firms with few growth opportunities and large free cash flow.

Jensen (1986) argues that firms with greater potential overinvestment problem use higher levels of leverage, because the interest commitment reduces the managerial

discretionary use of the cash. My third hypothesis tests this free cash flow hypothesis in corporate capital structure policy.

Hypothesis 3: Other things equal, free cash flow is positively related to leverage, and relation between free cash flow and leverage is strongest for firms with few growth opportunities and large free cash flow.

3. Empirical Framework

In this section, I describe my econometric model and the variables used in the study. I use the regression equation below as the basis for testing my hypotheses of interrelations between ownership structure, leverage, growth opportunities, and free cash flow. To specify the model fully, I include additional variables based on previous research.

One concern over estimating the impact of ownership structure on leverage is the possibility of reverse causation from current leverage to current equity ownership. McConnell and Servaes (1995) find evidence that firm value is positively correlated with leverage for low-growth firms, and negatively correlated with leverage for high-growth firms. If, as suggested by Cho (1998), firm value affects ownership structure, causality may operate in the opposite direction. To control for possible biases due to reverse causality, I include a one-year lag between ownership structure (and all other

explanatory variables) and leverage (see Smith and Watts, 1992; Rajan and Zingales, 1995).[7]

Since the free cash flow hypothesis argues that firms with higher free cash flow have higher levels of leverage, it seems natural to examine cross-sectional relations between the firm's capital structure and free cash flow (and ownership structure). With the preceding considerations in mind, I specify:

$$Lev_{i,t} = \beta_0 + \beta_1 Man_{i,t-1} + \beta_2 Inst_{i,t-1} + \beta_3 FCF_{i,t-1} + \beta_4 M/B_{i,t-1} + \beta_5 ROA_{i,t-1} + \beta_6 Cv_{i,t-1} + \beta_7 Size_{i,t-1} + \beta_8 R\&D_{i,t-1} + \beta_9 R\&DDUM_{i,t-1} + \beta_{10} Exp_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where subscript *i* and *t* refer to firm and fiscal year, and year and industry dummy variables are suppressed. *Lev* denotes leverage, *Man* denotes managerial equity ownership, *Inst* denotes institutional equity ownership, *FCF* denotes free cash flow, *M/B* denotes the market-to-book ratio, *ROA* denotes the return on assets, *Cv* denotes the collateral value, *Size* denotes the size of firm, *R&D* denotes R&D ratio, *R&DDUM*

[7] An alternative methodology to control for reverse causality is to specify structural equations for ownership structure and leverage (Jensen, Solberg, and Zorn, 1992; Chen and Steiner, 1999). While the structural equation approach potentially can test both whether ownership structure and leverage share common determinants and whether one endogenous variable influences the other, this approach must specify a priori instrumental variables that influence one endogenous variable, but not the other (and vice versa). I do not estimate structural models specifying interdependencies between ownership structure and leverage for two reasons. First, theory provides little guidance as to the exact structure of the underlying simultaneous system of equations. Moreover, the regression coefficients tend to be sensitive to the specification of the equations (see Lang, Ofek, and Stulz, 1996). Second, there is little empirical evidence that ownership structure and leverage are determined simultaneously. Jensen, Solberg, and Zorn (1992) find that managerial ownership affects capital structure policy, but not vice versa, while Chen and Steiner (1999) find evidence that managerial ownership and capital structure affect each other. In addition, Chaplinsky and Niehaus (1993) examine whether capital structure and managerial ownership share common determinants and find little evidence that they can be explained by the same set of variables.

denotes an indicator variable on the availability of R&D data, *Exp* denotes the selling expense ratio, and $\varepsilon_{i,t}$ denotes the error terms.

I measure leverage (*Lev*) as the ratio of the book value of total debt to the book value of assets. An alternative is to divide the book value of total debt by the market value of assets. This market value of *Lev* is possibly inappropriate, since differences in market values would be reflected in both *M/B* and the market value of *Lev* and may create a negative spurious correlation.[8]

This paper is primarily concerned with the effects of ownership structure and free cash flow, but omitting other variables from the specification can bias the estimates. A number of factors other than ownership structure and free cash flow may affect corporate capital structure decisions. I include other variables that have been shown to influence leverage.

A. Ownership Structure Managerial equity ownership is defined as the percentage of total shares outstanding held by corporate officers and members of the board of directors. The other category of equity ownership, institutional ownership, is measured by the percentage of equity held by institutional investors.

B. Free Cash flow The literature provides mixed guidance on the measures of free cash flow, which Jensen (1986) defines as cash flow left after firms have invested

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[8] I also ran the regressions with the market value of debt ratio. All estimated coefficients, except for the market-to-book ratio, have the same sign and significance as the equivalent coefficients in using the book value of debt ratio. For example, the coefficient on managerial ownership for low-growth firms is 0.030 and significant at the l-percent level, while the coefficient for high-growth firms is -0.001 and not significant. The coefficients on institutional ownership for low- and high-growth firms are -0.121 and -0.053, respectively, and significant at the l-percent level. The difference in the above coefficients is also

all available positive NPV projects. Since the value of positive NPV projects is unobservable, free cash flow (*FCF*) is difficult to measure in practice. The most commonly used *FCF* definition is the one suggested by Lehn and Poulsen (1989). Their measure of *FCF* is the operating income before depreciation minus taxes, interest expenses, and preferred and common dividends. While this measures after-tax cash flow that is not distributed to security holders, it does not provide a measure of the availability of positive NPV projects. Chaplinsky and Niehaus (1993), on the other hand, proxy *FCF* using the operating income before depreciation minus taxes, interest expenses, and capital expenditures. Using this definition, they assume that capital expenditures represent investment in all positive NPV projects.

However, both measures of *FCF* are net of interest expenses. *FCF* net of interest expenses is more likely to capture the effect of leverage, because firms with higher interest expenses have greater leverage. To identify relations between capital structure and *FCF*, it is better to use a *FCF* measure gross of interest expenses, since such a measure is less dependent on the firm's capital structure. I adopt the *FCF* definition used by Lehn and Poulsen (1989), with some modification. I measure *FCF* here as follows:

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significant. The coefficients on the market-to-book ratio for low- and high-growth firms are -0.040 and -0.016, respectively, and significant at the 1-percent level.

$$FCF = [\text{Operating income before depreciation} - \text{Taxes} - \text{Preferred dividends} - \text{Common dividends} - \text{Capital expenditures}] \div \text{Book value of assets}^{9} \quad (2)$$

As in Chaplinsky and Niehaus (1993), I also assume that capital expenditures represent investment in all positive NPV projects.[10, 11]

C. Growth Opportunities A central issue in any test of the free cash flow hypothesis is the question of a measure of the firm' growth opportunities that are inherently unobservable (Yoon and Starks, 1995). While there is no consensus on the most reliable proxy for growth opportunities, the market-to-book ratio is a growth measure used most frequently by researchers (Smith and Watts, 1992; Bizjak, Brickley, and Coles, 1993; Berger, Ofek, and Yermack, 1997; Harford, 1999). Thus, the primary measure used in this study as a proxy for growth opportunities is the market-to-book ratio (*M/B*), which is defined as follows:

$$M/B = [\text{Book value of assets} - \text{Book value of equity} + \text{Market value of equity}] \div \text{Book value of assets} \quad (3)$$

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[9] This free cash flow measure is given by Compustat item [#13 - (#16 – change in #35) - #19 - #21 - #128] ÷ #6.

[10] When I use a free cash flow measure net of interest expenses in the capital structure regressions, the coefficients on free cash flow for low- and high-growth firms are significantly negative. This may support the argument that this measure of free cash flow is more likely to reflect the effect of leverage.

[11] Harford (1999) find that once firms have accumulated a large stock of cash from previous free cash flow, both high- and low-growth firms exhibit the agency problem with respect to this accumulated free cash flow. In using a flow-based measure, I implicitly assume that firms with high and low free cash flow are similar with respect to cash reserves.

In the spirit of Myers' (1977) characterization of growth opportunities as the difference between firm value and existing assets, Smith and Watts (1992) argue that higher the *M/B*, the higher the ratio of growth opportunities to firm value and lower the ratio of assets in place to firm value. However, *M/B* has a couple of potential problems. First, since the book value of assets is measured at historical costs less depreciation, *M/B* is likely to contain significant measurement error for firms with long-lived assets (Smith and Witts, 1992). Second, because firm value is measured as the market value of equity plus the book value of debt, the ratio involves measurement error for highly levered firms (Gaver and Gaver, 1993). Because of these problems, I also employ the price-to-operating earnings (*P/E*) ratio as a second proxy for growth opportunities. Since results using this alternative proxy are consistent with the *M/B* results, I do not report them here.[12]

D. Return on Assets Myers (1984) points out that managers prefer funding their investments first with retained earnings, then debt, and finally, equity. If firms accumulate retained earnings, they become less levered. This implies inverse relations between return on assets (*ROA*) and leverage. I measure *ROA* as earnings before depreciation, interest expenses, and taxes, divided by the book value of assets.

[12] The firm's *P/E* ratio is calculated by dividing the stock price at the end-of-fiscal year by operating earnings per share. Since operating earnings are calculated before interest payments, the earning number is unaffected by leverage. A disadvantage of this measure, however, is that one can use this measure only for firms with nonnegative earnings. This reduces the sample to 10,636 observations, i.e., 28.1 percent of sample observations are deleted. All estimated coefficients have the same sign and significance as the equivalent coefficients in using *M/B*.

E. Collateral Value of Assets Myers and Majluf (1984) suggest that there are costs associated with issuing securities due to information asymmetry between shareholders and managers, and issuing debt secured by property reduces these costs. Therefore, firms with high proportion of tangible assets are expected to have higher leverage because such assets can serve as collateral. In addition, secured debt can mitigate the shareholder-bondholder conflicts in case of wealth distribution and asset substitution. To measure collateral value of assets (*Cv*), I use the ratio of net property, plant, and equipment plus inventory divided by the book value of assets.

F. Firm size Large firms tend to be more diversified and thus have less volatile cash flow. This leads large firms to have lower levels of bankruptcy risk. I measure firm size (*Size*) by the natural log of the book value of assets.

G. Uniqueness Titman (1984) argues that the firm's liquidation imposes costs on customers and employees. Since firms with unique products impose relatively high costs from liquidation on customers and employees, uniqueness of the assets is expected to be negatively related to leverage. Uniqueness of the assets is measured by research and development expenses over sales (*R&D*), and selling expense over sales (*Exp*), patterned after Titman and Wessels (1988). Two variables also measure future growth opportunities that are likely captured by *M/B*. In addition, I include an indicator variable (*R&DDUM*) on the availability of R&D data and treat missing values for R&D as zero expenditure (see Himmelberg, Hubbard, and Palia, 1999).[13]

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[13] Several recent studies argue that when firms spend negligible R&D expenditure, they omit this line from their income statements (Bizjak, Brickley, and Coles, 1993; Loughran and Ritter, 1997;

Following the findings by Bradley, Jarrell, and Kim (1984) that a significant portion of the cross-sectional variation in the firm's leverage is explained by industry factors, industry dummies are included to control for industry factors and are based on two-digit SIC codes. Year dummies for each year are also included in regressions to capture unobserved macroeconomic effects.[14]

4. Data

4.1. Sample Selection

In constructing the sample, I initially take the list of firms and the financial accounting data from the 1998 Compustat annual files (including the research file). While previous research has concentrated mainly on large (or manufacturing) firms, I examine a sample of firms of all sizes, including firms that have dropped out of the sample and are not currently in existence. I use a sample period that spans for 6 years from 1993 to 1998. The use of lagged explanatory variables as mentioned in Section 3 implies that the sample period actually used for estimation on leverage runs from 1994

Himmelberg, Hubbard, and Palia, 1999). They suggest that eliminating observations with missing R&D values is undesirable since it significantly reduces the sample size and biases the sample in favor of R&D-intensive firms.

[14] Capital structure is also likely to be influenced by the effective corporate tax rate. The firm's marginal tax rate on interest deductions depends on the firm's non-debt tax shields (DeAngelo and Masulis, 1980). Firms with larger non-debt tax shields are expected to have lower debt in their capital structure. However, when I include the net operating loss carryforwards (or the sum of book depreciation and investment tax credits) as a proxy for the marginal tax rate in my capital structure regressions, the coefficients are positive or insignificant. A possible explanation is that to capture relations between debt and taxes, it is probably more appropriate to analyze *incremental* financing decisions (MacKie-Mason, 1990; Graham, 1996; Hovakimian, Opler, and Titman, 2001). For this reason, I do not include the non-debt tax shields as a control variable in my reported results.

to 1998 and for all explanatory variables from 1993 to 1997. This yields a sample of 22,532 firm observations. To be included in the sample for further analysis, I require that the data on equity ownership are available. In addition, utility and financial companies are not included in the sample because their capital structures are likely to be significantly different from other firms in the sample.

The data on equity ownership are taken from the Compact Disclosure. This database reports two sets of managerial ownership statistics from two independent sources. The first source is the corporate proxy statement and the second one is Spectrum, which is based on insider trading and other SEC filings. Anderson and Lee (1997) provide evidence that Spectrum-based Compact Disclosure (hereafter, *Spectrum*) reveals significant reporting discrepancies in managerial ownership data from proxy statements, while the proxy-based Compact Disclosure data (hereafter, *Compact Disclosure*) are much cleaner. As a result, I use managerial equity ownership data from *Compact Disclosure*.[15] With respect to institutional equity ownership, only *Spectrum* provides the appropriate ownership data.[16] After I merge firm level data from the

[15] Anderson and Lee (1997) examine the fit between managerial ownership data from four databases and from proxy statements. Corporate Text, *Compact Disclosure*, Value Line, and *Spectrum* in descending order reproduce the benchmark ownership statistics of proxy statements. Furthermore, they show that the reporting discrepancies in the Value Line and *Spectrum* could significantly influence coefficient estimates of the regressions.

[16] Shleifer and Vishny (1986) suggest that blockholders have incentives to monitor and influence managers appropriately to protect their significant investments. Empirical evidence is generally consistent with their argument. Friend and Lang (1988), Mehran (1992), and Berger, Ofek, and Yermack (1997) report that the presence of block shareholders increases leverage. However, I do not include block ownership as an explanatory variable in my reported results, since block ownership taken from *Spectrum* includes holdings held by any shareholders who own at least 5 percent of the outstanding shares and thus captures portion of the ownership held by managers and institutional investors. As a check for the influence of block ownership on capital structure, I also ran the regressions with block ownership. I find

Compustat with equity ownership data, my sample contains 14,788 observations for 4,829 firms.

A breakdown of all sample firms and of low- and high-growth firms by year and industry is provided in Table 1. To classify firms in the sample as either high or low with respect to growth opportunities, I take the median market-to-book ratio (*M/B*) by year as a cutoff point. For each year, firms are ranked according to their fiscal year-end *M/B*. Firms above the median *M/B* are placed in the high-growth subsample and the other half of the firms with lower than the median *M/B* are placed in the low-growth subsample.[17] Panel A shows that the sample over the 5-year period contains 14,788 observations for 4,829 firms, while the low- and high-growth subsamples consist of 7,393 observations for 2,960 firms and 7,395 observations for 3,187 firms, respectively. The samples are more heavily weighted toward the later part of the sample period. While the average percentage of observations for the first two years is 17.5 percent of the sample, the average for the 1996 to 1998 period is 21.7 percent.

Panel B of Table 1 indicates industry distribution of the sample. The sample contains 60 industry groups, and firms in manufacturing industries (two-digit SIC codes between 20 and 39) represent more than 59 percent of all firms. Chemical, computer,

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that the coefficient on block ownership is significantly positive for low-growth firms but is not significant for high-growth firms.

[17] While I may stratify firms in the sample into three or four equal subsamples based on their *M/B*, there is a concern that relations between ownership structure and leverage reflect relations between firm size and leverage. For example, the mean (median) firm size for the bottom, second, third, and top quartiles of the growth classification is $375.2 million ($79.1 million), $1,159.5 million ($146.6 million), $1,422.9 million ($134.0 million), and $791.5 million ($86.0 million). See Section 5.3. for the impact of firm size on relations between ownership structure and leverage.

and instruments firms are classified as high-growth firms, while construction, textiles, primary and fabricated metals, transportation equipment, and durable goods firms are classified as low-growth firms. Industry distributions are consistent with conventional perceptions and are comparable with those in Gavor and Gavor (1993) and Baber, Janakiraman, and Kang (1996).

4.2. Descriptive Statistics

Table 2 provides descriptive statistics for all sample firms and for low- and high-growth firms. Panel A presents the definition and descriptive statistics for the variables for all sample firms. Managers, on average, own 19.1 percent of the equity in their firms. Their ownership varies between 0 and 97.5 percent. The mean of managerial ownership is higher than that reported by several other studies (e.g., Jensen, Solberg, and Zorn, 1992; Agrawal and Knoeber, 1996). Two possible explanations may account for this. First, the mean (median) firm size in the sample, $937.4 million ($105.1 million), is smaller than that in the previous studies.[18] Since managers in small firms have higher equity ownership than those in large firms (Demsetz and Lehn, 1985; Holderness, Kroszner, and Sheehan, 1999; Himmelberg, Hubbard, and Palia, 1999), the presence of smaller firms in my sample leads to higher managerial ownership level. Second, a recent study by Denis and Sarin (1999) provides evidence that a substantial fraction of firms exhibit large changes in managerial ownership in any given year and

[18] For example, the sample firms in Agrawal and Knoeber (1996) and Berger, Ofek, and Yermack (1997) have average assets totaling $5.8 billion and $2.4 billion, respectively.

these changes are not reversed in subsequent years. The sample in this study covers a time period that is different from that in previous studies.

Indicator variable on the availability of R&D data supports the argument that simply eliminating observations with missing R&D values significantly reduces the sample size. The mean indicator variable is 0.615, implying that 38.5 percent of observations in the sample have missing values for R&D.

Panel B of Table 2 shows firm characteristics for the low- and high-growth subsamples. The first column identifies the variables, the second and third columns provide descriptive statistics for each subsample, and the last column reports the *p*-value for the difference in means between the two subsamples. The difference in the market-to-book ratio (*M/B*) between the two subsamples is significant. The mean (median) *M/B* for the high-growth subsample is 2.680 (2.207), compared to a mean (median) of 1.137 (1.137) for the low-growth subsample. Both the *t*-test and the Wilcoxon test for difference in means indicate that *M/B* differs significantly ($p<0.01$) between the two subsamples. As expected, high-growth firms have lower amount of debt in their capital structure than low-growth firms. The mean (median) leverage for high-growth firms is 18.2 percent (13.8 percent), compared to a mean (median) of 27.0 percent (25.9 percent) for low-growth firms. This is consistent with the free cash flow hypothesis in which firms with fewer growth opportunities have higher levels of leverage.

There is also evidence that ownership structure significantly differs between the two subsamples. Low-growth firms have higher managerial ownership and lower institutional ownership than high-growth firms. The mean (median) managerial

ownership for low-growth firms is 20.4 percent (13.4 percent), compared to a mean (median) of 17.7 percent (10.7 percent) for high-growth firms. This is consistent with the argument that managerial ownership has the role of mitigating conflicts of interest between shareholders and managers, and conflicts are more significant for low-growth firms. On the other hand, the mean (median) institutional ownership for low-growth firms is 28.7 percent (23.8 percent), compared to a mean (median) of 33.9 percent (31.6 percent) for high-growth firms. Based on difference in means, managerial and institutional ownerships differ significantly ($p<0.01$) between the two subsamples.

5. Regression Results

5.1. Ownership Structure and Leverage by Growth Opportunities

Table 3 presents the results for the impact of growth opportunities on relations between ownership structure and leverage. The second and third columns provide regression results for low- and high-growth firms. The values of *t*-statistics are adjusted for the heteroskedasticity in residuals using the White (1980) method, and are presented in parenthesis below each coefficient estimate. The last column reports the difference in coefficients between low- and high-growth firms and the *t*-statistics for the difference.

Results suggest that the sensitivity of relations between ownership structure and leverage varies cross-sectionally with growth opportunities. The coefficient on managerial ownership for low-growth firms is 0.033 and significant at the 1-percent level, while the coefficient for high-growth firms is 0.001 and not significant. The difference in coefficients on managerial ownership is significant at the 5-percent level

(t=2.034). The coefficients on institutional ownership for low- and high-growth firms are -0.142, and -0.061, respectively, and significant, and so is the difference in coefficients between low- and high-growth firms (t=-4.912).

These findings lend support to Hypothesis 1 that divergence of interests between shareholders and managers over capital structure is greater for low-growth firms, and therefore the role of equity ownership in mitigating the overinvestment problem is more important for these firms. In addition, leverage increases as managerial ownership rises, but it declines with institutional ownership. While managers have little control over institutional holdings, they have the ability to manage levels of managerial ownership and debt financing. For the mechanisms chosen internally by them, managers optimize their usage such that the total agency costs in the firm are minimized. If, as suggested by Kim and Sorensen (1986), firms with high managerial ownership have lower agency costs of debt, they also tend to have higher levels of leverage. Thus, leverage and managerial ownership are complementary. However, when institutional investors provide valuable monitoring services and act as a restraint to opportunistic behavior by managers, firms find it optimal to utilize lower level of leverage, which is an alternative mechanism to reduce the agency conflicts.

There is also evidence that firms with greater agency costs of free cash flow use more leverage. The coefficients on free cash flow for low- and high-growth firms are 0.268 and 0.215, respectively, and statistically significant. This is consistent with Jensen (1986), but inconsistent with the results by Chaplinsky and Niehaus (1993), who find negative relations between free cash flow and leverage. The different results may

occur because the free cash flow measure used by Chaplinsky and Niehaus (1993) is net of interest expenses and thus may partially capture the effect of leverage.

While most of the control variables have signs as expected based on theories of capital structure, one exception is the market-to-book ratio (*M/B*). The results indicate that relations between *M/B* and leverage differ between low- and high-growth firms. While the coefficient on *M/B* for low-growth firms is 0.109 and significant, the coefficient for high-growth firms is -0.010 and also significant at the 1-percent level. For high-growth firms, this finding lends support to the Myers' (1977) argument that firms with higher investment in intangible assets tend to use less debt in their capital structure to reduce the agency costs associated with risky debt. For low-growth firms, a possible explanation is that growth adds value to the firm, which increases borrowing capacity.[19]

5.2. Ownership Structure and Leverage by Growth Opportunities and Free Cash Flow

My second hypothesis is that divergence of interests between shareholders and managers varies with growth opportunities and free cash flow, as does the disciplinary role of ownership structure in capital structure policy. To investigate this argument, I use a stratification procedure by combining free cash flow with growth opportunities. Sample firms are classified as either high or low with respect to growth opportunities

[19] These analyses are based on the sample that deletes 133 observations with debt ratio of more than one to minimize the effect of extreme observations. If debt ratio is defined to have the value between zero and

and free cash flow. For each year, firms with greater than the median value are placed in the high group and ones with less than the median value are placed in the low group. Firms with low-growth opportunities and high-free cash flow (hereafter, *HFCF*) are most likely to have the overinvestment problem, while firms with high-growth opportunities and low-free cash flow (hereafter, *LFCF*) are least likely. Other firms that have low-growth opportunities and low-free cash flow, or high-growth opportunities and high-free cash flow are relatively well balanced and placed in intermediate firms.

Table 4 presents the results of the impact of both growth opportunities and free cash flow on relations between ownership structure and leverage. The second, third, and fourth columns provide regression results for *HFCF* firms, intermediate firms, and *LFCF* firms, respectively. The last column reports the difference in coefficients between *HFCF* firms and *LFCF* firms and the *t*-statistics for the difference. The values of *t*-statistics are adjusted for the heteroskedasticity in residuals using the White (1980) method, and are presented in parenthesis below each coefficient estimate.

The results indicate that the effect of ownership structure on leverage is most important for *HFCF* firms. The coefficient on managerial ownership is significant only for *HFCF* firms. While the coefficients on institutional ownership are significantly negative for all three subsamples, the test for the difference in the coefficients between *HFCF* firms and *LFCF* firms indicates that the coefficient for *HFCF* firms is significantly greater. These findings support Hypothesis 2 that divergence of interests

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one, one can obtain consistent estimates by Tobit regressions. When Tobit regressions are used, results remain materially identical.

between managers and shareholders is most severe for firms with few growth opportunities and large free cash flow, and thus relations between ownership structure and leverage are most important for these firms. In addition, the results provide evidence that firms with more overinvestment problem have higher levels of leverage. The coefficients on free cash flow are 1.064 (t=9.005), 0.151 (t=4.315), and -0.007 (t=-0.179) for *HFCF* firms, intermediate firms, and *LFCF* firms. This is consistent with Hypothesis 3 that relation between free cash flow and leverage is strongest for firms with few growth opportunities and large free cash flow.

5.3. Ownership Structure and Leverage by Firm Size

I extend the analysis by splitting the sample by firm size into quartiles and examining the top and bottom quartiles of firm size with two purposes in mind. First, previous studies have suggested that firm size is an important factor in determining the level of managerial ownership (Demsetz and Lehn, 1985; Holderness, Kroszner, and Sheehan, 1999; Himmelberg, Hubbard, and Palia, 1999). They have found evidence that managerial ownership is much higher for small firms. Moreover, numerous studies argue that capital structure is affected by firm size, finding a positive relation between firm size and leverage (Agrawal and Knoeber, 1996; Berger, Ofek, and Yermack, 1997). Since the sample in this study covers firms of all sizes, any relation between equity ownership and leverage could be the result of a relation between firm size and leverage. Second, the coefficients on managerial ownership in Table 3 are smaller than the coefficients in prior studies (e.g., Mehran, 1992; Berger, Ofek, and Yermack, 1997). To

facilitate comparison to previous studies, I focus my analysis on large firms, which previous research has concentrated on.

To investigate whether relations between equity ownership and leverage are affected by firm size, I stratify all sample firms into quartiles based on their end-of-fiscal year book value of assets. For each year, firms in the top and bottom quartiles of the distribution of firm sizes are placed in large and small firms.

Table 5 provides descriptive statistics for large and small firms. As expected, the difference in firm size between large and small firms is dramatic. The mean (median) size for large firms is $3.458 billion ($1.146 billion), compared to a mean (median) of $15.873 million ($14.799 million) for small firms. Ownership structure is also worth noting. For large firms, the mean (median) managerial and institutional ownerships are 9.1 percent (3.2 percent) and 52.4 percent (56.5 percent), respectively. On the other hand, the mean (median) managerial and institutional ownerships for small firms are 26.6 percent (24.5 percent) and 8.2 percent (3.8 percent), respectively. Interestingly, the market-to-book ratios for large and small firms are similar. In particular, the mean (median) market-to-book ratio for large firms is 1.851 (1.570), compared to a mean (median) of 1.982 (1.505) for small firms. Table 5 also provides descriptive statistics for the low- and high-growth subsamples for large and small firms when they are divided further according to their end-of-fiscal year market-to-book ratio.

Table 6 provides cross-sectional associations between firm size and the sensitivity of ownership structure to leverage. For large firms, the coefficient on managerial ownership is 0.075 and significant (t=3.083). Furthermore, the coefficient

on managerial ownership for low-growth large firms is 0.103 (t=3.405), compared to 0.035 (t=0.977) for high-growth large firms. While relations between institutional ownership and leverage are less pronounced for large firms, the coefficients on institutional ownership are significant for low-growth large firms (t=-2.851), but not significant for high-growth large firms (t=-0.875). The results based on large firms are almost identical to those reported in Table 3 and, in general, lend further support to my argument that the influence of ownership structure on leverage depends on the extent of the overinvestment problem.

For small firms, relations between managerial ownership and leverage are not significant for all small firms and for low- and high-growth small firms. The possible explanation is that high managerial ownership for small firms as in Table 5 more closely aligns managerial interests with those of shareholders, resulting in no relation between managerial ownership and leverage. On the other hand, the coefficients on institutional ownership are -0.269, -0.425, and -0.158 for all small firms and for the low- and high-growth small firms, all significant at the 1-percent level. This implies that institutional oversight through the board of directors encourages small firms to preserve borrowing capacity due to difficulty of borrowing.[20]

6. Conclusions

[20] I also investigate cross-sectional associations between both free cash flow and growth opportunities and the sensitivity of ownership structure to leverage for large firms. The results are materially identical to those in Table 4.

The purpose of this paper is to explore the implications of the free cash hypothesis concerning the disciplinary role of ownership structure in corporate capital structure policy. The investigation is motivated by the theoretical work of Jensen (1986) and Stulz (1990) on managerial overinvestment incentives. Based on the previous theoretical work, this study hypothesizes that associations between ownership structure and leverage vary cross-sectionally with growth opportunities and free cash flow.

I find that the sensitivity of ownership structure to leverage depends on growth opportunities and free cash flow. When firms in the sample are classified as low- and high-growth firms, relations between ownership structure and leverage are significantly greater for low-growth firms. Moreover, I observe evidence that the agency conflicts are more severe in the presence of large free cash flow. Relations between ownership structure and leverage are of the greatest significance for firms with few growth opportunities and large free cash flow. In addition, the results indicate that managerial ownership aligns the interests of shareholders and managers through eliciting increased leverage (i.e., the complementary monitoring mechanisms), whereas institutional investors discourage managerial overspending through the board of directors and encourage firms to preserve borrowing capacity (i.e., the substitutive monitoring mechanisms).

There is also evidence that firms with more severe overinvestment problem have higher levels of leverage, consistent with the free cash flow hypothesis. Moreover, my results indicate that firm size affects relations between ownership structure and

leverage. The impact of managerial ownership on leverage is concentrated for large firms, while the role of institutional ownership that encourages firms to preserve borrowing capacity is more pronounced for small firms due to their difficulty of borrowing.

Overall, the results generally support hypotheses that conflicts of interest between shareholders and managers vary with growth opportunities and free cash flow, as does the disciplinary role of ownership structure in capital structure policy.

Table 1. Year and Industry Distributions for All Sample Firms and for Low- and High-Growth Firms

This table presents the distributions by year and industry for all sample firms and for low- and high-growth firms. The sample contains 14,788 observations for 4,829 firms. For each year, firms are ranked according to their end-of-fiscal year market-to-book ratio. Firms above the median market-to-book ratio are placed in the high-growth subsample and the other half of the firms lower than the median market-to-book ratio are placed in the low-growth subsample. The low-growth subsample contains 7,393 observations for 2,960 firms and the high-growth subsample consists of 7,395 observations for 3,187 firms. Because all explanatory variables are lagged by one-year to control for the endogeneity of equity ownership, the firm's leverage is collected for the 1994 to 1998 period and all explanatory variables are collected for the 1993 to 1997 period. Financial statement data are obtained from the Compustat annual files (including the Research file) and equity ownership data are obtained from the Compact Disclosure.

Panel A: Sample Distributions by Year

	All Firms		Low-Growth Firms	High-Growth Firms
Year	*N*	Percent of Sample	*N*	*N*
1994	2,608	17.6	1,304	1,304
1995	2,568	17.4	1,284	1,284
1996	3,130	21.2	1,565	1,565
1997	3,217	21.7	1,608	1,609
1998	3,265	22.1	1,632	1,633
Total	*14,788*	*100.0*	*7,393*	*7,395*

Panel B: Sample Distributions by Industry

Two-Digit SIC Code	Industry Name	All Firms		Low-Growth Firms		High-Growth Firms	
		N	Percent	N	Percent	N	Percent
1	Agriculture Production-Crops	43	0.3	23	0.3	20	0.3
2	Agriculture Production-Livestock, Animal Spec	5	0.0			5	0.1
7	Agricultural Services	3	0.0	1	0.0	2	0.0
10	Metal Mining	73	0.5	26	0.4	47	0.6
12	Coal Mining	11	0.1	11	0.1		
13	Oil and Gas Extraction	482	3.3	268	3.6	214	2.9
14	Mining Nonmetallic Minerals	28	0.2	14	0.2	14	0.2
15	Building Construction	85	0.6	79	1.1	6	0.1
16	Heavy Construction	60	0.4	39	0.5	21	0.3
17	Construction-Special Trade	51	0.3	42	0.6	9	0.1
20	Food and Kindred Products	454	3.1	235	3.2	219	3.0
21	Tobacco Products	10	0.1	3	0.0	7	0.1
22	Textile Mill Products	168	1.1	134	1.8	34	0.5
23	Apparel and Other Finished Products	210	1.4	119	1.6	91	1.2
24	Lumber and Wood Products	132	0.9	80	1.1	52	0.7
25	Furniture and Fixtures	165	1.1	86	1.2	79	1.1
26	Paper and Allied Products	235	1.6	148	2.0	87	1.2
27	Printing and Publishing	304	2.1	106	1.4	198	2.7
28	Chemicals and Allied Products	880	6.0	275	3.7	605	8.2
29	Petroleum Refining	101	0.7	69	0.9	32	0.4
30	Rubber and Plastic Products	269	1.8	151	2.0	118	1.6
31	Leather and Leather Products	91	0.6	63	0.9	28	0.4
32	Stone, Clay and Glass Products	141	1.0	99	1.3	42	0.6
33	Primary Metals	344	2.3	237	3.2	107	1.4
34	Fabricated Metal Products	394	2.7	258	3.5	136	1.8
35	Industrial Machinery and Computer Equipment	1,400	9.5	641	8.7	759	10.3
36	Electronic Equipment	1,569	10.6	705	9.5	864	11.7
37	Transportation Equipment	426	2.9	265	3.6	161	2.2
38	Measuring Instruments, Photography, Watches	1,164	7.9	439	5.9	725	9.8
39	Miscellaneous Manufacturing Industries	253	1.7	149	2.0	104	1.4
40	Railroad Transportation	27	0.2	18	0.2	9	0.1
41	Transit and Passenger Transportation	7	0.0	4	0.1	3	0.0
42	Motor Freight Transportation	33	0.2	19	0.3	14	0.2
44	Water Transportation	36	0.2	25	0.3	11	0.1
45	Air Transportation	62	0.4	47	0.6	15	0.2
46	Pipe Lines	5	0.0	5	0.1		
47	Transportation Services	24	0.2	5	0.1	19	0.3
48	Communications	270	1.8	93	1.3	177	2.4
50	Durable Goods-Wholesale	595	4.0	401	5.4	194	2.6
51	Nondurable Goods-Wholesale	274	1.9	172	2.3	102	1.4
52	Building Materials, Hardware and Garden	62	0.4	47	0.6	15	0.2
53	General Merchandise Stores	157	1.1	112	1.5	45	0.6
54	Food Stores	160	1.1	106	1.4	54	0.7
55	Auto Dealers and Gas Stations	64	0.4	37	0.5	27	0.4
56	Apparel and Accessory Stores	224	1.5	123	1.7	101	1.4
57	Home Furniture and Equipment Stores	135	0.9	97	1.3	38	0.5
58	Eating and Drinking Places	345	2.3	196	2.7	149	2.0
59	Miscellaneous Retail	375	2.5	193	2.6	182	2.5
70	Hotels and Other Lodging Places	49	0.3	38	0.5	11	0.1
72	Personal Services	58	0.4	28	0.4	30	0.4
73	Business Services	1,308	8.8	373	5.0	935	12.6
75	Auto Repair, Services, and Parking	33	0.2	23	0.3	10	0.1
76	Miscellaneous Repair Services	13	0.1	9	0.1	4	0.1
78	Motion Pictures	94	0.6	54	0.7	40	0.5
79	Amusements and Recreation	196	1.3	104	1.4	92	1.2
80	Health Services	303	2.0	142	1.9	161	2.2
82	Educational Services	29	0.2	8	0.1	21	0.3
83	Social Services	23	0.2	17	0.2	6	0.1
87	Engineering, Accounting and Other Services	264	1.8	122	1.7	142	1.9
99	Nonclassifiable Establishment	12	0.1	10	0.1	2	0.0

Table 2. Descriptive Statistics

Panel A: Descriptive Statistics for All Sample Firms

Variables	Definition	All Firms (N = 14,788)						
		Mean	Min	25%	Median	75%	Max	S.D.
Market-to-book	(Book value of assets – book value of equity + market value of equity) ÷ book value of assets	1.909	0.345	1.137	1.514	2.207	8.980	1.222
Leverage	Book value of total debt ÷ book value of assets	0.226	0.000	0.045	0.199	0.351	0.926	0.196
Managerial equity ownership	Shares held by officers and directors ÷ shares outstanding	0.191	0.000	0.020	0.120	0.312	0.975	0.200
Institutional equity ownership	Shares held by institutions ÷ shares outstanding	0.313	0.000	0.085	0.274	0.514	0.920	0.250
Free cash flow	(Operating income before depreciation – taxes – preferred dividends – common dividends – capital expenditures) ÷ book value of assets	0.014	-0.550	-0.020	0.038	0.077	0.456	0.112
Return on assets	Earnings before depreciation, interest, and taxes ÷ book value of assets	0.128	-0.532	0.080	0.138	0.194	0.667	0.120
Asset collateral value	(Net property, plant, and equipment + inventory) ÷ book value of assets	0.471	0.000	0.305	0.478	0.637	0.984	0.225
Firm size	Log (book value of assets)	4.816	0.707	3.478	4.655	5.976	11.473	1.863
R&D	Research and development expenditures ÷ sales	0.038	0.000	0.000	0.000	0.041	1.163	0.083
Presence of R&D (indicator variable)	= 1 if R&D data are available	0.615	0.000	0.000	1.000	1.000	1.000	0.487
Selling expense	Selling, general and administration expenses ÷ sales	0.271	0.001	0.137	0.230	0.351	1.575	0.192

Panel B: Descriptive Statistics for Low- and High-Growth Firms

	Low-Growth Firms (N = 7,393)							High-Growth Firms (N = 7,395)							Significance
	Mean	Min	25%	Med.	75%	Max	S.D.	Mean	Min	25%	Med.	75%	Max	S.D.	test[a]
Market-to-book	1.137	0.345	0.978	1.137	1.316	1.655	0.228	2.680	1.396	1.790	2.207	3.067	8.980	1.321	0.00 (0.00)
Leverage	0.270	0.000	0.108	0.259	0.396	0.926	0.196	0.182	0.000	0.014	0.138	0.289	0.926	0.186	0.00 (0.00)
Managerial ownership	0.204	0.000	0.020	0.134	0.340	0.954	0.207	0.177	0.000	0.019	0.107	0.283	0.975	0.191	0.00 (0.00)
Institutional ownership	0.287	0.000	0.075	0.238	0.463	0.920	0.238	0.339	0.000	0.097	0.316	0.558	0.918	0.258	0.00 (0.00)
Free cash flow	0.008	-0.550	-0.022	0.029	0.063	0.456	0.093	0.019	-0.550	-0.017	0.050	0.093	0.446	0.127	0.00 (0.00)
Return on assets	0.100	-0.465	0.067	0.112	0.151	0.580	0.089	0.155	-0.532	0.111	0.177	0.233	0.667	0.140	0.00 (0.00)
Asset collateral value	0.523	0.000	0.376	0.537	0.679	0.985	0.214	0.419	0.000	0.239	0.414	0.579	0.967	0.224	0.00 (0.00)
Firm size	4.766	0.707	3.477	4.645	5.867	11.304	1.794	4.866	0.718	3.479	4.665	6.084	11.473	1.928	0.01 (0.03)
R&D	0.020	0.000	0.000	0.000	0.018	0.854	0.048	0.056	0.000	0.000	0.010	0.075	1.163	0.104	0.00 (0.00)
Presence of R&D	0.563	0.000	0.000	1.000	1.000	1.000	0.496	0.667	0.000	0.000	1.000	1.000	1.000	0.471	0.00 (0.00)
Selling expense	0.230	0.001	0.116	0.201	0.300	1.490	0.159	0.313	0.003	0.169	0.268	0.403	1.575	0.213	0.00 (0.00)

[a]Significance tests for comparisons of low-growth firms with high-growth firms. The first entry is p-value based on the t-test, and the second entry in parenthesis is p-value based on the Wilcoxon test.

Table 3. Growth Opportunities and Relations between Ownership Structure and Leverage

This table presents the regression coefficients for low- and high-growth firms. The dependent variable in the regressions is the firm's debt ratio. The values of *t*-statistics appear in parentheses below each coefficient estimate and are adjusted for the heteroskedasticity in residuals using the White (1980) method. The tests for significant differences in the coefficients between low- and high-growth firms are reported in the last column. All regressions are estimated with industry and year dummy variables.

	Low-Growth Firms (LG)	High-Growth Firms (HG)	Test of LG = HG
Intercept	-0.022	0.178***	-0.200***
	(-1.107)	(10.379)	(-7.856)
Managerial equity ownership	0.033***	0.001	0.031**
	(2.923)	(0.099)	(2.034)
Institutional equity ownership	-0.142***	-0.061***	-0.081***
	(-10.885)	(-5.723)	(-4.912)
Free cash flow	0.268***	0.215***	0.054
	(7.337)	(7.275)	(1.140)
Market-to-book	0.109***	-0.010***	0.119***
	(11.187)	(-6.682)	(12.074)
Return on assets	-0.449***	-0.467***	0.019
	(-11.554)	(-17.500)	(0.395)
Asset collateral value	0.260***	0.231***	0.030
	(19.513)	(17.017)	(1.553)
Firm size	0.029***	0.017***	0.012***
	(16.406)	(12.097)	(5.112)
R&D	-0.527***	-0.111***	-0.416***
	(-7.854)	(-3.387)	(-5.572)
Presence of R&D (indicator variable)	-0.021***	-0.021***	-0.000
	(-4.101)	(-3.715)	(-0.017)
Selling expense	-0.021	-0.051***	0.029
	(-1.043)	(-3.198)	(1.148)
Number of observations	7,393	7,395	
Adjusted R-squared	0.246	0.253	

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

Table 4. Growth Opportunities and Free Cash Flow and Relations between Ownership Structure and Leverage

This table presents the results on relations between leverage and ownership structure when sample firms are classified either high or low with respect to growth opportunities and free cash flow (*FCF*). The dependent variable in the regressions is the firm's debt ratio. The values of *t*-statistics appear in parentheses below each coefficient estimate. The tests for significant differences in the coefficients between *HFCF* and *LFCF* firms are reported in the last column. All regressions are estimated with industry and year dummy variables.

	High-*FCF* and Low-Growth Firms (*HFCF*)	Intermediate Firms	Low-*FCF* and High-Growth Firms (*LFCF*)	Test of *HFCF* = *LFCF*
Intercept	0.088***	0.122***	0.152***	-0.063*
	(2.992)	(7.651)	(6.215)	(-1.682)
Managerial equity ownership	0.032**	0.015	0.003	0.029
	(1.970)	(1.360)	(0.179)	(1.170)
Institutional equity ownership	-0.142***	-0.081***	-0.090***	-0.052**
	(-8.068)	(-7.749)	(-5.006)	(-2.084)
Free cash flow	1.064***	0.151***	-0.007	1.071***
	(9.005)	(4.315)	(-0.179)	(8.556)
Market-to-book	0.079***	-0.003	-0.014***	0.093***
	(5.068)	(-1.603)	(-5.713)	(5.896)
Return on assets	-1.203***	-0.393***	-0.338***	-0.865***
	(-15.379)	(-13.003)	(-9.669)	(-10.101)
Asset collateral value	0.206***	0.247***	0.271***	-0.065**
	(10.402)	(19.373)	(13.502)	(-2.316)
Firm size	0.037***	0.022***	0.018***	0.019***
	(13.794)	(13.416)	(7.297)	(5.231)
R&D	-0.708***	-0.238***	-0.077*	-0.632***
	(-4.428)	(-6.060)	(-1.790)	(-3.814)
Presence of R&D (indicator variable)	-0.014*	-0.026***	-0.010	-0.004
	(-1.846)	(-5.078)	(-1.204)	(-0.333)
Selling expense	-0.014	-0.051***	-0.042*	0.027
	(-0.405)	(-3.086)	(-1.880)	(0.652)
Number of observations	3,216	8,356	3,216	
Adjusted R-squared	0.280	0.285	0.241	

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

Table 5. Descriptive Statistics for Large and Small Firms

The sample is split by firm size into quartiles to control for the effect of firm size on relations between ownership structure and leverage. Firms are ranked according to their end-of-fiscal year book value of assets. Firms in the top and bottom quartiles of the distribution of firm sizes are placed in large and small firms. Large and small firms are divided further according to their market-to-book ratio.

	Large Firms (top quartile of firm size)						Small Firms (bottom quartile of firm size)					
	All Firms		Low-Growth Firms		High-Growth Firms		All Firms		Low-Growth Firms		High-Growth Firms	
N	3,696		1,848		1,848		3,696		1,848		1,848	
	Mean (Median)	S.D.	Mean (Median)	S.D.	Mean (Median)	S.D.	Mean (Median)	S.D.	Mean (Median)	S.D.	Mean (Median)	S.D.
Market-to-book	1.851	0.980	1.244	0.199	2.457	1.070	1.982	1.394	1.080	0.252	2.885	1.482
	(1.570)		(1.246)		(2.111)		(1.505)		(1.086)		(2.375)	
Leverage	0.277	0.178	0.324	0.173	0.230	0.169	0.197	0.198	0.221	0.200	0.174	0.193
	(0.258)		(0.309)		(0.206)		(0.145)		(0.186)		(0.110)	
Managerial ownership	0.091	0.141	0.101	0.155	0.080	0.124	0.266	0.214	0.275	0.218	0.257	0.211
	(0.032)		(0.037)		(0.029)		(0.245)		(0.260)		(0.237)	
Institutional ownership	0.524	0.219	0.500	0.225	0.548	0.209	0.082	0.109	0.075	0.098	0.088	0.119
	(0.565)		(0.538)		(0.586)		(0.038)		(0.035)		(0.040)	
Free cash flow	0.033	0.072	0.021	0.066	0.045	0.076	-0.020	0.151	-0.011	0.122	-0.030	0.175
	(0.043)		(0.033)		(0.054)		(0.015)		(0.016)		(0.014)	
Return on assets	0.160	0.075	0.122	0.055	0.199	0.073	0.071	0.158	0.069	0.121	0.072	0.189
	(0.155)		(0.125)		(0.194)		(0.094)		(0.086)		(0.106)	
Asset collateral value	0.522	0.212	0.550	0.209	0.495	0.212	0.426	0.219	0.473	0.212	0.378	0.216
	(0.526)		(0.559)		(0.489)		(0.426)		(0.488)		(0.362)	
Firm size	7.313	1.099	7.245	1.067	7.380	1.126	2.582	0.650	2.601	0.650	2.564	0.651
	(7.044)		(6.925)		(7.137)		(2.695)		(2.730)		(2.661)	
R&D	0.023	0.049	0.013	0.029	0.033	0.060	0.048	0.092	0.031	0.065	0.065	0.109
	(0.000)		(0.000)		(0.007)		(0.005)		(0.000)		(0.020)	
Presence of R&D	0.612	0.487	0.567	0.496	0.657	0.475	0.648	0.478	0.609	0.488	0.687	0.464
	(1.000)		(1.000)		(1.000)		(1.000)		(1.000)		(1.000)	
Selling expense	0.205	0.137	0.167	0.119	0.242	0.144	0.363	0.224	0.316	0.192	0.410	0.244
	(0.184)		(0.136)		(217)		(0.309)		(0.274)		(0.350)	

Table 6. Firm Size and Relations between Ownership Structure and Leverage

The table presents the regression coefficients for large and small firms. The dependent variable in the regressions is the firm's debt ratio. The values of *t*-statistics appear in parentheses below each coefficient estimate. All regressions are estimated with industry and year dummy variables.

	Large Firms (top quartile of firm size)			Small Firms (bottom quartile of firm size)		
	All	Low-Growth	High-Growth	All	Low-Growth	High-Growth
Intercept	0.369***	0.364***	0.350***	0.090***	-0.135***	0.131***
	(12.744)	(8.103)	(7.857)	(3.760)	(-3.779)	(3.889)
Managerial equity ownership	0.075***	0.103***	0.035	0.013	0.010	0.021
	(3.083)	(3.405)	(0.977)	(0.954)	(0.561)	(1.094)
Institutional equity ownership	-0.054***	-0.055***	-0.018	-0.269***	-0.425***	-0.158***
	(-3.903)	(-2.851)	(-0.875)	(-9.043)	(-8.979)	(-4.295)
Free cash flow	0.200***	0.163*	0.116	0.204***	0.220***	0.207***
	(3.550)	(1.906)	(1.449)	(5.018)	(3.184)	(4.309)
Market-to-book	-0.024***	-0.006	-0.018***	-0.002	0.167***	-0.008***
	(-6.679)	(-0.282)	(-4.363)	(-0.763)	(10.528)	(-3.086)
Return on assets	-0.458***	-0.404***	-0.356***	-0.379***	-0.405***	-0.426***
	(-7.975)	(-4.277)	(-4.580)	(-9.554)	(-5.585)	(-9.085)
Asset collateral value	0.086***	0.104***	0.053	0.324***	0.355***	0.302***
	(3.729)	(3.466)	(1.456)	(18.333)	(15.057)	(12.012)
Firm size	0.003	0.006*	-0.001	0.032***	0.034***	0.026***
	(1.133)	(1.505)	(-0.217)	(6.318)	(5.084)	(3.637)
R&D	-0.427***	-0.722***	-0.386***	-0.224***	-0.323***	-0.183***
	(-5.970)	(-3.322)	(-5.310)	(-5.312)	(-4.118)	(-3.857)
Presence of R&D (indicator variable)	-0.029***	-0.037***	-0.021*	-0.018**	-0.019*	-0.016
	(-4.144)	(-3.680)	(-1.819)	(-2.241)	(-1.824)	(-1.341)
Selling expense	0.012	0.025	0.005	-0.029	-0.048	-0.047**
	(0.408)	(0.515)	(0.122)	(-1.461)	(-1.499)	(-2.058)
Number of observations	3,696	1,848	1,848	3,696	1,848	1,848
Adjusted R-squared	0.273	0.199	0.266	0.248	0.300	0.257

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

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Essay II

The Impact of Managerial Ownership on Firm Investments

1. Introduction

When managers insulate themselves from internal and external firm governance mechanisms, they have discretion over their firms' investment choices. Agency models, beginning with Jensen and Meckling (1976), suggest that the interests of managers are often not aligned with those of shareholders, and tout the benefits of managerial ownership in interest alignments between managers and shareholders. This paper analyzes the effect of managerial ownership on discretionary firm investments from a managerial perspective. When managers have a significant portion of their wealth tied to firm value, they may have an incentive to select firm investments for their benefit rather than maximizing shareholder wealth.

Jensen and Meckling (1976), among others, suggest that ownership structure influences firm investments that in turn affect firm value. Yet few studies examine the link between ownership structure and firm investments. One exception is Cho (1998), who examines firm investments across ownership levels. Cho uses two proxies for firm investments, capital expenditure and R&D expenditure, and provides evidence on a similar and nonmonotonic relation between managerial ownership and both types of firm investments.

This study differs from previous work on firm investments in two ways. First, it elaborates on the different characteristics between the two types of firm investments, and suggests that unlike Cho (1998), managerial ownership affects each type of investments differently. R&D expenditure is subject to more uncertainty and has a higher risk and return profile than capital expenditure. Managers desire to reduce firm

risk to protect their underdiversified personal wealth and as a result influence the level and structure of firm investments.

I analyze 7,747 observations for 2,572 firms from 1994 to 1998, and focus on both small and large firms. Results on the relation between managerial ownership and firm investments suggest that managers respond to each type of investments differently. After controlling for the endogeneity of managerial ownership, I find that it is nonmonotonically associated with firm investments; however, the effect of managerial risk aversion due to underdiversification is pronounced for R&D expenditure. In particular, levels of both capital expenditure and R&D expenditure first increase with managerial ownership because of the interest alignment effect, but with increasing ownership only R&D expenditure declines significantly. The effect of managerial risk aversion is well reflected in the structure of firm investments. The proportion of R&D expenditure to total firm investments first increases and then declines with managerial ownership, indicating that with increasing ownership managers tend to spend less on R&D expenditure to reduce firm risk.

Second, this study examines the implications of the overinvestment problem in the link between managerial ownership and firm investments. I investigate whether, when considered with the severity of the overinvestment problem, the relation between managerial ownership and firm investments varies with growth opportunities and whether both types of firm investments are a result of overinvestment.

Two pieces of related evidence emerge. First, the nonmonotonic relation between capital expenditure and managerial ownership remains the same for high-growth firms. However, for low-growth firms the relation between capital expenditure

and managerial ownership is initially negative as ownership levels rise, even though it is insignificant at all ownership levels. Second, the relation between R&D expenditure and managerial ownership remains the same for both low- and high-growth firms. Taken together, the results suggest that capital expenditure, and not R&D expenditure, may be the subject of overinvestment.

The remainder of the paper is organized as follows. Section 2 discusses the relation between managerial ownership and firm investments. Section 3 explains the empirical framework and Section 4 describes the data and the sample characteristics. The empirical results are presented in Section 5 and Section 6 concludes.

2. Managerial Equity Ownership and Investment Theory

Jensen and Meckling (1976), Cho (1998), and several others have explored the relation between managerial ownership and firm investments.[1] Jensen and Meckling (1976) argue that managerial ownership affects firm value by its effect on firm

[1] A large empirical literature, starting with Fazzari, Hubbard, and Petersen (1988), concentrates on the effect that cash flows have on firm investments to test for the presence and importance of financing constraints. Fazzari, Hubbard, and Petersen (1988) find that cash flows and investments are related even after controlling for growth opportunities and the relation is stronger for low-dividend firms. Vogt (1994) and Hadlock (1998), among others, provide two competing explanations of why cash flows affect investments. First, the asymmetric information hypothesis of Myers and Majluf (1984) identifies the adverse selection problem and suggests that the relation between cash flows and investments is a symptom of underinvestment. One strain of empirical work explores this implication for capital expenditure (Fazzari, Hubbard, and Petersen, 1988; Hoshi, Kashyap, and Scharfstein, 1991; Oliner and Rudebusch, 1992), while Himmelberg and Petersen (1994) explore this for R&D expenditure. Second, the free cash flow hypothesis of Jensen (1986) focuses on the overinvestment problem and implies that the relation between cash flows and investments is a symptom of overinvestment. Oliner and Rudebusch (1992) and Strong and Meyer (1990) study the role of agency problem in the impact of cash flows on investments. To distinguish between these competing two explanations, Vogt (1994) tests the interaction between growth opportunities and cash flows, finding that the free cash flow hypothesis tends to explain the relation for capital expenditure and the asymmetric information hypothesis for R&D expenditure. On the other hand, Hadlock (1998) analyzes the impact of managerial ownership on the sensitivity of investments to cash flows and finds evidence consistent with the asymmetric information hypothesis.

investments. Cho (1998) views these effects as a two-stage process: the first stage is the impact of managerial ownership on firm investments, while the second is the effect of firm investments on firm value. There are a number of studies that link managerial ownership to firm value, and several others that relate firm investments to firm value.[2, 3] Yet, there is very little direct evidence regarding the relation between managerial ownership and firm investments. One exception includes Cho (1998), who finds evidence of a nonmonotonic relation for the Fortune 500 manufacturing firms for 1991. Levels of both capital expenditure and R&D expenditure increase for ownership levels below 7 percent and above 38 percent, while they decline for ownership levels between 7 percent and 38 percent.[4]

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[2] A plethora of studies examine the relation between managerial holdings and firm value. Morck, Shleifer, and Vishny (1988) estimate a piecewise linear relation between board ownership and firm value for 371 Fortune 500 firms for 1980, finding that firm value increases for board shareholdings below 5 percent and above 25 percent, but declines for holdings between 5 percent and 25 percent due to an entrenchment effect. McConnell and Servaes (1990) find an inverted U-shaped relation between firm value and managerial ownership, with an inflection point between 40 percent and 50 percent of managerial ownership. Hermalin and Weisbach (1991) examine 142 NYSE firms and find that firm value rises with ownership level up to 1 percent, then declines in the ownership range between 1 percent and 5 percent, become positive again for ownership levels between 5 percent and 20 percent, and finally decreases for ownership levels exceeding 20 percent. More recently, Mehran (1995) finds that firm value is positively related to the percent of managerial ownership, and Holderness, Kroszner, and Sheehan (1999) corroborate the findings by Morck, Shleifer, and Vishny (1988) for firms for 1935. Finally, Himmelberg, Hubbard, and Palia (1999) control for the endogeneity of ownership induced by unobserved firm heterogeneity and find little evidence that managerial ownership affects firm value.

[3] The literature concerning the link between firm investments and firm value strongly supports the positive effect of firm investments on the market value of the firm. McConnell and Muscarella (1985) examine the market value effect of capital expenditure and show that on average, announcements of increases (decreases) in capital expenditure are associated with significant positive (negative) stock returns. Chan, Martin, and Kensinger (1990) analyze announcements of increased R&D spending and find a significant and positive effect of announcements of increased R&D expenditure to share price. Chauvin and Hirschey (1993) examine the cross-sectional influence of R&D expenditure on the market value of the firm, finding a large and positive relation between the two.

[4] Cho uses a grid search technique to find two breakpoints with most significant slope coefficients on the three managerial ownership variables. He suggests 7 percent and 38 percent of managerial ownership as breakpoints for the effect of the level of managerial ownership on firm investments. In additional analysis, he applies simultaneous equation regression in order to control for the endogeneity of

While Cho (1998) provides the first evidence that managerial ownership influences the level of firm investments directly, he treats both types of firm investments on similar considerations. When managers are faced with a discretionary choice on firm investments, Cho finds evidence that managerial ownership affects levels of investments similarly for both capital expenditure and R&D expenditure. However, capital expenditure and R&D expenditure are known to have different characteristics. Capital expenditure represents spending for additions to the firm's fixed plant and equipment and is often used to produce existing products. Capital expenditure thus increases the tangible asset base of the firm and is likely to produce additional cash flows in the near future, in part due to accelerated depreciation allowances. On the other hand, R&D expenditure represents spending that relates to the development of new products or services, and reflects the firm's contribution to research and development. However, R&D expenditure is subject to major uncertainty about both the probability of scientific success and the cost required for economically successful commercialization. Furthermore, R&D expenditure takes several years to develop. Pakes and Schankerman (1984) point out that there is a sizable gestation lag (a lag between project inception and completion) and application lag (the time from project completion to commercial application) between the outlay of an R&D expenditure and the beginning of the associated cash flows. Taken together, R&D expenditure is an investment in intangible assets, and its impact on the asset size and future cash flows is

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managerial ownership, firm investments, and firm value. The regression results show that investments affect firm value, and firm value affects managerial ownership, but not vice versa.

difficult to estimate and not likely to be realized in the near future.[5] If managers do not regard R&D expenditure as a necessary investment, it will be more easily susceptible to managerial discretion.

Theoretical studies by Fama (1980) and Amihud and Lev (1981) point out the conflicts between managers and shareholders because of managerial preference for low firm risk due to the overinvestment of human capital in a single firm and the consequent underdiversification of personal wealth portfolio.[6] Amihud and Lev (1981) argue that managers have an incentive to select investments that reduce the variability of the firm's cash flows and managerial equity ownership leads managers to make investment decisions in the interest of shareholders. Empirical evidence is generally consistent with their argument. Amihud and Lev (1981) also report that firms whose managers have small equity ownership engage in risk reducing conglomerate mergers more often than firms with large managerial ownership. Agrawal and Mandelker (1987) examine the relation between managerial equity holdings and the characteristics of the investment decision and find evidence that managerial equity holdings motivate managers to select variance-increasing investments.

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[5] R&D expenditure is expensed in the period in which they are incurred. On the other hand, the expected future cash flows associated with this expenditure are not recognized until the period in which they are realized. Dechow and Sloan (1991) examine CEOs whose compensation is measured using accounting-earnings performance and find that CEOs spend less on R&D expenditure during their final year to improve short-term earning performance. They also provide evidence that the reductions in R&D expenditure are mitigated through CEO equity ownership.

[6] Managerial wealth is tied to firm value through bonuses, year-to-year adjustments in salary levels, options and restricted stock grant size. Hence, the risk associated with managerial human capital is closely related to the firm's risk. Such risk cannot be effectively diversified in managerial personal portfolio because human capital cannot be traded in competitive market. Gilson (1989) provides evidence that managerial default-related losses are significant. Departing senior managers lose the sizable remaining human capital from financially distressed firms and are not employed in top positions by an exchange-listed firm for at least three years after their departure.

While managerial ownership helps in aligning the interests between managers and shareholders over investment policy, equity ownership makes a managerial wealth more underdiversified. This effect is compounded for managers, because they also have substantial human capital tied to firm value. Lambert, Larcker, and Verrecchia (1991) argue that managers with large economic stake in the firm have a strong desire to reduce the firm's unsystematic risk, and suggest that agency problem need not be monotonically decreasing in managerial equity ownership. Recently, Ofek and Yermack (2000) document evidence of managerial desire to diversify away the unsystematic risk associated with concentrating wealth in a single firm. They examine the impact of stock-based compensation on managerial ownership and find that due to managerial unsystematic risk, equity compensation succeeds in increasing ownership for lower-ownership managers, but higher-ownership managers negate much of its impact by selling previously owned shares. All things being equal, equity ownership makes managers face the tradeoff between interest alignment and underdiversification. As a result, the relation between investments and managerial ownership is not necessarily monotonic.

This leads me to suggest that managerial ownership affects each type of firm investments differently and so does the structure of firm investments. As their ownership rises, managers have greater incentives to increase firm value because they have to internalize more of the financial consequences of their investment decisions. When, as in previous studies, firm investments positively affect its value, managers devote significant effort to searching for new profitable projects and improve the efficiency of these investments by reducing both underinvestment problem and

overinvestment problem. Overall, the interest alignment effect of managerial ownership induces the initial rise in investment levels. In addition, the effect is supposed to be stronger for R&D expenditure, because R&D expenditure requires more effort to manage and learn about new technologies. However, beyond some significant ownership level, managerial ownership is associated with less portfolio diversification for managers. Managers thus prefer low firm risk due to their underdiversification. Risk-averse managers may reject positive NPV investments having sufficient downside risk. The effect of managerial risk aversion is more pronounced for R&D investments due to their uncertainty and high risk-return profile, resulting in a decrease in R&D expenditure. For capital expenditure, managers tend to invest at an efficient level and the effect of managerial ownership is expected to level off or increase less. As managerial ownership increases further, both the interest alignment effect and the managerial risk aversion effect are supposed to be operative. While Morck, Shleifer, and Vishny (1988) and Cho (1998) tend to suggest that the interest alignment effect dominates, it is not clear which one does. When the proportion of R&D expenditure to total firm investments is designed to measure managerial incentive to affect the structure of firm investments, this R&D intensity is likely to first rise and then decline with managerial ownership since R&D expenditure is more susceptible to managerial discretion.

3. Empirical Framework

One concern over estimating the impact of managerial ownership on firm investments is the possibility of reverse causation from current investments to current

managerial ownership. While there is a lag between the outlay of investments and the beginning of the associated cash flows, causality can operate in the opposite direction. First, when there is a positive market reaction to announcements of investments, managers either exercise their stock options and restricted stock, or buy more equity after stock price rises. Second, to the extent that managers have better information than the market, they are likely to buy more stock with good information regarding the firm's prospects and sell the ones with bad information about the firm's investments. To control for possible biases due to reverse causality, a one-year lag is introduced between managerial ownership (and all other independent variables) and firm investments (see Hermalin and Weisbach, 1991; Smith and Watts, 1992).[7]

I employ three proxy variables for discretionary firm investments. The first two proxies relate to the level of firm investments. The first one is capital expenditure (*Compustat item #128*), and the other measure is R&D expenditure (*Compustat item #46*). For uniformity, I divide each measure by the beginning-of-period value of property, plant, and equipment. This transformation from levels to ratios makes it possible to compare capital expenditure and R&D expenditure over time and across firms. The third proxy measures the firm's investment structure and is designed to capture the magnitude of managerial incentive to affect the firms' investment choices. The empirical measure of investment structure is the proportion of R&D expenditure to

[7] An alternative methodology to control for reverse causality is to specify structural equations for managerial ownership and firm investments. The structural equation approach potentially can test both whether managerial ownership shares common determinants with firm investments and whether one endogenous variable influences the other. However, this approach must specify a priori instrumental variables that influence one endogenous variable, but not the other (and vice versa). I do not estimate structural models specifying interdependencies between managerial ownership and firm investments, because theory provides little guidance as to the exact structure of the underlying simultaneous system of equations and the regression coefficients tend to be sensitive to the specification of the equations.

total firm investments when the sum of capital expenditure and R&D expenditure is a measure of total firm investments.[8]

$$\textit{Capital expenditure ratio} = \textit{Capital expenditure} \div \textit{Book value of the beginning-of-year fixed assets} \quad (1)$$

$$\textit{R\&D expenditure ratio} = \textit{R\&D expenditure} \div \textit{Book value of the beginning-of-year fixed assets} \quad (2)$$

$$\textit{R\&D intensity} = \textit{R\&D expenditure} \div [\textit{Capital expenditure} + \textit{R\&D expenditure}] \quad (3)$$

Based on the preceding discussion in Section 2, I use a piecewise linear specification in managerial ownership. Following Cho (1998), I use 7 percent and 38 percent of managerial ownership as breakpoints for the effects of levels of managerial ownership on firm investments. Specifically,

INS1 = ownership level	if managerial ownership level < 0.07,
= 0.07	if managerial ownership level ≥ 0.07;
INS2 = zero	if managerial ownership level < 0.07,
= ownership level - 0.07	if 0.07 ≤ managerial ownership level < 0.38,
= 0.31	if managerial ownership level ≥ 0.38;
INS3 = zero	if managerial ownership level < 0.38,
= ownership level - 0.38	if managerial ownership level ≥ 0.38.

[8] While there are other components of firm investments such as mergers and acquisitions, physical and R&D investments are the principal components of total firm investments. See Section 5. 3. for the impact of mergers and acquisitions on the relation between managerial ownership and the structure of firm investments.

Similar to Morck, Shleifer, and Vishny (1988), I consider alternative breakpoints of 5 percent and 25 percent of managerial ownership. The 5 percent ownership level is justified as a point of mandatory public disclosure of ownership by the SEC (and no longer negligible), and the 25 percent ownership level is considered based on empirical findings that suggest that 20 percent to 30 percent is the ownership range beyond which a hostile bid for the firm may not succeed.[9]

The literature suggests that several other variables could affect firm investments. Managerial ownership may be significantly related to firm investments because it proxies for these variables. The literature shows that the following variables may affect firm investments:

A. Growth opportunities The market-to-book ratio is included to control for the impact of growth opportunities on firm investments. The use of this ratio also helps control for the possibility that cash flows may serve as a proxy for growth opportunities. A number of studies report a significantly positive relation between the market-to-book ratio and firm investments (Fazzari, Hubbard, and Petersen, 1988; Hoshi, Kashyap, and Scharfstein, 1991; Lang, Ofek, and Stulz, 1996; Kaplan and Zingales, 1997). This ratio is measured as the sum of the book value of debt and the market value of equity to the book value of the firm's total assets. Other studies suggest sales growth as an additional proxy for expected profitability and find evidence that sales growth has significant explanatory power for firm investments (Fazzari, Hubbard, and Petersen, 1988; Fazzari

[9] Additionally, I investigate a curvilinear relation between managerial ownership and firm investments but a piecewise linear specification appears to be a better representation.

and Petersen, 1993; Himmelberg and Petersen, 1994). Sales growth is measured as the annual change in sales deflated by lagged sales.

B. Cash Flows Fazzari, Hubbard, and Petersen (1988), Hoshi, Kashyap, and Scharfstein (1991), and others provide evidence of positive influence of cash flows on the firms' capital expenditure. Later studies confirm this for R&D expenditure (Himmelberg and Petersen, 1994).[10] The measure of cash flows is the sum of income before extraordinary items, depreciation, and interest expense. Other studies suggest that low cash flows may not constrain discretionary investments by firms with a large accumulated stock of cash (Fazzari, Hubbard, and Petersen, 1988; Hoshi, Kashyap, and Scharfstein, 1991; Kaplan and Zingales, 1997). I also include cash stock, which is measured as the level of cash and short-term investment, deflated by the book value of assets.

C. Volatility I include a volatility variable to control for variability of cash flows, because firms with volatile cash flows are more likely to have periods of internal cash flow shortfalls. Minton and Schrand (1999) find that firms react to these shortfalls by permanently forgoing investments and do not change the timing of investments by using external capital markets to fully cover the shortfalls. The results provide evidence that cash flow volatility is associated with low levels of firm investments. However, Cho (1998) finds no such relation between volatility and firm investments. Cash flow volatility is defined as the standard deviation of the firm's annual cash flows over the seven-year period, preceding each of the five sample years from 1993 to 1997. A firm

[10] See footnote 1 for details on the relation between cash flows and firm investments.

is included in the sample for a given year if it has at least 4 non-missing observations during the seven years.

D. Leverage Lang, Ofek, and Stulz (1996) suggest that high leverage reduces both current funds available for firm investments and the firm's ability to raise additional funds to invest, leading to the negative relation between leverage and firm investments. They find evidence that more levered firms, particularly firms with few growth opportunities, invest less on average. I measure leverage as the ratio of the book value of short-term and long-term debt to the book value of assets.

Finally, industry dummy variables based on two-digit SIC codes are introduced to control for industry effects. Since I am interested in the predictable effects of the firm's managerial ownership on its investments, it seems natural to look at the cross-sectional relation between managerial ownership and firm investments. With this in mind, the empirical specification to investigate whether managerial ownership affects firm investments is:

$$INVESTMENT_{i,t} = \alpha + \beta_1 INS1_{i,t-1} + \beta_2 INS2_{i,t-1} + \beta_3 INS3_{i,t-1} + \beta_4 Market\text{-}to\text{-}Book_{i,t-1} + \beta_5 Sales\ Growth_{i,t-1} + \beta_6 Cash\ Flows_{i,t-1} + \beta_7 Cash\ Slack_{i,t-1} + \beta_8 Volatility_{i,t-1} + \beta_9 Leverage_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

where subscript i and t represent the firm and fiscal year, respectively, and $\varepsilon_{i,t}$ is a white-noise error term. Industry dummy variables are suppressed.

The above equation is estimated annually using piecewise linear ordinary least squares regression for each of the five samples from 1994 to 1998. I present the means

of the annual coefficient estimates. To test the hypothesis that the mean coefficient estimate is statistically different from zero, I calculate and report a *t*-statistics

$t = \frac{\bar{r}}{(\sigma(\bar{r}) / \sqrt{n})}$ where $\bar{r}$ and $\sigma(\bar{r})$ are the average and standard deviation of the annual regression coefficient estimates and n is the number of the year.[11]

4. Data

4.1. Sample Selection

In constructing the sample, I take the list of firms and the financial accounting data from the 1998 Compustat annual files (including the research file). While previous research has concentrated on the large manufacturing firms, I examine a sample of all firm sizes, including firms that have dropped out of the sample and are not currently in existence, and use a sample period that spans six years from 1993 to 1998. The use of lagged explanatory variables as discussed in Section 3 implies that the sample period actually used for estimation on firm investments runs from 1994 to 1998 and for all explanatory variables from 1993 to 1997. This yields a sample of 9,366 firm observations. To be included in the sample for further analysis, I require that data on managerial ownership are also available, and these data are taken from the Compact Disclosure. The Compact Disclosure reports two sets of managerial ownership statistics from two independent sources. The first source is the corporate proxy statement, and the second one is Spectrum, which is based on insider trading and other SEC filings.

[11] I also use lagged explanatory variables averaged over a five-year period to reduce the noise and pooled data. The regression results using average regressors and pooled data are almost identical to those reported in the paper.

Anderson and Lee (1997) provide evidence that Spectrum-based Compact Disclosure (hereafter, *Spectrum*) reveals significant reporting discrepancies in managerial ownership data from proxy statements, while the proxy-based Compact Disclosure data (hereafter, *Compact Disclosure*) are much cleaner. As a result, I use managerial equity ownership data from *Compact Disclosure*.[12]

After aligning managerial ownership and firm level accounting data at the end of each fiscal year, I eliminate firms that have incomplete ownership data or financial accounting data for selected items. In addition, I drop utility and financial firms from the sample because their investment and ownership structure is likely to be significantly different from other firms in the sample.[13]

Table 1 reports the distribution of sample firms by year and industry. Panel A illustrates that simply eliminating observations with missing R&D values substantially reduces the sample size. When all observations with missing R&D values are deleted, sample size is reduced from 7,747 observation for 2,572 firms to 4,470 observations for 1,487 firms. Some recent studies show concern with this procedure. Himmelberg, Hubbard, and Palia (1999) suggest that eliminating observations with missing R&D values is undesirable since it significantly reduces the sample size and biases the sample in favor of R&D-intensive firms. Bizjak, Brickley, and Coles (1993) and Loughran and

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[12] Anderson and Lee (1997) examine the fit between managerial ownership data from four databases and those from proxy statements. Corporate Text, *Compact Disclosure*, Value Line, and *Spectrum* in descending order reproduce the benchmark ownership statistics of proxy statements. Furthermore, they show that the reporting discrepancies in the Value Line and *Spectrum* could significantly influence the results.

[13] To validate the *Compact Disclosure* data, I select all firms with managerial ownership exceeding 75 percent. The mean and median reporting discrepancies between proxy statements and *Compact Disclosure* are 0.63 percent and 0 percent. In about 78 percent of the cases, the proxy data and the

Ritter (1997) argue that when firms have no R&D expenditure, they simply omit this line from their income statements. Following their suggestions, I treat missing R&D values as zero expenditure. The sample is a little heavily weighted toward the later part of the sample period. While the percent of observations for the 1994 to 1995 period is 17.8 percent and 19.5 percent of the sample, the percent for the 1996 to 1998 period is between 20.4 percent and 21.4 percent.

Panel B of Table 1 shows the distribution of sample firms and the means of firm investments organized according to two-digit SIC codes. Consistent with the findings of prior study (Chauvin and Hirschey, 1993), R&D spendings are more concentrated than capital expenditure. A few high-tech sectors account for the overwhelming share of R&D activity. In addition, when all observations with missing R&D values are eliminated, the number of two-digit industry groups diminishes from 60 to 45 firm groups.

4.2. Descriptive Statistics

Table 2 gives the definitions of variables, along with sample-wide summary statistics. Firms in the sample exhibit considerable cross-sectional variation in firm investments. Capital expenditure ranges from 0 percent to 190.4 percent, and the range of R&D expenditure is from 0 percent to 300.3 percent. Since all missing R&D values are set to zero expenditure, the median R&D expenditure is 0 percent. Managers, on average (median), own 16.6 percent (9.2 percent) of the equity in their firms. These figures are higher than those documented by Cho (1998), who reports the average and

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Compact Disclosure data are within 2 percent of each other. As a further check, I use the proxy data and

median managerial ownership to be 12.14 percent and 4.45 percent, respectively. There are at least two possible explanations for this difference. First, this study covers firms of all sizes, while Cho focuses only on large manufacturing firms. Since managerial ownership tends to be inversely related to firm size (Demsetz and Lehn, 1985; Holderness, Kroszner, and Sheehan, 1999; Himmelberg, Hubbard, and Palia, 1999), the presence of smaller firms in this sample leads to higher ownership levels. Second, while Cho uses a single year (1991) data, this sample is more recent and covers period from 1993 to 1997. A recent study by Denis and Sarin (1999) provides evidence that a substantial number of firms exhibit large changes in managerial ownership within a given year, but that these changes are not reversed in subsequent years.

5. Regression Results

5.1. Managerial Ownership and Firm Investments

First, I examine the effects of managerial ownership on the level and structure of firm investments. To test whether different levels of managerial ownership have different effects on firm investments, I use two sets of breakpoints of managerial ownership in Table 3. Panel A reports the means of annual coefficient estimates and their *t*-statistics for firms in which breakpoints are 7 percent and 38 percent of managerial ownership, as in Cho (1998). Panel B reports the means for breakpoints of 5 percent and 25 percent of managerial ownership, as in Morck, Shleifer, and Vishny (1988).

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reestimate regressions, finding no significance changes in the coefficients and their significance levels.

The second and fourth columns in Panels A and B provide regression results using only managerial ownership variables. The results in Panel A are consistent with those in Cho (1998). For both capital expenditure and R&D expenditure, the level of investments rises significantly for ownership levels below 7 percent and then declines significantly for ownership levels between 7 percent and 38 percent. However, the relation between both types of investments and ownership becomes insignificant for managerial levels above 38 percent. In Panel B, the results show a similar relation between R&D expenditure and managerial ownership, but the relation between capital expenditure and ownership is significant only for ownership levels up to 5 percent.

The third and fifth columns in Panels A and B provide regression results with several control variables. In both Panels, the nonmonotonic relation between R&D expenditure and managerial ownership remains significant even after the inclusion of the control variables. The regression results for capital expenditure in Panel A show that it is significantly and positively associated with managerial ownership only for ownership levels up to 7 percent, and Panel B shows similar results. In addition, I find that the coefficients on managerial ownership are much larger for R&D expenditure than for capital expenditure.

On the other hand, the sixth and seventh columns in Panels A and B present the effect of managerial ownership on investment structure. When I use only managerial ownership variables, the results show that R&D intensity rises significantly for ownership levels up to the first breakpoint and then declines significantly for ownership levels over the first breakpoint. The regressions with several control variables provide evidence that R&D intensity declines significantly between 7 percent and 38 percent in

Panel A and that the ratio rises significantly up to the first breakpoint and then declines significantly between the first and second breakpoints in Panel B.

To summarize, the results in Table 3 provide evidence that managerial ownership affects each type of firm investments differently and that is reflected in the structure of firm investments. The size of coefficients on managerial ownership variables in capital expenditure and R&D expenditure suggests that R&D expenditure tends to be more sensitive to managerial ownership. When managers devote significant effort to searching for new profitable firm investments as managerial ownership increases, the interest alignment effect is stronger for R&D expenditure, because R&D expenditure requires more effort for managers to learn new technologies than capital expenditure. In addition, R&D expenditure is harder to monitor and is therefore subject to managerial discretion, resulting in a stronger interest alignment effect. However, higher managerial ownership, all things being equal, implies less portfolio diversification for managers. Managerial risk aversion, due to underdiversification, sets in and affects firm investments. The results provide evidence that risk-averse, underdiversified managers decrease R&D expenditure but not capital expenditure.[14]

Results for most control variables are consistent with expectations. One exception is a positive relation between the level of R&D expenditure and volatility, while Minton and Schrand (1999) find that cash flow volatility is associated with low

[14] While Minton and Schrand (1999) suggest the possibility that firms can potentially substitute across capital expenditure and R&D expenditure, evidence here does not support the argument that managers substitute across these investments.

investment levels. However, consistent with Cho (1998) I do not find a significant relation between capital expenditure and volatility.[15]

5.2. Controlling for the Overinvestment Problem

The preceding analysis based on previous empirical findings has assumed that firm investments are positively associated with its value. However, Jensen (1986) suggests that managers with substantial free cash flow tend to invest it in wasteful projects rather than pay it out to shareholders, since their own compensation and prestige increase with outlays. Once managers exhaust positive NPV projects, they continue to invest in negative NPV projects. As a result, the interest alignment effect of managerial ownership induces managers to decrease firm investments with negative NPV, and the relation between managerial ownership and firm investments is conditioned on the existence of growth opportunities.

To classify firms in the sample as either high or low with respect to growth opportunities, I take the median market-to-book ratio (*M/B*) by year as a cutoff point. For each year, firms are ranked according to their fiscal year-end *M/B*. Firms above the median *M/B* are placed in the high-growth subsample and the other half of the firms with lower than the median *M/B* are placed in the low-growth subsample.

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[15] Results for the relation between managerial ownership and levels of firm investments are somewhat different than Cho (1998). One major difference between this study and Cho is that his sample includes only large firms. To examine whether the difference in firm size may explain the difference between my results and Cho, I rank firms in the sample by their book value of assets and reestimate the piecewise regression for firms ranked in the top quartile. Since Cho uses a single year (1991) data, I estimate the regression for each year. I replicate the shape of the relation for the year 1997 sample, but the statistical significance of each coefficient is different than Cho.

The first six regressions in Table 4 report results for high-growth firms, in a manner somewhat similar to Table 3. The relation between capital expenditure and managerial ownership is significant and positive for ownership levels up to the first breakpoint and then becomes insignificant for levels beyond the first breakpoint. R&D expenditure and the proportion of R&D expenditure to total investments increase and then decrease significantly as managerial ownership rises.

The next six regressions in Table 4 report results for low-growth firms. Two pieces of results emerge. First, the relation between capital expenditure and managerial ownership is initially negative as ownership levels rise, while it is insignificant at all ownership levels. Second, the nonmonotonic relation between R&D expenditure and managerial ownership remains the same as in Table 4. These findings provide evidence that if the overinvestment problem exits, the subject of overinvestment is capital expenditure and not R&D expenditure. The explanation for the different findings between capital expenditure and R&D expenditure involves the incentives that managers have in expanding the firm's tangible asset base. Since capital expenditure typically adds to the amount of assets under managerial control and generates more predictable future cash flows, it becomes the subjects of overinvestment. On the other hand, R&D expenditure produces less certain cash flows and increases the firm's tangible asset base only if successful. Since R&D expenditure represents investment in intangible and highly uncertain assets, it is less likely to be associated with overinvestment.

5.3. Sensitivity Analysis

In the preceding analysis, all observations with missing R&D values have been set to zero R&D expenditure and included in the sample since many Compustat firms report R&D expenditure as missing when the actual expenditure is near zero. To check for the validity of this procedure, I conduct the analysis after eliminating all observations with missing R&D values. The sample contains 4,470 observations for 1,487 firms. The relation between R&D expenditure and managerial ownership in Table 5 is almost identical to those reported in the Table 3. Regression results without and with control variables show that R&D expenditure rises significantly up to the first breakpoint and then declines significantly between the first and second breakpoints.

The second sensitivity analysis examines the argument that the meaningful measure of managerial willingness to bear risk is the dollar value of managerial ownership and not percent ownership (Friend and Lang, 1988). This suggests that the personal wealth constraint of managers is a barrier to managerial equity ownership. As firm size increases, managers may hold a smaller percent of shares in their firms, representing a larger portion of their wealth. Agrawal and Mandelker (1987) and Friend and Lang (1988) argue that the relevant underdiversification risk to managers depends on marketable and non-marketable wealth of managers, and the fraction of their wealth invested in own firm's stocks. However, other information about the managerial portfolio is not easily available. Therefore, the analysis is based on the assumption that larger the market value, larger is the underdiversified concentration of holdings in the firm. Table 6 provides descriptive evidence based on dollar ownership. For each year, firms are ranked into deciles based on dollar ownership. The dollar value of managerial equity ownership is calculated as the market value of common equity at the end of fiscal

year times the percent ownership held by managers. Panels A, B, and C of Table 6 show the mean and median of the three proxies for firm investments in each ownership decile for all firms in the sample, firms with high growth opportunities, and firms with low growth opportunities, respectively.[16] Several stylized facts emerge from these Panels. First, while capital expenditure is nonmonotonically associated with dollar ownership, the relation between capital expenditure and dollar ownership for high- and low-growth firms are in the opposite direction. Second, the relation between R&D expenditure and dollar ownership is the same irrespective of whether the potential overinvestment problem exists or not. Third, the proxy for investment structure, the proportion of R&D expenditure to total firm investments, indicates a similar shape for both high- and low-growth firms. Taken together, the results based on dollar ownership are consistent with findings for percent ownership.

While I include capital expenditure and R&D expenditure as the principal components of total firm investments, mergers and acquisitions (M&As, *Compustat item #129*) may be also a special type of firm investments. This leads to an alternative measure for investment structure defined as the proportion of R&D expenditure to the sum of capital expenditure, R&D expenditure, and M&As. I use the alternative measure averaged over a five-year period to reduce the noise in M&As. The regression results are not materially different from those reported in the paper. The estimated coefficients on managerial ownership variables have the same sign, and the proportion

[16] Since the number of firms in each year is not always a multiple of ten, deciles four through ten in each panel contain a slightly different number of observations. However, the numbers of observations for deciles one through three are dramatically different because dollar ownership is significantly skewed toward low ownership levels. The number of observations with zero ownership value is quite different annually, and SAS tends to allocate more observations with zero ownership value to decile two.

of R&D expenditure to total firm investments declines significantly between the first and second breakpoints.

The last sensitivity check is the causality between managerial ownership and firm investments. In the analysis, a one-year lag between managerial ownership and firm investments is introduced to minimize the endogeneity problem. If some good investments are undertaken in the future and managers with that information increase their ownership, a one-year lag would not be enough to control for reverse causality. Ultimately, a definitive study of the lag structure of ownership and investments must acknowledge the explicit nature of investment policy. However, this concern is partially mitigated by the preceding findings in this analysis. If investments determine managerial ownership, one would expect a positive relation between managerial ownership and investments because firm investments are positively associated with firm value. However, this line of reasoning cannot explain the observed negative relation between managerial ownership and R&D expenditure that occurs as ownership becomes highly concentrated in the hands of managers.

6. Conclusions

This paper examines how managers with large economic stakes in the firm affect investment policy. Managerial ownership is often touted in agency models as instruments for interest alignments. However, high managerial ownership is associated with less portfolio diversification for managers. Ofek and Yermack (2000) analyze the impact of stock-based compensation on managerial ownership and find evidence in favor of managerial incentives for diversification.

Results here show that managerial ownership nonmonotonically affects both the level and structure of firm investments. The impact of managerial ownership on firm investments depends on the types of firm investments. Since R&D expenditure is subject to more uncertainty and has higher risk, managerial preference for lower firm risk due to their underdiversification leads to more managerial discretion over R&D expenditure. As managerial ownership rises, levels of both capital expenditure and R&D expenditure first increase. But as ownership increases further, only R&D expenditure declines significantly. The proportion of R&D expenditure to total firm investments, a measure to capture the magnitude of managerial incentives to avoid R&D expenditure, first increases and then declines as managerial ownership rises.

To examine the implications of the overinvestment problem in firm investments, I segment firms in the sample into two subsamples according to the firm's market-to-book ratio. I find limited evidence of overinvestment and that the subject of overinvestment is capital expenditure and not R&D expenditure. The relation between capital expenditure and managerial ownership remains the same for high-growth firms, while it is in the opposite direction for low-growth firms. On the other hand, the relation between R&D expenditure and managerial ownership remains the same for both high- and low-growth firms, suggesting that R&D expenditure does not result in overinvestment. Further analysis with the dollar value of managerial ownership yields the results similar to findings for percent ownership.

This paper makes two contributions to existing literature. First, it documents the existence of managerial risk aversion due to underdiversification, which influences the level and structure of firm investments. Second, the results provide limited evidence of

the existence of overinvestment, which apply only to capital expenditure and not R&D expenditure.

An interesting area for future research is to analyze the link between ownership structure and mergers and acquisitions (M&As), which are a special case of discretionary firm investments. While there is concern that M&As limit R&D effort, it is interesting to analyze the influence of M&As on the other types of firm investments and whether ownership structure affects the relation between M&As and other firm investments.

Table 1. Year and Industry Distributions for All Sample Firms

This table presents the distribution by year and industry for all sample firms. The sample contains 7,747 observations for 2,572 firms when all observations with missing R&D values are set to zero R&D expenditure and included in the sample, and 4,470 observations for 1,487 firms when all observations with missing R&D values are excluded from the sample. Because all explanatory variables are lagged by one-year to control for the endogeneity of managerial equity ownership, the firm's investment variables are collected for the 1994 to 1998 period and all explanatory variables are collected for the 1993 to 1997 period. Financial statement data are obtained from the Compustat annual files (including the Research file), and managerial equity ownership data are obtained from the Compact Disclosure.

Panel A: Sample Distributions by Year

Year	When all observations with missing R&D values are set to zero R&D and included in the sample		When all observations with missing R&D values are excluded from the sample	
	N	Percent of Sample	*N*	Percent of Sample
1994	1,379	17.8	779	17.4
1995	1,508	19.5	866	19.4
1996	1,582	20.4	932	20.8
1997	1,619	20.9	951	21.3
1998	1,659	21.4	942	21.1
Total	*7,747*	*100.0*	*4,470*	*100.0*

Panel B: Sample Distributions by Industry

Two-Digit SIC Code	Industry Name	Observations with missing R&D values are included in the sample			Observations with missing R&D values are excluded	
		N	Mean of CPX	Mean of R&D	N	Mean of R&D
1	Agriculture Production-Crops	25	0.201	0.167	16	0.260
2	Agr. Production-Livestock	8	0.183	0.000		
7	Agricultural Services	4	0.329	0.000		
10	Metal Mining	32	0.225	0.000		
12	Coal Mining	2	0.094	0.000		
13	Oil and Gas Extraction	243	0.377	0.005	26	0.044
14	Mining Nonmetallic Minerals	17	0.200	0.010	9	0.019
15	Building Construction	32	0.230	0.002	2	0.028
16	Heavy Construction	24	0.293	0.011	5	0.052
17	Construction-Special Trade	18	0.252	0.002	4	0.010
20	Food and Kindred Products	290	0.229	0.007	70	0.028
21	Tobacco Products	12	0.140	0.018	5	0.043
22	Textile Mill Products	116	0.224	0.042	32	0.153
23	Apparel	104	0.304	0.000	12	0.003
24	Lumber and Wood Products	95	0.287	0.006	31	0.019
25	Furniture and Fixtures	117	0.258	0.044	59	0.087
26	Paper and Allied Products	162	0.180	0.037	76	0.079
27	Printing and Publishing	219	0.235	0.030	22	0.300
28	Chemicals and Allied Products	515	0.254	0.183	423	0.223
29	Petroleum Refining	71	0.226	0.003	29	0.008
30	Rubber and Plastic Products	167	0.258	0.052	104	0.083
31	Leather and Leather Products	42	0.324	0.030	6	0.208
32	Stone, Clay and Glass Products	87	0.250	0.031	36	0.074
33	Primary Metals	206	0.223	0.024	82	0.060
34	Fabricated Metal Products	269	0.249	0.045	157	0.078
35	Indus. Mach. and Comp. Equip.	652	0.345	0.440	582	0.493
36	Electronic Equipment	776	0.386	0.351	648	0.420
37	Transportation Equipment	286	0.282	0.105	199	0.151
38	Measuring Instruments	540	0.301	0.555	518	0.579
39	Miscellaneous Manuf. Indus.	118	0.286	0.112	63	0.209
40	Railroad Transportation	46	0.108	0.000		
41	Transit and Passenger Transp.	5	0.302	0.000		
42	Motor Freight Transportation	89	0.315	0.000		
44	Water Transportation	32	0.151	0.000		
45	Air Transportation	46	0.307	0.000		
46	Pipe Lines	2	0.048	0.000		
47	Transportation Services	25	0.415	0.000		
48	Communications	132	0.271	0.002	19	0.017
50	Durable Goods-Wholesale	304	0.352	0.023	164	0.043
51	Nondurable Goods-Wholesale	151	0.313	0.009	72	0.019
52	Build. Mat., Hard. and Garden	31	0.296	0.000	29	0.000
53	General Merchandise Stores	94	0.225	0.000	82	0.000
54	Food Stores	102	0.233	0.000	57	0.000
55	Auto Dealers and Gas Stations	34	0.277	0.000	29	0.000
56	Apparel and Accessory Stores	108	0.319	0.000	97	0.000
57	Home Furn. and Equip. Stores	59	0.366	0.000	58	0.000
58	Eating and Drinking Places	169	0.280	0.000	131	0.000
59	Miscellaneous Retail	155	0.351	0.000	111	0.000
70	Hotels and Other Lod. Places	40	0.315	0.000	29	0.000
72	Personal Services	37	0.294	0.000	5	0.000
73	Business Services	455	0.495	0.415	225	0.839
75	Auto Repair and Parking	18	0.316	0.000	4	0.000
76	Miscellaneous Repair Services	6	0.185	0.000		
78	Motion Pictures	38	0.325	0.000		
79	Amusements and Recreation	59	0.228	0.003	30	0.006
80	Health Services	118	0.312	0.035	84	0.048
82	Educational Services	13	0.422	0.000		
83	Social Services	4	0.139	0.000		
86	Membership Organizations	1	0.245	0.000	1	0.000
87	Eng., Acc. and Other Services	125	0.388	0.042	27	0.194

Table 2. Descriptive Statistics

Variables	Definition	Mean	Min	25%	Median	75%	Max	S.D.
Capital expenditure ratio	Capital expenditure ÷ book value of the beginning-of-year fixed assets	0.307	0.000	0.155	0.238	0.381	1.904	0.240
R&D expenditure ratio[a]	R&D expenditure ÷ book value of the beginning-of-year fixed assets	0.163	0.000	0.000	0.000	0.138	3.003	0.383
Proportion of R&D to total investments[a]	R&D expenditure ÷ (capital expenditure + R&D expenditure)	0.188	0.000	0.000	0.000	0.363	1.000	0.262
Managerial equity ownership	Shares held by officers and directors ÷ shares outstanding	0.166	0.000	0.015	0.092	0.264	0.894	0.190
Market-to-book	(Book value of assets - book value of equity + market value of equity) ÷ book value of assets	1.787	0.362	1.155	1.484	2.037	18.461	1.123
Sales growth	Annual change in sales ÷ beginning-of-year sales	0.150	-0.337	0.035	0.110	0.223	1.210	0.197
Cash flows	(Income before extraordinary items + depreciation + interest expenses) ÷ book value of fixed assets	0.643	0.059	0.285	0.448	0.738	6.611	0.653
Cash slack	Cash and short-term investments ÷ book value of assets	0.103	0.000	0.015	0.049	0.146	0.737	0.128
Volatility	Standard deviation of the firm's annual cash flows over the previous seven-years	0.234	0.003	0.052	0.104	0.223	4.766	0.403
Leverage	Book value of total debt ÷ book value of assets	0.207	0.000	0.066	0.195	0.318	0.856	0.159

[a]Observations with missing R&D values are set to zero R&D expenditure and included in the sample. This adjustment is made since many Compustat firms report R&D expenditure as missing when the actual expenditure is near zero.

Table 3. Relations between Managerial Equity Ownership and Firm Investments

This table presents the means of annual regressions of capital expenditure, R&D expenditure, and the proportion of R&D expenditure to total firm investments on managerial ownership and other firm characteristics. Each equation reports the means of the five annual least squares values for each coefficient and *t*-statistics in parenthesis. All observations with missing R&D values are set to zero R&D expenditure.

Panel A: Regressions Using 7 percent and 38 percent of Managerial Ownership as Breakpoints

	Dependent Variables					
	Capital Expenditure Ratio		R&D Expenditure Ratio		R&D/(Capital Expenditure+R&D)	
Intercept	0.280***	0.227***	0.144***	-0.177***	0.193***	0.025
	(45.071)	(6.762)	(26.567)	(-5.546)	(27.291)	(1.170)
INS1[a]	0.709***	0.266***	1.194***	0.531***	0.441***	-0.008
	(24.905)	(6.167)	(10.551)	(3.823)	(4.188)	(-0.097)
INS2[b]	-0.074***	-0.027	-0.387***	-0.275***	-0.247***	-0.122***
	(-2.628)	(-1.037)	(-7.890)	(-10.570)	(-7.366)	(-6.391)
INS3[c]	0.003	-0.025	0.026	0.008	-0.057	-0.000
	(0.051)	(-0.547)	(0.370)	(0.205)	(-0.868)	(-0.003)
Market-to-book		0.025***		0.024***		0.013***
		(5.592)		(3.638)		(8.371)
Sales growth		0.222***		0.011		-0.061***
		(11.617)		(0.420)		(-3.744)
Cash flows		0.089***		0.100***		0.012***
		(5.821)		(5.086)		(2.861)
Cash slack		0.096**		0.680***		0.269***
		(2.014)		(12.275)		(10.777)
Volatility		0.013		0.032***		0.004
		(0.904)		(2.779)		(0.432)
Leverage		-0.157***		-0.078***		-0.062***
		(-5.785)		(-4.828)		(-9.840)
Industry dummy		Yes		Yes		Yes
Range of Adj. R^2	0.10-0.62%	25.22-26.90%	0.40-0.83%	30.24-36.21%	0.74-1.35%	49.13-52.72%
Number of observations	7,747	7,747	7,747	7,747	7,747	7,747

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

[a]INS1=managerial ownership if managerial ownership<0.07; =0.07 if managerial ownership≥0.07.

[b]INS2=0 if managerial ownership<0.07; =managerial ownership-0.07 if 0.07≤ managerial ownership<0.38; =0.31 if managerial ownership≥0.38.

[c]INS3=0 if managerial ownership<0.38; =managerial ownership-0.38 if managerial ownership≥0.38.

Panel B: Regressions Using 5 percent and 25 percent of Managerial Ownership as Breakpoints

	Dependent Variables					
	Capital Expenditure Ratio		R&D Expenditure Ratio		R&D/(Capital Expenditure+R&D)	
Intercept	0.281***	0.228***	0.134***	-0.180***	0.187***	0.023
	(49.008)	(6.538)	(22.024)	(-5.901)	(30.132)	(1.093)
MAN1[a]	0.782***	0.235*	1.996***	1.064***	0.906***	0.193*
	(9.866)	(1.655)	(44.857)	(8.848)	(11.279)	(1.764)
MAN2[b]	0.003	0.013	-0.468***	-0.364***	-0.310***	-0.172***
	(0.051)	(0.235)	(-6.348)	(-6.974)	(-5.341)	(-4.069)
MAN3[c]	-0.047	-0.036	-0.081*	-0.056*	-0.101***	-0.031
	(-1.065)	(-1.151)	(-1.726)	(-1.690)	(-2.791)	(-1.198)
Market-to-book		0.025***		0.024***		0.013***
		(5.713)		(3.698)		(8.464)
Sales growth		0.222***		0.011		-0.060***
		(11.756)		(0.462)		(-3.767)
Cash flows		0.089***		0.101***		0.012***
		(5.817)		(5.091)		(2.887)
Cash slack		0.096**		0.679***		0.269***
		(2.030)		(12.105)		(10.722)
Volatility		0.013		0.032***		0.004
		(0.874)		(2.726)		(0.448)
Leverage		-0.157***		-0.077***		-0.062***
		(-5.755)		(-4.758)		(-10.026)
Industry dummy		Yes		Yes		Yes
Range of Adj. R^2	0.10-0.82%	25.16-26.94%	0.44-0.95%	30.28-36.25%	0.87-1.38%	49.13-52.80%
Number of observations	7,747	7,747	7,747	7,747	7,747	7,747

* denote p-value < 0.10 ** denote p-value < 0.05 *** denote p-value < 0.01

[a]MAN1=managerial ownership if managerial ownership<0.05; =0.05 if managerial ownership≥0.05.

[b]MAN2=0 if managerial ownership<0.05; =managerial ownership-0.05 if 0.05≤ managerial ownership<0.25; =0.20 if managerial ownership≥0.25.

[c]MAN3=0 if managerial ownership<0.25; =managerial ownership-0.25 if managerial ownership≥0.25.

Table 4. Growth Opportunities and Relations between Managerial Equity Ownership and Firm Investments

This table presents the means of annual regressions for low- and high-growth firms. For each year, firms are ranked according to their end-of-fiscal year market-to-book ratio. Firms above the median market-to-book ratio are placed in the high-growth subsample and the other half of the firms with lower than the median market-to-book ratio are placed in the low-growth subsample. Each equation reports the means of the five annual least squares values for each coefficient and *t*-statistics in parenthesis.

	High-Growth Firms (*N*=3,875)						Low-Growth Firms (*N*=3,872)					
	Capital Expenditure		R&D Expenditure		R&D/(CPX+R&D)		Capital Expenditure		R&D Expenditure		R&D/(CPX+R&D)	
Intercept	0.252***	0.253***	-0.224***	-0.229***	0.044**	0.042**	0.115***	0.115***	-0.090**	-0.095**	-0.004	-0.008
	(4.878)	(4.853)	(-4.632)	(-4.759)	(2.094)	(2.096)	(2.675)	(2.619)	(-2.149)	(-2.313)	(-0.134)	(-0.260)
INS1	0.558***		0.739***		-0.142		-0.065		0.321*		0.161	
	(8.106)		(4.652)		(-1.467)		(-0.514)		(1.796)		(1.541)	
INS2	-0.023		-0.364***		-0.104***		0.009		-0.186***		-0.128***	
	(-0.775)		(-6.072)		(-5.492)		(0.248)		(-4.319)		(-3.793)	
INS3	-0.114		-0.090		-0.047		0.004		0.058		0.030	
	(-1.580)		(-0.861)		(-0.889)		(0.071)		(1.638)		(0.894)	
MAN1		0.597***		1.443***		0.118		-0.281		0.650***		0.329*
		(2.842)		(6.835)		(1.175)		(-1.408)		(3.317)		(1.905)
MAN2		0.039		-0.467***		-0.195***		0.062		-0.237***		-0.143***
		(0.481)		(-6.659)		(-3.250)		(1.074)		(-3.054)		(-2.725)
MAN3		-0.090*		-0.132		-0.032		-0.011		-0.015		-0.027
		(-1.656)		(-1.388)		(-0.664)		(-0.323)		(-1.033)		(-1.203)
Market-to-book	0.014***	0.014***	0.016*	0.016*	0.009**	0.009**	0.079***	0.080***	0.029***	0.029***	0.032***	0.032***
	(3.988)	(4.053)	(1.723)	(1.781)	(2.506)	(2.491)	(4.916)	(4.987)	(3.462)	(3.349)	(4.052)	(3.936)
Sales growth	0.248***	0.248***	0.022	0.023	-0.072***	-0.072***	0.159***	0.159***	-0.036	-0.035	-0.055**	-0.055**
	(8.158)	(8.172)	(0.588)	(0.623)	(-3.828)	(-3.908)	(6.086)	(6.043)	(-1.569)	(-1.506)	(-2.456)	(-2.405)
Cash flows	0.080***	0.080***	0.126***	0.126***	0.015***	0.015***	0.097***	0.097***	0.058***	0.058***	0.005	0.006
	(5.598)	(5.633)	(5.336)	(5.320)	(4.084)	(3.955)	(4.833)	(4.807)	(3.061)	(3.046)	(0.568)	(0.610)
Cash slack	0.107***	0.106***	0.784***	0.780***	0.319***	0.317***	0.083	0.084	0.433***	0.435***	0.212***	0.213***
	(2.778)	(2.816)	(12.551)	(12.337)	(12.053)	(11.839)	(1.228)	(1.248)	(5.824)	(5.787)	(5.884)	(5.797)
Volatility	0.021	0.021	0.030	0.032	0.002	0.004	0.003	0.003	0.046**	0.045**	0.011	0.010
	(1.348)	(1.302)	(1.310)	(1.319)	(0.186)	(0.279)	(0.182)	(0.170)	(2.386)	(2.339)	(1.130)	(1.062)
Leverage	-0.196***	-0.197***	-0.075	-0.073	-0.027**	-0.026**	-0.122***	-0.121***	-0.129***	-0.129***	-0.091***	-0.091***
	(-5.014)	(-5.027)	(-1.614)	(-1.572)	(-2.525)	(-2.458)	(-3.631)	(-3.617)	(-2.804)	(-2.800)	(-4.098)	(-4.099)

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

Table 5. The Effect of Missing R&D Values on Relations between Managerial Ownership and R&D Expenditure

All observations with missing R&D values have been set to zero R&D expenditure and included in the sample. To check for the validity of this procedure, I conduct the analysis after deleting observations with missing R&D values. The sample contains 4,470 observations for 1,487 firms. Each equation reports the means of the five annual least squares values for each coefficient and *t*-statistics in parenthesis.

	Dependent Variable = R&D Expenditure Ratio			
Intercept	0.239***	-0.158**	0.228***	-0.162**
	(26.016)	(-2.330)	(23.119)	(-2.426)
INS1	1.770***	0.530*		
	(8.444)	(1.752)		
INS2	-0.442***	-0.286***		
	(-5.366)	(-9.473)		
INS3	0.035	0.013		
	(0.243)	(0.152)		
MAN1			2.728***	1.108***
			(13.337)	(3.889)
MAN2			-0.481***	-0.405***
			(-3.298)	(-3.932)
MAN3			-0.102	-0.036
			(-1.019)	(-0.458)
Market-to-book		0.014		0.013
		(1.556)		(1.548)
Sales growth		0.025		0.026
		(0.700)		(0.725)
Cash flows		0.187***		0.188***
		(5.992)		(5.923)
Cash slack		0.768***		0.765***
		(14.538)		(14.370)
Volatility		0.088***		0.088***
		(4.294)		(4.180)
Leverage		-0.195***		-0.197***
		(-5.043)		(-4.912)
Industry dummy		Yes		Yes
Range of Adj. R^2	0.41-1.35%	39.19-46.42%	0.37-1.35%	39.28-46.51%

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

Table 6. Firm Investments by Dollar Ownership Decile

Since managerial risk taking may be better measured by the dollar value of managerial ownership, firms in the sample are partitioned into deciles at the end-of-fiscal year according to the magnitude of dollar ownership. Dollar ownership is calculated as the market value of common equity times the percentage ownership held by managers. Panels A, B, and C provide descriptive statistics of firm investments for all firms and for high- and low-growth firms, separated by deciles of dollar ownership.

Panel A: All Firms (N=7,747)

	Capital Expenditure		R&D Expenditure		R&D/(CPX+R&D)	
	Mean	Median	Mean	Median	Mean	Median
Decile 1 (Low)	0.305	0.234	0.143	0.000	0.168	0.000
Decile 2	0.302	0.224	0.175	0.000	0.191	0.000
Decile 3	0.271	0.208	0.198	0.000	0.230	0.000
Decile 4	0.306	0.229	0.171	0.000	0.179	0.000
Decile 5	0.324	0.246	0.172	0.000	0.188	0.000
Decile 6	0.319	0.255	0.168	0.000	0.187	0.000
Decile 7	0.316	0.243	0.148	0.000	0.184	0.000
Decile 8	0.327	0.249	0.168	0.009	0.195	0.043
Decile 9	0.309	0.251	0.149	0.000	0.187	0.000
Decile 10 (High)	0.290	0.235	0.136	0.000	0.173	0.000

Panel B: High-Growth Firms (N=3,875)

	Capital Expenditure		R&D Expenditure		R&D/(CPX+R&D)	
	Mean	Median	Mean	Median	Mean	Median
Decile 1 (Low)	0.341	0.278	0.189	0.000	0.214	0.000
Decile 2	0.358	0.275	0.266	0.014	0.244	0.051
Decile 3	0.383	0.294	0.323	0.045	0.267	0.145
Decile 4	0.409	0.324	0.282	0.040	0.249	0.131
Decile 5	0.382	0.295	0.237	0.044	0.239	0.140
Decile 6	0.368	0.298	0.224	0.030	0.232	0.115
Decile 7	0.358	0.270	0.216	0.033	0.223	0.110
Decile 8	0.346	0.272	0.193	0.029	0.227	0.088
Decile 9	0.326	0.257	0.177	0.000	0.207	0.000
Decile 10 (High)	0.311	0.267	0.151	0.000	0.179	0.000

Panel C: Low-Growth Firms (N=3,872)

	Capital Expenditure		R&D Expenditure		R&D/(CPX+R&D)	
	Mean	Median	Mean	Median	Mean	Median
Decile 1 (Low)	0.284	0.214	0.113	0.000	0.143	0.000
Decile 2	0.264	0.203	0.130	0.000	0.162	0.000
Decile 3	0.247	0.184	0.141	0.000	0.196	0.000
Decile 4	0.251	0.193	0.128	0.000	0.181	0.000
Decile 5	0.263	0.201	0.119	0.000	0.151	0.000
Decile 6	0.268	0.213	0.089	0.000	0.137	0.000
Decile 7	0.270	0.210	0.089	0.000	0.132	0.000
Decile 8	0.252	0.207	0.082	0.000	0.142	0.000
Decile 9	0.249	0.206	0.051	0.000	0.127	0.000
Decile 10 (High)	0.216	0.176	0.049	0.000	0.104	0.000

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Essay III

An Investigation of the Free Cash Flow Hypothesis in Corporate Dividend Policy

1. Introduction

Why do firms employ dividends as a payout method when presumably less costly alternatives exist? Since the early 1990s, top income-tax rates have risen from 28 percent to 39.6 percent while capital gains taxes have fallen from 28 percent to 20 percent. Although share repurchases have been growing rapidly during the 1990s, dividends still remain the predominant payout device. Jagannathan, Stephens, and Weisbach (2000) report that in 1996, dividends account for 65 percent of total payouts, which are the sum of dividends and share repurchases, compared to 69 percent in 1985. Prior studies have attempted to explain this apparent preference for dividends, despite tax provisions and changes in executive compensation favoring stock options.[1] Much more than taxes and managerial compensation policy are necessary to explain how dividends are used in practice.

Economists have proposed a number of explanations of the so-called dividend puzzle. Of these, a plausible idea is that corporate dividend policy addresses agency problems between shareholders and managers (Rozeff, 1982; Easterbrook, 1984; Jensen, 1986).[2] According to these agency theories, unless profits are paid out to shareholders as dividends, they may be committed to unprofitable projects that provide private benefits for the managers. Jensen (1986) argues that paying dividends reduces

[1] Recently, Fenn and Liang (2001) examine the relation between managerial stock options and corporate payout policy. They find evidence of a positive relation between share repurchases and stock options and suggest that the growth in stock options may help explain the rise in share repurchases.

[2] Another popular idea is that firms signal future or current profitability by paying dividends (Bhattacharya, 1979; Miller and Rock, 1985). These authors argue that since managers possess more information about the firm's cash flows than do investors outside the firm, the managers have incentives to unambiguously signal that information to investors, and dividends act as a signal that reduces the information asymmetry between investors and managers.

the discretionary resources under managerial control and so helps to mitigate the overinvestment problem. Rozeff (1982) and Easterbrook (1984) argue that the payment of dividends exposes companies to the possible need to raise external funds, and hence subjects them to greater monitoring by capital markets.

In this study, I examine the implications of the free cash flow hypothesis in corporate dividend policy, and focus specifically on cross-sectional relations between managerial ownership and dividend payout policy. Given the severity of the overinvestment problem, relations between managerial ownership and dividend payouts may be conditioned on the existence of growth opportunities. This research examines how the sensitivity of relations between managerial ownership and dividend payouts varies cross-sectionally with growth opportunities.

Tests using a sample of 10,255 observations for 3,510 firms for the 1994 to 1998 period indicate that the sensitivity of managerial ownership to dividend payouts varies directly with the relative abundance of growth opportunities. I find that dividend payouts for low-growth firms are significantly related to managerial ownership. In contrast, there are no significant relations between dividend payouts and managerial ownership for high-growth firms. Also, share repurchases, another important payout vehicle, have similar relations with managerial ownership.

The other feature that distinguishes this study is that I investigate associations between free cash flow and dividend payouts, which are not yet precisely delineated in the literature. Consistent with the prediction by Jensen (1986), there is a strong positive relation between the level of free cash flow and dividend payouts. Furthermore,

association between free cash flow and dividend payouts is stronger for low-growth firms.

The rest of the paper is organized as follows. Section 2 presents hypotheses relating dividend payouts, managerial ownership and free cash flow. Section 3 explains the empirical framework and Section 4 describes the data and the sample characteristics. The empirical results are presented in Section 5 and Section 6 concludes.

2. Dividend Payouts, Managerial Ownership, and Free Cash Flow Theory

Corporate dividend policy has been viewed as a control mechanism that mitigates agency conflicts between shareholders and managers. Jensen (1986) argues that managers with substantial free cash flow tend to invest it in wasteful projects rather than pay it out to shareholders, because managerial compensation and perquisites increase even with poor investments. These unnecessary investments lead to poor performance, creating conflicts between shareholders and managers. Jensen emphasizes the disciplinary role of dividends that restrain managerial unprofitable expansionary tendencies by limiting financial resources available to managers. Dividend payments represent an ongoing commitment to maintain higher payments in future periods, because firms are reluctant to cut dividends and have been greeted by a significant negative stock market reaction when they do. Furthermore, Rozeff (1982) and Easterbrook (1984) argue that paying large dividends increases the chances that

external capital may have to be raised and this brings managers under greater scrutiny of capital markets.

Jensen and Meckling (1976) suggest that managerial ownership serves as another mechanism for reducing the agency conflicts between shareholders and managers. They argue that as managerial ownership increases, the agency conflicts decline because managers bear more of the wealth effects of their divergent behaviors. Rozeff (1982) acknowledges that managerial ownership provides direct incentive alignment between shareholders and managers, while dividends serve as a bonding mechanism to control agency costs. Since all forms of controlling agency costs are themselves costly, Rozeff views managerial ownership and dividend payouts as substitute means of addressing potential agency problems. The effect of managerial ownership on dividend payouts has been the subject of a number of studies (Rozeff, 1982; Jensen, Solberg, and Zorn, 1992; Agrawal and Jayaraman, 1994; Holder, Langrehr, and Hexter, 1998). These studies have found negative cross-sectional relations between managerial ownership and dividend payouts, and interpreted that managerial ownership and dividend payouts serve as substitutes in controlling the agency conflicts.[3]

[3] Another strain of empirical work looks at the effect that dividend change announcements have on stock price reaction (Lang and Litzenberger, 1989; Yoon and Starks, 1995). Lang and Litzenberger (1989) argue that the information content of a dividend change announcement depends on the severity of the firm's overinvestment problem, since the dividends affect the level of cash flows available for wasteful investments. They find that the absolute value of the announcement abnormal return is larger for firms with few growth opportunities than for firms with many growth opportunities. However, Yoon and Starks (1995) find evidence counter to the argument of Lang and Litzenberger. They investigate the extent to which dividend changes are related to subsequent changes in wasteful investments. They observe that, in general, there are significant increases (decreases) in capital expenditures after dividend increases (decreases) for firms regardless of their growth opportunities. Yoon and Starks suggest that dividend change announcements are associated with revisions in analysts' forecasts of current earnings.

There is yet another aspect to be considered in relations between managerial ownership and dividend payout policy. If one assumes, as suggested by Jensen (1986) and Stulz (1990), that managers receive utility from increasing the size of the firm, the control function of dividend payouts and managerial ownership on the overinvestment problem varies with the firm's growth opportunities. The overinvestment problem is less important and may be trivial for firms with many growth opportunities, because the objectives of managers and shareholders are more likely to coincide. On the other hand, when good projects are not available, managers with substantial free cash flow must find ways to spend it and hence choose poor projects. Thus, the overinvestment problem is higher for low-growth firms than for high-growth firms, and divergence of interests between shareholders and managers over the firm's payout policy are more severe in firms with few growth opportunities.

If the interpretations in the previous studies regarding substitutability between managerial ownership and dividend payouts are correct, the negative relation between managerial ownership and dividend payouts should be more pronounced for firms with few growth opportunities. The first hypothesis examined in this paper is that relations between managerial ownership and dividend payouts are conditioned on the existence of growth opportunities and are stronger for firms with few growth opportunities.

Jensen (1986) argues that the disciplinary effect of dividend payouts is more important for firms with large free cash flow and these firms have high dividend payouts. While both low- and high-growth firms may have the overinvestment problem with the free cash flow, one can expect stronger relations between free cash flow and

dividend payouts for low-growth firms since these firms are likely to invest unprofitably and shareholders would demand high dividend payouts. The second hypothesis examined in this study is that relations between the level of free cash flow and dividend payouts are positive and are stronger for firms with few growth opportunities.

3. Empirical Framework

One concern over estimating the impact of managerial ownership on dividend payouts is the possibility that managerial ownership is endogenous. Exogenous changes in dividend payouts would increase firm value which in turn increases the dollar value of managerial ownership. To control for possible biases due to reverse causality, I use a one-year lag between managerial ownership (and all other explanatory variables) and dividend payouts (see Smith and Watts, 1992; Rajan and Zingales, 1995). Furthermore, the one-year lag can be used to overcome the concern of spurious correlation between dividend yield and the market-to-book ratio because both dividend yield and the market-to-book ratio are dependent on stock prices (see Gavor and Gavor, 1993; Gul, 1999).[4]

[4] An alternative methodology to control for reverse causality is to specify structural equations for managerial ownership and dividend payouts (Jensen, Solberg, and Zorn, 1992). They find that managerial ownership affects dividend policy, but not vice versa. While the structural equation approach potentially can test both whether managerial ownership and dividend payouts share common determinants and whether one endogenous variable influences the other, this approach must specify a priori instrumental variables that influence one endogenous variable, but not the other (and vice versa). I do not estimate structural models specifying interdependencies between managerial ownership and dividend policy with at least two reasons in mind. First, theory provides little guidance as to the exact structure of the underlying simultaneous system of equations. Moreover, the regression coefficients tend to be sensitive to the specification of the equations (see Lang, Ofek, and Stulz, 1996). Second, there is little empirical evidence that managerial ownership and dividend policy are determined simultaneously.

I use three measures of dividend payouts to represent the firm's payout policy since there is little consensus on the most reliable proxy for dividend payouts. The first measure is dividend payout ratio that is the most commonly used proxy for dividend payouts (Rozeff, 1982; Agrawal and Jayaraman, 1994; Holder, Langrehr, and Hexter, 1998; Gul, 1999). The second measure is dividends-to-operating income. Jensen, Solberg, and Zorn (1992) argue that dividend payments as a percentage of operating income assure a more consistent denominator across firms since some firms pay dividends even when their net income is negative. The third measure is dividend yield (Smith and Watts, 1992; Agrawal and Jayaraman, 1994; Gul, 1999; Fenn and Liang, 2001).

$$\textit{Dividend payout ratio} = \textit{Cash dividends per share} \div \textit{Earnings per share before extraordinary items} \quad (1)$$

$$\textit{Dividends-to-operating income} = \textit{Cash dividends} \div \textit{Operating income} \quad (2)$$

$$\textit{Dividend yield} = \textit{Cash dividends per share} \div \textit{Price per share} \quad (3)$$

I measure managerial ownership by the percentage of total shares outstanding held by corporate officers and members of the board of directors. These data are reported in company proxy statements.

There are a number of variables other than managerial ownership that are likely to be related to corporate dividend payouts. Agency cost-based explanations of

corporate payout policy suggest that free cash flow and financing costs affect dividend payouts.

Jensen (1986) defines free cash flow as cash flow left after firms have invested all available positive NPV projects. While the literature provides little guidance on the measures of free cash flow (*FCF*), the most commonly used *FCF* definition is the one suggested by Lehn and Poulsen (1989). I adopt this *FCF* definition, with some modification. *FCF* used in the study is defined as follows:[5, 6]

$$FCF = [\text{Operating income before depreciation} - \text{Interest expenses} - \text{Taxes} - \text{Preferred dividends}] \div \text{Book value of assets}^{7} \quad (4)$$

My proxies for free cash flow also include a measure of growth opportunities. The most frequently used proxy for growth opportunities is the market-to-book ratio (Smith and Watts, 1992; Harford, 1999; Fama and French, 2001; Fenn and Liang, 2001). The market-to-book ratio (M/B) is defined as follows:

$$M/B = [\text{Book value of assets} - \text{Book value of equity} + \text{Market value of equity}] \div \text{Book value of assets} \quad (5)$$

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[5] Following Lehn and Poulsen (1989), Agrawal and Jayaraman (1994) define free cash flow as the operating income before depreciation minus interest expenses, taxes, and preferred and common dividends, divided by the book value of assets. To identify relations between free cash flow and dividend payments, I use a free cash flow measure gross of common dividends.

[6] Harford (1999) find that once firms have accumulated a large stock of cash from previous free cash flow, both high- and low-growth firms exhibit the agency problem with respect to this accumulated free cash flow. In using a flow-based measure, I implicitly assume firms with high and low free cash flow are similar with respect to cash reserves.

[7] This free cash flow measure is given by Compustat item [#13 - #15 – (#16 – change in #35) - #19] ÷ #6.

In the spirit of Myers' (1977) characterization of growth opportunities as the difference between firm value and existing assets, Smith and Watts (1992) argue that higher the market-to-book ratio, the higher the ratio of growth opportunities to firm value and lower the ratio of assets in place to firm value.

Firms with relatively low financing costs can distribute more cash to shareholders because they know that external funds can be raised relatively inexpensively. As proxies for external financing costs, I employ two variables, risk and firm size. Firms with higher operating and financial leverage would have higher costs of external financing. The standard deviation of the firm's monthly stock returns over the previous sixty-months is a measure of risk, patterned after Holder, Langrehr, and Hexter (1998).[8]

Larger firms are generally regarded as having more stable cash flows and having less information asymmetry, which results in lower financing costs (Smith and Watts, 1992; Fenn and Liang, 2001). I measure firm size as the natural logarithm of the book value of assets.

There are a number of factors that potentially influence dividend payout policy. One such factor, stock options, is difficult to obtain and beyond the scope of my study. A recent study by Fenn and Liang (2001) suggests that managerial stock options create incentives to avoid dividends and to favor share repurchases because the value of an option declines when a stock goes ex-dividend but not when a company repurchases

[8] If less than thirty monthly return data are available, risk is coded as missing.

shares. As in Jagannathan, Stephens, and Weisbach (2000), directly controlling for the impact of managerial stock options in my empirical work is difficult here due to unavailability of data on stock options from the Compact Disclosure.

4. Data

4.1. Sample Selection

In constructing the sample, I initially take the list of firms and the financial accounting data from the Compustat annual files (including the research file). While previous research has concentrated mainly on large firms, I examine a sample of all firm sizes, including firms that are not currently in existence. I use a sample period that spans for 6 years from 1993 to 1998. For the purpose of the lagged analysis as in Section 3, the sample period actually used for estimation on dividend payouts runs from 1994 to 1998 and for all explanatory variables from 1993 to 1997. I also require that firms have monthly stock return listed on the CRSP monthly stock file. I do not include utility and financial companies in the sample because their ownership structure and dividend payouts are likely to be significantly different from other firms in the sample. This yields a sample of 12,189 firm observations. To be included in the sample for further analysis, I require that the data on managerial ownership are also available.

The data on managerial equity ownership are taken from the Compact Disclosure. This database reports two sets of managerial ownership statistics from two independent sources. The first source is the corporate proxy statement and the second source is Spectrum, which is based on insider trading and other SEC filings. Anderson

and Lee (1997) provide evidence that Spectrum-based Compact Disclosure (hereafter, *Spectrum*) reveals significant reporting discrepancies in managerial ownership data from proxy statements, while the proxy-based Compact Disclosure data (hereafter, *Compact Disclosure*) do not. Based on their results, I collect managerial equity ownership data from *Compact Disclosure*.[9] After merging firm level data from the Compustat and CRSP with managerial ownership data, the final sample contains 10,255 observations for 3,510 firms.

A breakdown of all sample firms and of low- and high-growth firms by year and industry is provided in Table 1. For each year, firms are ranked according to their end-of-fiscal year market-to-book ratio (*M/B*). The one-third of the firms with the lowest *M/B* are placed in the low-growth subsample and the one-third with the highest *M/B* are placed in the high-growth subsample.[10] Panel A shows that the sample over the 5-year period contains 10,255 observations for 3,510 firms, while the low- and high-growth subsamples consist of 3,417 observations for 1,670 firms and 3,418 observations for 1,531 firms. The samples are slightly heavily weighted toward the later part of the sample period. The percentage of observations ranges from 18.2 percent for 1994 to 21.5 percent for 1998.

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[9] Anderson and Lee (1997) examine the fit between managerial ownership data from four databases and from proxy statements. Corporate Text, *Compact Disclosure*, Value Line, and *Spectrum* in descending order to reproduce the benchmark ownership statistics of proxy statements. They show that the reporting discrepancies in the Value Line and *Spectrum* could significantly influence coefficient estimates of the regressions.

[10] When I stratify firms in the sample into four equal subsamples based on their *M/B*, the results remain materially identical to those based on the classification into three equal subsamples.

Panel B of Table 1 presents industry distribution of the three samples. The sample contains 61 industry groups, and firms in manufacturing industries (two-digit SIC codes between 20 and 39) represent more than 60 percent of all sample firms. Chemical, computer, and instruments firms tend to be classified as high-growth firms. Construction, textiles, primary and fabricated metals, transportation equipment, and durable goods firms tend to be classified as low-growth firms. Industry distributions are consistent with conventional perceptions and comparable with those in Gavor and Gavor (1993) and Baber, Janakiraman, and Kang (1996).

4.2. Descriptive Statistics

Table 2 provides descriptive statistics for all sample firms and for low- and high-growth firms. Panel A presents the definition and descriptive statistics for the variables for all sample firms. Some firms pay dividends even when their earnings are negative. Agrawal and Jayaraman (1994) treat dividend payout ratio of firms with negative earnings as a missing observation. On the other hand, Holder, Langrehr, and Hexter (1998) use a smoothing algorithm to minimize the effect of extreme observations. The dividend payout ratio in the sample ranges from –1,667% to 17,600%. Rather than deleting or smoothing extreme observations, I winsorize those observations. There are 258 observations with negative dividend payout ratio and 180 observations with a payout ratio greater than one. The winsorization is to assign a ratio

of one if the dividend payout ratio is negative or greater than one.[11] This approach reduces the impact of extreme observations and allows the use of a larger number of observations than would be possible if these extreme observations were deleted.

Panel B of Table 2 shows firm characteristics for the low- and high-growth subsamples. Column 1 identifies the variables used in the study, columns 2 through 8 provide statistics for the low-growth subsample, columns 9 through 15 provide statistics for the high-growth subsample, and the last column reports the *p*-value for the difference of means test between low-growth and high-growth firms. The first entry is *p*-value based on the *t*-test, and the second entry in parenthesis is *p*-value based on the Wilcoxon two-sample test.

As expected, the difference in the market-to-book ratio (*M/B*) between the two subsamples is significant. The mean (median) *M/B* for the high-growth subsample is 3.358 (2.692), compared to a mean (median) of 1.050 (1.069) for the low-growth subsample. Both a *t*-test and a Wilcoxon test for difference in means indicate that *M/B* differs significantly ($p<0.01$) between the two subsamples.

There is evidence that dividend payout policy is different between low- and high-growth firms. My analysis is performed on winsorized dividend payout ratio. Both the *t*-test and Wilcoxon test for differences in means show that the winsorized dividend payout is significantly different between low-growth firms (mean of 0.138, median of 0.000) and high-growth firms (mean of 0.109, median of 0.000). The dividend yield is also significantly higher for low-growth firms (mean of 0.007, median

[11] In an earlier version of this paper, I delete those observations with negative or greater than one

of 0.000) than high-growth firms (mean of 0.005, median of 0.000). On the other hand, while the *t*-test reveals significant differences in means, the Wilcoxon two-sample test shows that the dividends-to-operating income ratio is not significantly different between low-growth firms (mean of 0.037, median of 0.000) and high-growth firms (mean of 0.046, median of 0.000). These results are consistent with the argument that dividend payouts are used as a bonding mechanism to control agency costs of free cash flow and also consistent with the earlier findings (Smith and Watts, 1992; Gavor and Gavor, 1993; Gul, 1999).

There is also evidence that low-growth firms have significantly higher managerial ownership than high-growth firms. The mean (median) managerial ownership for low-growth firms is 20.3 percent (13.5 percent), compared to a mean (median) of 15.1 percent (8.8 percent) for high-growth firms. Both a *t*-test and a Wilcoxon test for difference in means indicate that managerial ownership differs significantly ($p<0.01$) between the two subsamples. This would be consistent with the argument that managerial ownership is more important, and therefore more evident, in situations where the agency costs of free cash flow are potentially more severe.[12]

While the Wilcoxon test reveals significant differences in means, the *t*-test shows that free cash flow is not significantly different between low-growth firms (mean of 0.056, median of 0.068) and high-growth firms (mean of 0.061, median of 0.131). Possible explanations are that profitability, the ratio of operating income to total assets,

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dividend payout ratio from the sample. When this approach is used, empirical results remain identical.

is significantly different between low-growth firms (mean of 0.098, median of 0.108) and high-growth firms (mean of 0.129, median of 0.188). Furthermore, debt ratio, which is the ratio of total debt to total assets, is significantly higher for low-growth firms (mean of 0.267, median of 0.262) than high-growth firms (mean of 0.151, median of 0.100).

5. Regression Results

5.1. Managerial Ownership and Dividend Payouts by Growth Opportunities

Table 3 presents the results for the impact of growth opportunities on relations between managerial ownership and dividend payouts. Three sets of regressions are run using dividend payout ratio, dividends-to-operating income, and dividend yield. Columns 2 and 3 provide the regression estimates for low- and high-growth firms with dividend payout ratio as the dependent variable. Column 4 reports the difference in coefficients between low- and high-growth firms and the *t*-statistics for the difference. Columns 5 through 7 and Columns 8 through 10 present the results of similar regressions for dividends-to-operating income and dividend yield as the dependent variables. A *t*-statistic appears in parentheses below each coefficient and is adjusted for the heteroskedasticity in residuals using the White (1980) method. All regressions provide the estimates obtained after adjusting for industry and year effects. To control

[12] This may not be consistent with the argument that since growth opportunities are more discretionary and less easily monitored, firms with greater growth opportunities generally have higher levels of managerial ownership (Demsetz and Lehn, 1985).

for industry effect, all variables except for the year indicator are defined as differences from two-digit SIC industry means.

Turning first into the role of managerial ownership, relations between managerial ownership and dividend payouts appear to differ dramatically with growth opportunities. For low-growth firms, managerial ownership has very pronounced effects on dividend payouts. The coefficients on managerial ownership with dividend payout ratio, dividends-to-operating income, and dividend yield as dependent variables are -0.048, -0.013, and -0.002, respectively, all significant at the 5-percent level. The interpretation of the results obtained here is that firms with managerial ownership greater than the industry mean have dividend payouts lower than the industry mean. The results are consistent with the findings in the earlier studies (Rozeff, 1982; Jensen, Solberg, and Zorn, 1992; Agrawal and Jayaraman, 1994; Holder, Langrehr, and Hexter, 1998). These findings indicate that low-growth firms have high agency costs of free cash flow and thus substitutability between managerial ownership and dividend payouts is more pronounced for low-growth firms. However, there is no apparent link between managerial ownership and dividend payouts for high-growth firms. The coefficients on managerial ownership with dividend payout ratio, dividends-to-operating income, and dividend yield as dependent variables are -0.011, -0.002, and -0.001, respectively, and all of them are not significant. These findings lend support to the first hypothesis that divergence of interests between shareholders and managers over payout policy is

greater for low-growth firms, and thus relations between managerial ownership and dividend payouts, through mitigating the agency conflicts, are stronger for these firms.[13]

There is also evidence that free cash flow leads to an increase in dividend payouts and the effect is stronger for low-growth firms. The results show that the coefficients on free cash flow for both low- and high-growth firms are significantly positive and so are the differences in coefficients on free cash flow between low- and high-growth firms. These findings support the second hypothesis that relations between free cash flow and dividend payouts are positive and are more pronounced for low-growth firms.

While most of control variables have signs in line with expectations, one exception is the market-to-book ratio. The relation between the market-to-book ratio and dividend policy variables is in most cases not significant. However, this is consistent with the results obtained by Gavor and Gavor (1992) and Gul (1999).

Jagannathan, Stephens, and Weisbach (2000) suggest that even though share repurchases have not replaced dividends as a primary payout vehicle, they have become an important source of payouts. Thus, firms can distribute free cash flow through ordinary cash dividends and share repurchases. I extend the analysis by examining whether share repurchases, like dividends, play a role in controlling the agency costs of free cash flow. Following Fama and French (2001), I measure share repurchases as the

[13] There is another possible interpretation that relies on tax effects. As the percentage of shares held by managers increases, their consideration on the dividend payouts is far more likely to be influenced by consideration of the personal income tax and they tend to lower the dividend payouts. However, this cannot explain different relations between managerial ownership and dividend payouts for low- and high-growth firms.

annual change in treasury stock.[14] Some firms use the retirement method, rather than treasury stock, to account for repurchases. The annual changes in treasury stock of these firms are measured as the difference between purchases and sales of stock, when the difference is positive, and zero otherwise. Table 4 presents the results of the impact of growth opportunities on relations between managerial ownership and share repurchases. Following Jagannathan, Stephens, and Weisbach (2000), who find that repurchases are used by firms with higher non-operating cash flows, I also include non-operating income in the analysis, which is defined as the ratio of non-operating income (Compustat data item #61) to total assets.

Consistent with the results with dividend payouts, managerial ownership appears to have some effect on share repurchases for low-growth firms, while there is no apparent link for high-growth firms. The coefficient on managerial ownership for low-growth firms is –0.048 and significant at the 10-percent level, while the coefficient for high-growth firms is 0.036 and not significant. The difference in coefficients on managerial ownership is also significant at the 10-percent level. While free cash flow is positively related to share repurchases for both low- and high-growth firms, the effect of non-operating income is apparent only for low-growth firms.

5.2. Sensitivity Analysis

[14] Fama and French (2001) point out two cases where share repurchases do not have the effect of non-cash dividends. First, repurchased stock is reissued to employee stock ownership plans and as executive stock options. Second, repurchased stock is reissued to the acquired firm in a merger. They suggest that the annual change in treasury stock is qualified as non-cash dividends, because treasury stock captures the cumulative effects of share repurchases and reissues and it is not affected by new issues of stock.

A central issue in a test of the free cash flow hypothesis is the question of a measure of the firm's growth opportunities that are inherently unobservable. A particular concern is whether the market-to-book ratio comprises a reasonable proxy for growth opportunities. Actually, the market-to-book ratio has a couple of potential problems. First, since the book value of assets is measured at historical costs less deprecation, the market-to-book ratio is likely to contain significant error for firms with long-lived assets (Smith and Watts, 1992). Second, because firm value is measured as the market value of equity plus the book value of debt, the ratio involves measurement error for highly leveraged firms (Gavor and Gavor, 1993). As an alternative measure of growth opportunities, I employ the firm's average annual growth rate in sales over the previous five-years (Rozeff, 1982; Jensen, Solberg, and Zorn, 1992; Agrawal and Jayaraman, 1994; Holder, Langrehr, and Hexter, 1998).[15] The results in Table 5 confirm the previous findings and lend further support to the argument that the effect of managerial ownership on dividend payouts varies with growth opportunities. With three sets of dividend policy variables, the coefficients on managerial ownership for low-growth firms are negative and significant, while the coefficients for high-growth firms are not significant. Moreover, the difference in coefficients on managerial ownership between low- and high-growth firms is significant at the 1- and 5-percent levels.

[15] While this is one of the most frequently used measures of growth opportunities in the literature, McConnell and Servaes (1995) suggest two possible concerns with this measure. First, it relies upon historical growth and presumes that historical growth is a reasonable proxy for future growth opportunities. More importantly, the observed growth in sales may represent an increase in sales due to an acquisition rather than to positive NPV investment opportunities. Lehn and Poulsen (1989) point out

I also estimate the regression with an alternative measure of free cash flow to examine the robustness of relations between free cash flow and dividend policy. While the most frequently used measure of free cash flow is the one used by Lehn and Poulsen (1989), their measure does not provide a measure of the availability of positive NPV projects. Holder, Langrehr, and Hexter (1998), on the other hand, use an alternative measure of free cash flow assuming that capital expenditures represent investment in all positive NPV projects. As in Holder, Langrehr, and Hexter (1998), I assume that capital expenditures represent investment in all positive NPV projects and employ a proxy for free cash flow defined as follows:

$$FCF = [Operating\ income\ before\ depreciation - Interest\ expenses - Taxes - Preferred\ dividends - Capital\ expenditures] \div Book\ value\ of\ assets \quad (6)$$

The results reported in Table 6 show that while the coefficients on free cash flow are significant for both low- and high-growth firms, the difference in coefficients on free cash flow is also significant with dividends-to-operating income ratio and dividend yield. This confirms the previous findings that relations between free cash flow and dividend payouts are stronger for low-growth firms.

Finally, I estimate the regression using the average of the variables over the sample period for the firms. The advantage of this approach is that it alleviates problems with the unusual fluctuations in dividend payouts that occur through time

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that if the acquisition diminishes equity value, sales growth measures high growth prospects when in fact it measures the nonproductive use of free cash flow.

(Rozeff, 1982; Jensen, Solberg, and Zorn, 1992; Fenn and Liang, 2001). I eliminate all observations for firms for which there are only one or two annual observations. Thus, I examine how firm characteristics influence average dividend policy over a 3- to 5-year period. I am left with a sample of 7,989 observations for 1,950 firms - 574 firms with three observations, 613 firms with four observations, and 763 firms with five observations. Since dividend payouts are measured as the arithmetic firm-level average, my regression sample has 1,950 observations. The results displayed in Table 7 are consistent with the previous findings that dividend payouts are significantly related with managerial ownership only for low-growth firms.

6. Conclusions

The purpose of this study is to explore the implications of the free cash flow hypothesis concerning the disciplinary role of managerial ownership in corporate dividend policy. The investigation is motivated by the work of Rozeff (1982) and Jensen (1986) on divergence of interests between shareholders and managers over the payout policy. I focus on the impact of growth opportunities on the relation between managerial ownership and dividend payouts.

Results indicate that the sensitivity of managerial ownership to dividend payouts depends on growth opportunities. Managerial ownership appears to have a very pronounced effect on dividend payouts for low-growth firms, while there is no apparent link for high-growth firms. There is also evidence that firms with high free cash flow tend to have high dividend payouts and relations between the level of free cash flow and

dividend payouts are stronger for low-growth firms. I find that share repurchases are another payout vehicle that can be used to mitigate the agency costs of free cash flow.

Overall, this study suggests that the agency approach is relevant to an understanding of corporate dividend policy. Conflicts of interest between shareholders and managers over the payout policy vary with growth opportunities, and managerial ownership mitigates the agency conflicts for companies with more serious free cash flow problem while its effect for other firms is marginal. Thus, dividend payout policy and managerial ownership are of greater significance for firms with few positive net present value (NPV) projects.

Table 1. Year and Industry Distributions for All Sample Firms and for Low- and High-Growth Firms

This table presents the distributions by year and industry for all sample firms and for low- and high-growth firms. The sample contains 10,255 observations for 3,510 firms. For each year, firms are ranked according to their end-of-fiscal year market-to-book ratio. The one-third of the firms with the lowest market-to-book ratio is placed in the low-growth subsample, and the one-third with the highest market-to-book ratio is placed in the high-growth subsample. The low-growth subsample contains 3,417 observations for 1,670 firms, and the high-growth subsample contains 3,418 observations for 1,531 firms. Because all explanatory variables are lagged by one-year to control for endogeneity of managerial equity ownership, the firm's dividend policy variables are collected for the 1994 to 1998 period and all explanatory variables are collected for the 1993 to 1997 period. Financial statement data are obtained from the Compustat annual files (including the Research file), stock return data are from the CRSP monthly stock file, and managerial equity ownership data are from the Compact Disclosure.

Panel A: Sample Distributions by Year

Year	*N*	Percent of Sample	Mean of Dividend Payouts		
			Dividends / *Earnings* [a]	*Dividends* / *Operating Income*	*Dividends* / Price
			All Firms		
1994	1,867	18.2	0.158	0.053	0.009
1995	1,983	19.3	0.151	0.050	0.008
1996	2,046	20.0	0.139	0.047	0.007
1997	2,150	21.0	0.124	0.041	0.005
1998	2,209	21.5	0.135	0.040	0.006
Total	*10,255*	*100.0*	*0.141*	*0.046*	*0.007*
			Low-Growth Firms		
1994	622	18.2	0.140	0.038	0.008
1995	661	19.3	0.139	0.039	0.008
1996	682	20.0	0.148	0.039	0.008
1997	716	21.0	0.133	0.036	0.006
1998	736	21.5	0.132	0.031	0.007
Total	*3,417*	*100.0*	*0.138*	*0.037*	*0.007*
			High-Growth Firms		
1994	622	18.2	0.135	0.058	0.007
1995	661	19.3	0.116	0.048	0.005
1996	682	20.0	0.103	0.045	0.005
1997	716	21.0	0.085	0.037	0.004
1998	736	21.5	0.113	0.044	0.004
Total	*3,418*	*100.0*	*0.109*	*0.046*	*0.005*

[a] I adjust the dividend payout ratio that is negative or greater than one to an exact ratio of one.

Panel B: Sample Distributions by Industry

Two-Digit SIC Code	Industry Name	All Firms			Low-Growth Firms			High-Growth Firms		
			Mean of Payouts			Mean of Payouts			Mean of Payouts	
		N	Div÷Ear.	Div÷Price	*N*	Div÷Ear.	Div÷Price	*N*	Div÷Ear.	Div÷Price
1	Agr. Production-Crops	40	0.329	0.008	13	0.446	0.010	15	0.286	0.005
2	Agr. Prod.-Livestockc	5	0.444	0.003				5	0.444	0.003
7	Agricultural Services	4	0.000	0.000	2	0.000	0.000			
10	Metal Mining	44	0.328	0.012	11	0.255	0.016	19	0.513	0.013
12	Coal Mining	7	0.000	0.000	6	0.000	0.000			
13	Oil and Gas Extraction	380	0.145	0.005	134	0.111	0.005	89	0.108	0.003
14	Mining Nonmet. Miner.	21	0.286	0.018	7	0.432	0.027	4	0.349	0.024
15	Building Construction	89	0.108	0.007	73	0.129	0.008	2	0.000	0.000
16	Heavy Construction	41	0.120	0.006	19	0.147	0.008	6	0.000	0.000
17	Const.-Special Trade	28	0.094	0.003	15	0.155	0.005	9	0.035	0.002
20	Food and Kindred Prod.	293	0.297	0.012	99	0.157	0.008	94	0.392	0.016
21	Tobacco Products	8	0.383	0.025	2	0.000	0.000	3	0.649	0.035
22	Textile Mill Products	112	0.203	0.010	71	0.194	0.010	8	0.128	0.005
23	Apparel	113	0.196	0.009	50	0.183	0.010	25	0.050	0.002
24	Lumber and Wood Prod.	92	0.212	0.012	33	0.209	0.012	21	0.149	0.007
25	Furniture and Fixtures	125	0.230	0.013	36	0.270	0.014	26	0.134	0.008
26	Paper and Allied Prod.	156	0.373	0.018	69	0.413	0.017	37	0.331	0.017
27	Printing and Publishing	227	0.270	0.013	41	0.166	0.010	102	0.303	0.014
28	Chem. and Allied Prod.	899	0.168	0.008	97	0.191	0.009	548	0.122	0.006
29	Petroleum Refining	92	0.434	0.022	30	0.365	0.016	5	0.000	0.000
30	Rubber and Plastic Prod.	192	0.156	0.009	62	0.084	0.005	47	0.144	0.007
31	Leather and its Prod.	33	0.052	0.004	19	0.088	0.007	7	0.005	0.001
32	Stone and Glass Prod.	93	0.139	0.009	43	0.156	0.011	19	0.108	0.009
33	Primary Metals	217	0.229	0.013	104	0.265	0.014	35	0.155	0.008
34	Fabr. Metal Products	278	0.193	0.011	121	0.174	0.011	43	0.212	0.012
35	Industrial Machinery	922	0.102	0.006	282	0.119	0.007	305	0.064	0.003
36	Electronic Equipment	1,019	0.083	0.004	274	0.076	0.004	400	0.061	0.003
37	Transportation Equip.	304	0.237	0.013	117	0.252	0.015	57	0.139	0.008
38	Measuring Instruments	848	0.078	0.003	222	0.083	0.004	379	0.061	0.002
39	Miscell. Manu. Ind.	150	0.109	0.006	73	0.030	0.002	38	0.202	0.011
40	Railroad Transportation	40	0.261	0.015	17	0.261	0.011	5	0.066	0.006
41	Transit Transportation	6	0.000	0.000	4	0.000	0.000	1	0.000	0.000
42	Motor Freight Transp.	101	0.073	0.003	46	0.079	0.003	20	0.070	0.004
44	Water Transportation	31	0.376	0.018	16	0.542	0.026	3	0.186	0.016
45	Air Transportation	77	0.040	0.002	40	0.046	0.002	13	0.074	0.006
46	Pipe Lines	5	0.000	0.000	3	0.000	0.000			
47	Transportation Services	19	0.117	0.008	3	0.160	0.016	7	0.098	0.006
48	Communications	221	0.188	0.008	40	0.174	0.005	99	0.141	0.006
50	Durable Goods-Whole.	394	0.078	0.004	200	0.059	0.004	78	0.094	0.005
51	Nondur. Goods-Whole.	172	0.203	0.010	90	0.252	0.012	29	0.040	0.003
52	Building Materials	42	0.095	0.004	25	0.109	0.005	13	0.080	0.003
53	General Merchandise	105	0.198	0.011	59	0.173	0.011	18	0.118	0.006
54	Food Stores	107	0.219	0.012	57	0.255	0.014	20	0.073	0.004
55	Auto Dealers	40	0.054	0.002	18	0.056	0.001	11	0.041	0.002
56	Apparel and Acce. Stores	130	0.098	0.005	58	0.073	0.003	24	0.070	0.005
57	Home Furniture	74	0.074	0.005	41	0.086	0.006	14	0.023	0.002
58	Eating and Drink. Places	204	0.068	0.004	85	0.079	0.004	55	0.076	0.005
59	Miscellaneous Retail	204	0.132	0.006	75	0.088	0.004	60	0.062	0.003
70	Hotels	32	0.175	0.007	18	0.130	0.007	4	0.273	0.002
72	Personal Services	36	0.242	0.011	5	0.432	0.028	15	0.282	0.010
73	Business Services	738	0.067	0.003	129	0.071	0.004	401	0.060	0.002
75	Auto Repair, Services	26	0.143	0.009	18	0.188	0.012	1	0.000	0.000
76	Miscell. Repair Services	8	0.084	0.006	3	0.000	0.000	1	0.000	0.000
78	Motion Pictures	82	0.070	0.001	38	0.000	0.000	14	0.071	0.001
79	Amusements	113	0.112	0.005	44	0.141	0.006	26	0.183	0.007
80	Health Services	208	0.032	0.001	69	0.036	0.001	67	0.022	0.001
82	Educational Services	14	0.097	0.007	4	0.250	0.018	8	0.023	0.001
83	Social Services	11	0.000	0.000	4	0.000	0.000	2	0.000	0.000
87	Eng., Account. Services	175	0.079	0.004	77	0.111	0.006	59	0.073	0.004
99	Nonclassif. Establish.	8	0.000	0.000	6	0.000	0.000	2	0.000	0.000

Table 2. Descriptive Statistics

This table displays descriptive statistics for all sample firms and for low- and high-growth firms. Panel A describes definitions for the variables analyzed in the study and presents descriptive statistics for the sample. Panel B reports descriptive statistics for low- and high-growth firms. For each year, the one-third of the firms with the lowest market-to-book ratio is placed in the low-growth subsample, and the one-third with the highest market-to-book ratio is placed in the high-growth subsample. *P*-value in the last column are reported for the *t*-test (the Wilcoxon test in parenthesis) of equality of the means of the low- and high-growth subsamples.

Panel A: Descriptive Statistics for All Sample Firms

Variables	Definition	All Firms (N = 10,255)						
		Mean	Min	25%	Median	75%	Max	S.D.
Market-to-book	(Book value of assets – book value of equity + market value of equity) ÷ book value of assets	1.990	0.345	1.172	1.539	2.224	19.927	1.513
Dividend payout ratio	Dividends per share ÷ earnings per share before extraordinary items	0.153	-16.667	0.000	0.000	0.161	176.000	2.235
Winsorized dividend payout ratio	Assign a ratio of one if dividend payout ratio is negative or greater than one	0.141	0.000	0.000	0.000	0.194	1.000	0.257
Dividends-to-operating income	Dividends ÷ operating income	0.046	0.000	0.000	0.000	0.071	0.568	0.082
Dividend yield	Dividends per share ÷ fiscal year closing price per share	0.007	0.000	0.000	0.000	0.011	0.120	0.012
Managerial equity ownership	Shares held by officers and directors ÷ shares outstanding	0.171	0.000	0.018	0.102	0.267	0.889	0.189
Free cash flow	(Operating income before depreciation – interest expenses – taxes – preferred dividends) ÷ book value of assets	0.067	-0.916	0.049	0.093	0.136	0.349	0.142
Risk	Standard deviation of monthly stock return over the previous sixty-months	0.141	0.020	0.090	0.127	0.176	0.592	0.070
Firm size	Log (book value of assets)	5.101	0.766	3.685	4.935	6.372	12.625	1.973

Panel B: Descriptive Statistics for Low- and High-Growth Firms

	Low-Growth Firms (N = 3,417)							High-Growth Firms (N = 3,418)							Significance
	Mean	Min	25%	Med.	75%	Max	S.D.	Mean	Min	25%	Med.	75%	Max	S.D.	Test[a]
Market-to-book	1.050	0.345	0.952	1.069	1.172	1.366	0.165	3.358	1.757	2.224	2.692	3.676	19.927	1.966	<0.001 (<0.001)
Dividend payout ratio	0.102	-16.667	0.000	0.000	0.104	32.000	1.012	0.188	-16.667	0.000	0.000	0.118	176.00	3.575	0.178 (<0.001)
Winsorized dividend payout ratio	0.138	0.000	0.000	0.000	0.163	1.000	0.273	0.109	0.000	0.000	0.000	0.129	1.000	0.218	<0.001 (0.097)
Dividends-to-oper. income	0.037	0.000	0.000	0.000	0.048	0.568	0.074	0.046	0.000	0.000	0.000	0.059	0.567	0.089	<0.001 (0.216)
Dividend yield	0.007	0.000	0.000	0.000	0.012	0.120	0.013	0.005	0.000	0.000	0.000	0.006	0.067	0.010	<0.001 (0.001)
Managerial ownership	0.203	0.000	0.021	0.135	0.332	0.876	0.209	0.151	0.000	0.019	0.088	0.227	0.881	0.170	<0.001 (<0.001)
Free cash flow	0.056	-0.608	0.037	0.068	0.098	0.346	0.084	0.061	-0.916	0.049	0.131	0.173	0.349	0.205	0.157 (<0.001)
Risk	0.140	0.020	0.094	0.127	0.171	0.524	0.064	0.151	0.034	0.094	0.139	0.189	0.592	0.075	<0.001 (<0.001)
Firm size	4.850	0.766	3.584	4.722	5.860	12.539	1.781	4.947	0.788	3.461	4.810	6.293	11.395	2.015	0.036 (0.088)

[a]Significance tests for comparisons of low-growth firms with high-growth firms. The first entry is p-value based on the t-test, and the second entry in parenthesis is p-value based on the Wilcoxon two-sample test.

Table 3. Growth Opportunities and Relations between Managerial Ownership and Dividend Payouts

This table presents the regression coefficients for low- and high-growth firms. For each year, the one-third of the firms with the lowest market-to-book ratio is placed in the low-growth subsample, and the one-third with the highest market-to-book ratio is placed in the high-growth subsample. To control for industry effects, all variables except for the year indicator are defined as differences from 2-digit SIC industry means. A *t*-statistic appears in parentheses below each coefficient estimate and is adjusted for the heteroskedasticity in residuals using the White (1980) method. The tests for significant differences between the coefficients of the two subsamples are also reported. All regressions are estimated with year dummy variables.

	Dependent Variables								
	Dividend payout ratio[a]			Dividends-to-operating income			Dividend yield		
	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*
Intercept	-0.001	-0.022***	0.021	-0.010***	-0.003	-0.007*	0.000	-0.002***	0.002***
	(-0.090)	(-3.100)	(1.540)	(-3.220)	(-0.970)	(-1.825)	(0.080)	(-5.720)	(3.022)
Managerial ownership	-0.048**	-0.011	-0.036	-0.013**	-0.002	-0.011	-0.002**	-0.001	-0.001
	(-2.462)	(-0.529)	(-1.257)	(-2.247)	(-0.283)	(-1.091)	(-2.474)	(-1.179)	(-1.000)
Free cash flow	0.121***	0.030**	0.091**	0.054***	0.028***	0.026**	0.011***	0.002***	0.009***
	(3.418)	(2.385)	(2.425)	(4.539)	(4.989)	(1.993)	(5.416)	(3.661)	(4.156)
Market-to-book	-0.002	-0.003**	0.000	0.003	-0.000	0.003	0.000	-0.000***	0.000
	(-0.245)	(-2.193)	(0.000)	(1.005)	(-0.173)	(1.020)	(0.173)	(-4.207)	(0.762)
Risk	-0.943***	-0.644***	-0.300***	-0.349***	-0.323***	-0.025	-0.059***	-0.036***	-0.023***
	(-13.708)	(-11.579)	(-3.390)	(-14.260)	(-12.203)	(-0.707)	(-14.971)	(-12.400)	(-4.651)
Firm size	0.032***	0.029***	0.003	0.002**	0.009***	-0.007***	0.001***	0.001***	0.000
	(9.894)	(11.872)	(0.678)	(2.278)	(8.911)	(-5.254)	(5.985)	(8.549)	(0.100)
Adjusted R-squared	0.136	0.229		0.116	0.238		0.151	0.232	
Number of observations	3,417	3,418		3,417	3,418		3,417	3,418	

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

[a]I adjust the dividend payout ratio that is negative or greater than one to an exact ratio of one.

Table 4. Growth Opportunities and Relations between Managerial Ownership and Share Repurchases

This table presents the results on relations between managerial ownership and share repurchases when sample firms are classified with respect to growth opportunities. Share repurchases are measured as the annual change in treasury stock. For each year, the one-third of the firms with the lowest market-to-book ratio is placed in the low-growth subsample, and the one-third with the highest market-to-book ratio is placed in the high-growth subsample. To control for industry effects, all variables except for the year indicator are defined as differences from 2-digit SIC industry means. A *t*-statistic appears in parentheses below each coefficient estimate and is adjusted for the heteroskedasticity in residuals using the White (1980) method. All regressions are estimated with year dummy variables.

	Dependent Variable		
	Share repurchases		
	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*
Intercept	0.015	0.034***	-0.020
	(0.860)	(2.700)	(-0.775)
Managerial ownership	-0.048*	0.036	-0.084*
	(-1.661)	(0.894)	(-1.694)
Free cash flow	0.118**	0.070***	0.048
	(2.198)	(3.064)	(0.825)
Non-operating cash flow	0.786**	-0.216	1.002
	(1.992)	(-0.458)	(1.637)
Market-to-book	-0.017	0.001	-0.017
	(-0.927)	(0.200)	(-0.943)
Risk	-0.480***	-0.339***	-0.141
	(-4.539)	(-4.587)	(-1.095)
Firm size	0.003	0.014***	-0.011*
	(0.781)	(3.699)	(-1.887)
Adjusted R-squared	0.010	0.028	
Number of observations	3,322	3,322	

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

Table 5. An Alternative Measure of Growth Opportunities and Relations between Managerial Ownership and Dividend Payouts

This table presents regression analysis of dividend payouts on managerial ownership with five-year historical sales growth as an alternative measure of growth opportunities. For each year, firms are ranked according to their average sales growth over the previous five-years. The one-third of the firms with the lowest sales growth is placed in the low-growth subsample, and the one-third with the highest sales growth is placed in the high-growth subsample. To control for industry effects, all variables except for the year indicator are defined as differences from 2-digit SIC industry means. A *t*-statistic appears in parentheses below each coefficient estimate and is adjusted for the heteroskedasticity in residuals using the White (1980) method. The tests for significant differences between the coefficients of the two subsamples are also reported. All regressions are estimated with year dummy variables.

	Dependent Variables								
	Dividend payout ratio[a]			Dividends-to-operating income			Dividend yield		
	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*
Intercept	0.021*	-0.070***	0.091***	0.000	-0.026***	0.026***	0.000	-0.004***	0.004***
	(1.650)	(-10.370)	(5.977)	(0.060)	(-14.250)	(5.422)	(0.080)	(-15.700)	(5.836)
Managerial ownership	-0.052**	0.027	-0.079***	-0.018**	0.008	-0.026***	-0.003**	0.000	-0.003**
	(-2.135)	(1.568)	(-2.650)	(-2.179)	(1.497)	(-2.642)	(-2.326)	(0.671)	(-2.347)
Free cash flow	0.101***	-0.007	0.108***	0.070***	0.022***	0.048***	0.009***	0.001**	0.007***
	(3.404)	(-0.436)	(3.211)	(5.917)	(4.370)	(3.701)	(5.336)	(2.356)	(4.174)
Sales growth	-0.169***	-0.023***	-0.146***	-0.058***	-0.006***	-0.051***	-0.008***	-0.001***	-0.008***
	(-3.509)	(-6.865)	(-3.015)	(-3.610)	(-5.876)	(-3.198)	(-3.626)	(-4.579)	(-3.259)
Risk	-0.997***	-0.446***	-0.551***	-0.427***	-0.158***	-0.269***	-0.064***	-0.022***	-0.042***
	(-14.422)	(-8.226)	(-6.277)	(-14.858)	(-9.366)	(-8.060)	(-15.846)	(-8.484)	(-8.817)
Firm size	0.037***	0.023***	0.014***	0.007***	0.004***	0.003**	0.001***	0.001***	0.001***
	(12.443)	(8.815)	(3.624)	(6.542)	(5.527)	(2.198)	(7.865)	(6.146)	(3.048)
Adjusted R-squared	0.216	0.118		0.211	0.129		0.224	0.126	
Number of observations	3,190	3,191		3,190	3,191		3,190	3,191	

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

[a]I adjust the dividend payout ratio that is negative or greater than one to an exact ratio of one.

Table 6. An Alternative Measure of Free Cash Flow and Relations between Managerial Ownership and Dividend Payouts

This table presents the coefficients in regressions of dividend payouts on managerial ownership with an alternative free cash flow measure. The alternative cash flow measure is defined as: *FCF = [operating income before depreciation – interest expenses – taxes – preferred dividends – capital expenditure] ÷ book value of assets*. To control for industry effects, all variables except for the year indicator are defined as differences from 2-digit SIC industry means. A *t*-statistic appears in parentheses below each coefficient estimate and is adjusted for the heteroskedasticity in residuals using the White (1980) method. The tests for significant differences between the coefficients of the two subsamples are also reported. All regressions are estimated with year dummy variables.

	Dependent Variables								
	Dividend payout ratio[a]			Dividends-to-operating income			Dividend yield		
	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low = High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low = High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low = High*
Intercept	-0.005	-0.019***	0.014	-0.011***	-0.002	-0.009**	-0.000	-0.002***	0.002***
	(-0.480)	(-2.750)	(1.034)	(-3.320)	(-0.660)	(-2.131)	(-0.170)	(-5.440)	(2.642)
Managerial ownership	-0.043**	-0.019	-0.024	-0.013**	-0.006	-0.007	-0.002**	-0.002*	-0.001
	(-2.200)	(-0.883)	(-0.843)	(-2.135)	(-0.787)	(-0.663)	(-2.280)	(-1.661)	(-0.583)
Free cash flow	0.057*	0.048***	0.009	0.059***	0.037***	0.022*	0.008***	0.003***	0.005**
	(1.651)	(3.848)	(0.245)	(5.588)	(6.515)	(1.874)	(3.914)	(5.172)	(2.238)
Market-to-book	-0.004	-0.003**	-0.001	0.002	-0.000	0.002	0.000	-0.000***	0.000
	(-0.436)	(-2.198)	(-0.141)	(0.819)	(-0.200)	(0.843)	(0.100)	(-4.169)	(0.633)
Risk	-0.962***	-0.623***	-0.339***	-0.351***	-0.308***	-0.043	-0.060***	-0.034***	-0.025***
	(-13.767)	(-11.398)	(-3.824)	(-14.468)	(-12.028)	(-1.204)	(-15.137)	(-12.254)	(-5.222)
Firm size	0.033***	0.029***	0.004	0.002**	0.009***	-0.007***	0.001***	0.001***	0.000
	(10.152)	(11.717)	(0.990)	(2.476)	(8.799)	(-5.032)	(6.391)	(8.381)	(0.548)
Adjusted R-squared	0.135	0.231		0.118	0.241		0.150	0.234	
Number of observations	3,365	3,367		3,365	3,367		3,365	3,367	

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

[a] I adjust the dividend payout ratio that is negative or greater than one to an exact ratio of one.

Table 7. Average Payout Policy and Relations between Managerial Ownership and Dividend Payouts

This table presents the result on average payout policy over a horizon longer than two years. The sample is left with 7,989 observations for 1,950 firms. Because the unit of observation is firm-level averages, the sample has 1,950 observations. Firms are ranked according to their average market-to-book ratio. The one-third of the firms with the lowest market-to-book ratio is placed in the low-growth subsample, and the one-third with the highest market-to-book ratio is placed in the high-growth subsample. To control for industry effects, all variables are defined as differences from 2-digit SIC industry means. A *t*-statistic appears in parentheses below each coefficient estimate and is adjusted for the heteroskedasticity in residuals using the White (1980) method. The tests for significant differences between the coefficients of the two subsamples are also reported.

	Dependent Variables								
	Dividend payout ratio[a]			Dividends-to-operating income			Dividend yield		
	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*	Low-Growth Firms (*Low*)	High-Growth Firms (*High*)	Test of *Low* = *High*
Intercept	0.014	-0.015**	0.029*	-0.001***	0.003	-0.004	0.001*	-0.001***	0.002***
	(0.950)	(-1.960)	(1.808)	(-3.320)	(0.660)	(-0.787)	(1.840)	(-2.850)	(2.934)
Managerial ownership	-0.103**	-0.012	-0.092	-0.031*	-0.007	-0.024	-0.006**	-0.002	-0.004
	(-2.030)	(-0.173)	(-1.136)	(-1.697)	(-0.300)	(-0.781)	(-1.995)	(-0.700)	(-1.010)
Free cash flow	0.218**	0.090**	0.128	0.077**	0.054***	0.022	0.019***	0.005***	0.014**
	(2.121)	(2.526)	(1.175)	(2.287)	(3.219)	(0.600)	(3.335)	(2.770)	(2.350)
Market-to-book	0.003	-0.002	0.005	0.005	0.001	0.004	0.001	-0.000	0.001
	(0.200)	(-0.625)	(0.316)	(0.975)	(0.714)	(0.742)	(0.633)	(-1.086)	(0.825)
Risk	-1.093***	-0.856***	-0.236	-0.452***	-0.437***	-0.014	-0.074***	-0.049***	-0.025**
	(-7.197)	(-6.147)	(-1.149)	(-7.387)	(-6.315)	(-0.141)	(-7.914)	(-6.636)	(-2.107)
Firm size	0.026***	0.023***	0.003	-0.000	0.007**	-0.007**	0.000	0.001**	-0.000
	(4.198)	(4.126)	(0.332)	(-0.200)	(2.538)	(-2.114)	(1.428)	(2.110)	(-0.100)
Adjusted R-squared	0.188	0.283		0.146	0.277		0.182	0.265	
Number of observations	650	650		650	650		650	650	

* denote *p*-value < 0.10 ** denote *p*-value < 0.05 *** denote *p*-value < 0.01

[a]I adjust the dividend payout ratio that is negative or greater than one to an exact ratio of one.

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