2011

Institutional Investors and Corporate Financial Policies

Ricky William Scott
University of South Florida, rwscott@usf.edu

Institutional Investors and Corporate Financial Policies

by

Ricky W. Scott

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Department of Finance
College of Business
University of South Florida

Co-Major Professor: Christos Pantzalis, Ph.D.
Co-Major Professor: Ninon Sutton, Ph.D.
Delroy Hunter, Ph.D.
Jianping Qi, Ph.D.

Date of Approval:
March 31, 2011

Keywords: Payout policy, Share repurchases, Dividends, R&D,
Investment policy, Managerial myopia, Liquidity, Herding

Dedication

I dedicate this dissertation to my wife, Elisabeth, who has supported me in this life-changing endeavor. If I was not confident of our eternal bond, I could have never undertaken the most difficult project of my life.

I would like to thank my beautiful daughters Sarah and Samantha for interrupting my work on a regular basis for questions, kisses, hugs and just to tell me about their day. My desire to demonstrate to you that you shouldn't give up on your dreams just because they are difficult to achieve has led me to reach goals I otherwise would have not been able to attain.

Acknowledgments

I thank the members of my Dissertation Committee: Dr. Delroy Hunter, Dr. Jianping Qi, and especially my Dissertation Co-Chairs Dr. Christos Pantzalis and Dr. Ninon Sutton for their advice, patience, guidance and encouragement. I am also thankful for the support and counsel I received from Dr. Scott Besley, Dr. Patrick Kelly, Dr. Ziwei Xu, Dr. Donald Flagg, Amy Dunkel, and Dr. Dror Parnes.

Table of Contents

List of Tables

Abstract

Institutional investors influence corporate payout and research and development (R&D) investment policies. Higher payouts are encouraged by institutional investors, especially in firms with high free cash flow and poor investment opportunities. They also positively influence stock repurchases, particularly in firms with high information asymmetry. The substitution of stock repurchases for dividends as a percentage of total payout is encouraged by institutional investors. Institutional owners persuade firm management to increase research and development (R&D) investment overall and specifically in firms with higher stock liquidity, higher information asymmetry, lower free cash flow, and better investment opportunities. Institutional investors decrease agency costs in payout and R&D investment policy decisions.

1 Institutional Investors and Payout Policy

1.1 Introduction

Corporations have been using purposeful payout policies for quite some time (Lintner (1956)) despite the fact that, in theory, payouts should have no effect on shareholder wealth, except for perhaps negative tax consequences (Miller and Modigliani (1961) and Poterba and Summers (1984)). Furthermore, repurchases and dividends are theoretically equivalent methods of payouts except where tax differentials favor one method over the other. This raises puzzling questions articulated in Black (1976) and elsewhere as to why firms choose to make payouts, how do they decide how much to payout and which payout method to use, and what forces shape these decisions.

One force that appears to influence the payout decisions of corporate managers is institutional investors. Institutional investors are organizations that pool large sums of money which they then invest in various companies. Banks, insurance companies, mutual funds, investment advisors, pension funds, hedge funds, and university endowments are the most common types of institutional investors. Institutions have become the dominant force in corporate ownership. They owned less than 10% of all U.S. stocks in 1955, 35% in 1975, and 53% in 2000. Now, institutions own nearly 70% of the shares of U.S. corporations. The predominance of institutional investors underscores the importance of the relationship between institutional investors and corporate financial policies.

Institutional investors have been shown to affect corporate governance in many areas (See Becht, Bolton, and Röell (2003)). Institutional investors should be better corporate stewards than individual investors because they are more informed and influential. On the other hand, institutional investors are agents that may take actions for their own benefit at the expense of their principals. One example in which institutional investors seem to have failed their principals as monitors is executive compensation. Institutional ownership has grown rapidly since 1980. In the meantime, the average U.S. corporate chief executive's salary has grown from 42 times to 400 times an average worker's salary without an accompanying improvement in firm performance.[1]

Institutional investors must actively monitor management to influence financial policies effectively, but institutions with different characteristics have different incentive levels to expend costly effort to monitor. Institutional investors are likely to fill one or more of three roles in monitoring management: active monitoring, passive monitoring, or cooperating with management at the expense of other shareholders (Elyasiani and Jia (2010)). Since institutions are likely to be better informed and have larger holdings than other investors, engaging in active monitoring and positively influencing corporate governance is likely to lead to improved firm performance (Shleifer and Vishny (1986)). Passive institutional owners such as index funds and many short-term traders are likely to have little effect on corporate governance or firm performance. Chung and Zhang (2011)

[1] Bogle, John C. (2010) Restoring Faith in Financial Markets, *Wall Street Journal* (January 19).

find that institutional investors gravitate to companies with pre-existing good governance to minimize monitoring costs. Cooperating with management to exploit other shareholders is likely when the institution has a business relationship (e.g. an investment banking relationship) with the firm (Cornett et al. (2007)). In this paper, I investigate empirically if institutional investors monitor management and influence corporate payout policy. Previous theoretical and empirical work provides the basis for my investigation.

Easterbrook (1984) and Jensen (1986) develop an agency-based theory which implies that higher payouts keep managers in the capital markets where monitoring costs are lower than those alternatively incurred by current shareholders. Therefore, payouts reduce agency costs. Agency-based theory recognizes that investment policies and payout policies are not independent. Payouts serve to prevent management from investing excess free cash flow in marginal or value-reducing projects. According to agency-based theory, better informed investors, such as institutions, should encourage higher payouts in firms that are likely to overinvest. Based on this theory, I test a prediction that institutional investors will encourage firms to pay out more of their free cash flow, especially in firms with high free cash flow and poor investment opportunities.

Barclay and Smith (1988) and Brennan and Thakor (1990) construct an adverse selection theory which asserts that larger, better informed shareholders will prefer repurchases to dividends. In this theory, larger investors have a greater incentive to become informed and informed shareholders know more about a repurchasing company's true value than other investors. This knowledge can be used to profit at the expense of less informed shareholders. If the firm is undervalued, informed investors will not offer their shares for repurchase. If the firm is overvalued, informed investors will offer their shares for repurchase. Other investors don't know enough about the company to judge if it is undervalued or overvalued. Therefore after repurchases are completed, informed investors will own proportionally more of undervalued firms and proportionally less of overvalued firms. In both cases, informed investors gain at the expense of other investors.

Institutional investors are considered to be better informed and generally have larger holdings in a firm than individual investors. Therefore, according to the adverse selection theory, institutional investors should prefer repurchases. Additionally, repurchases should become a more advantageous method of payout for institutional investors as the level of information asymmetry between informed and uninformed investors in a firm grows. The prediction that I test based on the adverse selection theory is that higher institutional investor ownership leads to a higher level of repurchases, especially in firms with higher asymmetric information.

Grullon and Michaely (2002) document a rising trend in repurchases beginning in 1982 with the adoption of safe harbor provisions which removed regulatory constraints against repurchases. They state that from 1980 to 2000, repurchases grew at an average annual rate of 26.1% while dividends grew at a 6.8% rate. As a result, share repurchases as a percentage of total dividends increased from 13% to 113%. Fama and French (2001) also document an increase in repurchases during a similar time period. Skinner (2008) reports that repurchases continue to increase until the end of his study in 2004. Because of this trend, in 1998, for the first time in history, U.S. corporations distributed more cash to shareholders through repurchases than through dividends (Grullon and Ikenberry (2000)).

Fama and French (2001) also provide evidence that the number of firms paying dividends declined dramatically during the period studied. They conclude that repurchases do not explain the decline in dividends as the primary effect of increases in the use of repurchases was to increase the payout of dividend payers. In contrast, Grullon and Michaely (2002) find evidence consistent with a substitution effect. They argue that firms are increasingly using funds for repurchases that would have otherwise been used for dividends. They note that their results differ from those of Fama and French’s because the measure of repurchases used by Fama and French includes not only repurchase activity, but also stock options used for payment to labor and new equity issuance.

If institutional investors prefer repurchases to dividends as predicted by the adverse selection theory and they therefore encourage repurchases over dividends as a percentage of total payouts in the firms they own, institutional investors may be the impetus behind the increase in repurchases as a percentage of total payout documented in Grullon and Michaely (2002). Consequently, I test a substitution hypothesis that institutional investors encourage a higher level of repurchases as related to dividends in the total payout composition. This conjecture expands on the adverse selection theory by not only predicting that institutional owners will encourage repurchases, but that they will encourage them at the expense of dividends.

My results provide support for all three of the propositions that I examine: agency-based theory, adverse selection theory, and the substitution hypothesis. I find that an increase in institutional ownership leads to a rise in a firm's total payout in the subsequent year, especially in firms with high free cash flow and poor investment opportunities. This indicates that institutional investors induce managers to make payouts in firms which are likely to otherwise overinvest thus reducing agency costs. This result provides support for the agency-based theory.

I also find that changes in institutional ownership have a positive relationship to subsequent stock repurchase activity, especially in firms with high information asymmetry. It could be argued that this indicates that institutional investors encourage higher repurchases for tax reasons, but that would not explain why institutions encourage repurchases more in firms with higher information asymmetry. It appears that institutional investors are using their information advantage to profit at the expense of other less informed investors thus providing evidence for the adverse selection theory.

My final result indicates that higher institutional ownership leads to a higher percentage of the total payout composition going to repurchases. Consequently, this leads to a lower percentage of the total payout mix going to dividends. This offers support for the substitution hypothesis and suggests that institutional owners are at least partially responsible for the increase of repurchases in relationship to dividends found in Fama and French (2001) and

Grullon and Michaely (2002). The empirical results on the relationship between institutions and dividends are not shown because, as in Grinstein and Michaely (2005), I do not find any evidence that institutional investors influence dividends. Therefore, the positive effect which I find that institutional owners have on total payout is entirely attributable to their positive effect on repurchase levels.

The prevalence of institutional investors and the potential impact of their superior monitoring ability highlight the importance of institutional investors to corporate payout policies. In this paper, I investigate empirically the relationship between institutional investors and payout policy. The primary contribution of this paper is that I determine that institutional investors are a driving force behind the increased use of stock repurchases by U.S. corporations as a means of payout and as a percentage of total payout. Additionally, I find that institutional investors encourage repurchases primarily in firms in which they have an informational advantage and higher total payouts predominantly in firms that should increase their payouts to avoid agency problems.

1.2 Literature Review and Hypotheses

1.2.1 Literature Review

Grinstein and Michaely (2005) conduct an investigation into the relationship between institutional investors and payout policy that is similar to mine. They find that low-dividend yielding stocks have higher institutional ownership than high-dividend yielding stocks. They also find that dividend-paying firms have higher institutional ownership than non-dividend-paying firms. Their results indicate that institutions do not prefer dividends, but that they hold firms that pay dividends to comply with prudent-man rule regulations. They find no evidence that institutions influence dividends. They also find that institutions prefer firms that repurchase shares, especially if they regularly repurchase. Finally, they find that institutional investors do not influence repurchases or total payouts. This final result is at odds with my findings.

I can offer some explanations for the discrepancies between their results and mine. One likely explanation is that my definition of repurchases differs from theirs. My definition is similar to that used by Fama and French (2001). I define repurchases as the dollar amount of stock repurchases minus the dollar amount of stock issues. I reason that if a firm repurchases a dollar's worth of stock in the same time period as the firm issues a dollar's worth of stock, then the firm has not really repurchased any shares at all. I also contend that the concept of negative repurchases is not valid for the purposes of my investigation. Therefore, if the value of stock issued is more than the value of that repurchased, I define repurchases as being equal to zero. In contrast, Grinstein and Michaely do not subtract stock issues from stock repurchases. They do not offer an explanation for this definition, but it is likely that their reasoning follows that expressed by Grullon and Michaely (2002) who argue that new equity issuance and stock options used for payment to labor should not be included in repurchase calculations.

Another possible explanation for the difference in our results is that when they look at total payouts they only include firms in their sample that pay dividends and I include all firms without regard to their payout policies. Also, the sample they analyze concludes in 1996 while my sample runs through 2005. This is important because, as previously noted; repurchases have become a comparatively more important payout method over time.

There are also some methodology differences. My primary methodology uses change regressions. They use change regressions that are very similar to mine, except they use a one-digit SIC code and a time period binary variable that differentiates their sample into two time periods. I use firm fixed effects and a dummy variable for every year. Their vector-autoregressive (VAR) methodology is quite similar to the Generalized Method of Moments (difference GMM) methodology I use for robustness, but there is one important difference. They use the *level* of total payouts as the dependent variable and the *level* of institutional holdings as the independent variable while I use the *change* in total payouts and institutional holdings. I used levels instead of changes to compare my outcomes to theirs and I obtained inconclusive results which were similar to theirs.

Shleifer and Vishny (1986) and others have theorized that large investors such as institutions are important monitors of firm management. Institutional investors can influence management through methods such as proxy votes, shareholder proposals, publicity generation and the threat of “voting with their feet” thus depressing stock share price as the shares are sold.

Graham, Harvey, and Rajgopal (2005) survey and interview CFOs who view institutional investors as the most important marginal investors. These CFOs point out that institutional investors are important because they can lower stock price by herding out of a stock after an earnings miss or they can provide easier access to capital leading to a lower future cost of capital if they are pleased with firm management. There is evidence that the simple act of selling shares can lead to governance changes that better discipline management (Gillan and Starks (2007)). Shareholder proposals sponsored by institutions get more votes and a more positive stock price reaction (Gillan and Starks (2000)). Carleton, Nelson, and Weisbach (1998) show how one institution, TIAA-CREF, had a high degree of success in influencing management through private negotiations.

There is ample evidence that institutions influence firm corporate governance and financial policies in a variety of areas. Institutional shareholders have been shown to: reduce empire building behavior in capital expenditures and acquisitions (Xu (2008)), positively influence terminations of poorly performing CEOs and firm valuation over time (Aggarwal et al. (2010)), have a positive impact on R&D and its productivity (Aghion, Van Reenen, and Zingales (2009)), and lower borrowing costs when using bonds (Bhojraj and Sengupta (2003)). There is also evidence that monitoring by institutional investors: leads to higher firm valuations and better operating performance (Ferreira and Matos (2008)), discourages earnings management (Cornett, Marcus and Tehranian (2008) and Chung, Firth, and Kim (2002)), improves return on assets (Elyasiani and Jia

(2010)), and improves pay-for-performance sensitivity of executive compensation (Hartzell and Starks (2003)).

Ajinkya, Bhorjraj, and Sengupta (2005) find that firms with greater institutional ownership are more likely to issue earnings forecasts and that these forecasts are more likely to be accurate. Cornett et al. (2007) find a positive relationship between institutional ownership and operating cash flow returns (though just for institutions with no business relationship with the firm). Foreign institutional ownership increases the probability of successful cross-border mergers (Ferreira, Massa, and Matos (2010)). Institutional owners use their influence over management to use larger audit firms because such firms are perceived to provide higher quality audits (Kane and Velury (2004)).

There is some evidence that institutions can have a negative effect on corporate governance or fail to monitor management effectively. Burns, Kedia, and Lipson (2010) find that institutional ownership is positively related to financial misreporting overall, although this relationship can be modified by the nature of the institutional owner. Fidrmuc, Goergen, and Renneboog (2006) discover that stock market reaction to U.K. insider transactions is higher when the dominant shareholders are institutions. They argue that this indicates that institutions do not monitor effectively or mitigate asymmetric information problems in the U.K.

Several studies have found a relationship between institutional investors and payout policies. Lie and Lie (1999) contend that managers are more sensitive to shareholders' tax situations if institutions own a higher percentage of the firm's shares indicating that institutions have more influence on management than other owners. Jagannathan, Stephens, and Weisbach (2000) find higher institutional ownership in firms that are increasing payouts, especially if the increased payout comes in the form of dividends. They explain that tax-exempt institutions that do not share in the tax benefits of repurchases may be behind the preference for increased dividends. It is also likely that prudent investor rules could be the cause of the preference for firms that increase dividends. Hankins, Flannery, and Nimalendran (2008) document that institutions have reduced their holdings in dividend-paying stocks as the “prudent investor” rule replaced the more-stringent “prudent man” rule in most states during the 1990s. Sulaeman (2008) proposes that management reacts to institutional investors’ leverage preferences by using repurchases to increase firm leverage if the firm’s current leverage is below the aggregate preference of its institutional shareholders. DeAngelo, DeAngelo, and Skinner (2000) assert that special dividends are declining because institutional ownership levels are rising and the informational advantage of institutional investors allows them to discern that special dividends are not generally economically different from regular dividends.

Financial research offers many theories as to why firms make payouts, how payout levels are determined and why different groups of investors appear to prefer payouts including psychological explanations, firm quality signaling, cash flow uncertainty motivations, agency theories, and clientele effects. Shefrin and Statman (1984) argue that investor preference for cash dividends is a psychologically driven result of self-control problems and regret aversion.

Firms may be attempting to signal future profitability by making payouts (Bhattacharya (1979) and Miller and Rock (1985)). Ofer and Thakor (1987) develop a model in which firms signal their true value using dividends, repurchases or both. Vermaelen (1984) theorized that repurchases could be used as a credible signal of firm quality as managers of inferior firms could not mimic this signal without decreasing the value of their untendered shares. There is evidence that signaling is occurring, although its effectiveness is questionable. Massa, Rehman, and Vermaelen (2007) demonstrate that a firm provides a positive signal about itself and a negative one about its competitors when it repurchases shares. This induces competing firms to make repurchases too in an attempt to mimic the signal.

Several recent studies are not supportive of signaling theory. Amihud and Li (2006) find that abnormal returns on dividend announcements have declined through the years as the level of institutional ownership has risen. They argue that since institutional investors are better informed the information content of dividend announcements has fallen. Therefore, firms have chosen to pay fewer dividends because the advantage of using them as costly signals of firm quality has fallen. The international study of Denis and Osobov (2008) casts doubt on the use of dividends to signal because dividends are primarily paid by firms that need to signal profitability the least (i.e. firms with the highest earnings). Li and Zhao (2008) find that firms with higher information asymmetry are less likely to repurchase stock or pay, initiate, or increase dividends.

Fuller and Blau (2010) find some support for signaling theory in their proposal that different explanations for dividends are needed for different kinds of firms. They find that high quality firms pay dividends to dispose of excess free cash-flow while lower quality firms pay dividends to signal future earnings and reduce excess free cash flow. Their results also apply to total payout and repurchases.

Several studies have determined that free cash flow levels and composition are related to payouts. Firm management appears to consider the permanence of cash flows when considering whether to make payouts and the payout method to employ. Guay and Harford (2000) and Jagannathan, Stephens, and Weisbach (2000) demonstrate that firms choose dividend increases to distribute relatively permanent cash flow changes and repurchases to distribute temporary cash flow increases. Their evidence appears to be related to the finding of Chay and Suh (2009) of a cash-flow uncertainty effect on dividends that is unrelated to firm maturity. They conclude that this cash-flow uncertainty effect is stronger than agency or investment opportunity explanations for dividends. There may be an interaction between the permanence of cash flows and the quality of corporate governance. Harford, Mansi, and Maxwell (2008) find that firms with weaker governance (as measured by anti-takeover provisions and inside ownership) avoid future payout commitments by using repurchases in lieu of dividend increases.

Agency-based theories (Easterbrook (1984) and Jensen (1986)) propose that payouts can be used to mitigate potential overinvestment or empire building problems. Grullon, Michaely and Swaminathan (2002) offer a "maturity hypothesis" to explain payouts linking the decision to pay dividends (or repurchase) with a firm's age and resultant decline in risk and investment opportunities. Grullon and Michaely (2004) find that repurchase announcements get a more positive reaction among firms that are likely to overinvest. They interpret this as indicating that these firms are signaling a reduction in agency costs. Similarly, Officer (2010) finds that dividend initiations get higher announcement returns in firms with poor investment opportunities and high cash flow. In tests on 4,000 companies from 33 countries, La Porta et al. (2000) offer support for an agency model that they call the "outcome model". In this model, firms make payouts because the opportunities to steal or misinvest are legally restrained and minority investors are powerful enough to extract the payments. Gugler (2003) provides evidence that Austrian firms that do not have good growth prospects make payouts. He finds that changes in dividends result in an almost equal and opposite change in R&D and capital investment indicating that payouts compete with R&D and capital investment for internal cash flows.

If management's decision to make a payout and the form of that payout (dividend or repurchase) is influenced by the characteristics of current stockholders or the type of stockholders that management wants to attract, the firm is said to be influenced by a clientele effect. Lee et al. (2006) find evidence of a clientele effect in their study of Taiwanese firms. After legalization of repurchases in Taiwan in 2000, firms with more heavily taxed shareholders were more likely to begin repurchases. This shows that management was both cognizant of and deferential to their shareholders' preferences or that management was pressured by shareholders to adopt a given payout policy.

Many financial researchers have investigated how clientele effects relate to institutional shareholders. This is true despite the finding of Brava et al. (2005) that many financial executives believe institutions are indifferent between dividends and repurchases. On the other hand, Jain (2007) finds that firms that repurchase more have higher institutional ownership and concludes that the institutions are attracted by the repurchasing. Bartov, Krinsky, and Lee (1998) find in a study of matched firms that firms with higher levels of institutional holdings repurchase more shares. They note that many prominent institutional investors, notably Fidelity, have openly expressed their preference for stock repurchases over dividends. They also explain that this preference is logical since institutions may be acting as good stewards for their investors whose income is taxable by reducing their taxes through the substitution for repurchases in place of dividends.

Tax differentials among varied classes of investors play a key role in clientele effects. Scholz (1992) finds that individual investors consider dividend yield and their personal tax situation when choosing investments providing evidence of a dividend clientele effect. Lie and Lie (1999) show that managers are more likely to choose repurchases as a means of payout if their firm has a low dividend yield indicating that they are sensitive to the tax implications of payouts to their shareholders. Allen, Bernardo, and Welch (2000) find that institutions prefer dividends because dividends are taxed for individuals but are often untaxed for institutions. Dhaliwal and Li (2006) results support this view in that excess trading volume around ex-dividend days is driven by tax-advantaged institutional investors such as pensions trading with tax-disadvantaged individuals. Their results also highlight the important insight that institutional shareholders are not necessarily homogenous. Therefore, clientele effects may differentiate between different types of institutional shareholders. Moser (2007) differentiates between classes of institutional investors and finds that firms increase the percentage of payouts that go towards repurchases as tax-disfavored institutional ownership increases, but decrease the percentage as tax-favored institutional ownership increases.

Renneboog and Trojanowski (2010) report a result that is inconsistent with tax-clientele explanations for payouts. They find that tax-exempt financial institutions in the U.K. prefer repurchases over dividends. On the other hand, this result is consistent with the adverse selection theory because the tax-exempt institutions' informational advantage over other less informed investors could allow them to profit from repurchases at the expense of the other investors.

The 1982 adoption of safe harbor provisions in the U.S. which made it considerably easier for firms to repurchase larger quantities of their own shares led to an upsurge in repurchases. Because of the increase in repurchases, the amount of funds dispersed to shareholders in the U.S. through repurchases now supersedes the amount of funds paid out through dividends. Dividends also seem to be declining, but the evidence on this has been the subject of some debate.

Skinner (2008) finds that there are now three main types of firms that make payouts: dividend payers that make regular repurchases, regular repurchasers, and occasional repurchasers. Firms that only pay dividends are now extremely rare. He argues that repurchases are fundamentally determined by earnings and they are increasingly replacing dividends, even for firms that still pay dividends.

Other research also supports the view that repurchases are replacing dividends. Grullon and Michaely (2002) argue for this view and find that the stock market reaction to dividend cuts is much less negative for firms that are repurchasing shares. Li and Zhao (2008) find that firms are less likely to increase dividends if they repurchase more. Brockman, Howe, and Mortal (2008) contend that managers prefer repurchases to dividends because of tax and flexibility advantages, and rising stock market liquidity has enabled them to make repurchases their payout method of choice. Banerjee, Gatchev, and Spindt (2007) propose that stock market liquidity and dividends are viewed as substitutes by investors. Therefore, the decline in the propensity to pay dividends can largely be explained by rising stock market liquidity. Notably, they find that changes in repurchase and institutional ownership are not responsible for the decline in dividends.

On the other hand, there is evidence that while repurchases are rising, they are not acting as substitutes for dividends. Fama and French (2001) find that fewer firms are paying dividends, but they argue that repurchases are not replacing dividends because repurchases are primarily being used to increase the payout of dividend payers. DeAngelo, DeAngelo, and Skinner (2000) report that the disappearance of special dividends does not appear to be related to increases in repurchases. Denis and Osobov (2008) conclude that repurchases are not being substituted for dividends in their study of international firms.

There also appears to be some question as to whether firms are actually paying out less in dividends and more in repurchases when adjusted for firm characteristics. DeAngelo, DeAngelo, and Stulz (2006) argue that dividends are disappearing. They report a strong association between a company's earned/contributed equity mix, which they use as a proxy for the life-cycle stage of a company, and dividends. They find that when controlling for a firm's life-cycle stage that the decline in dividends is even more pronounced than the one found by Fama and French. Eije and Megginson (2008) provide evidence that dividends are declining and repurchases are growing in 15 European Union countries. They find that a firm's life-cycle stage is not related to dividends in 15 European Union countries, although the age of the firm is associated with increased cash payouts.

Grullon et al. (2010) find that the propensity to pay using either dividends or repurchases or both has been relatively constant over the last 30 years with net payouts actually increasing over time when adjusted for firm characteristics. Denis and Osobov (2008) also find that aggregate dividends have not declined in an international study. Boudoukh et al. (2007) show that payout yields have replaced dividend yields as a significant predictor of equity returns after the enactment of the safe harbor provisions indicating the rising importance of repurchases and a relative stability in total payouts. DeAngelo, DeAngelo, and Skinner (2004) argue that aggregate real dividends paid by industrial firms have actually increased even though dividend payers have decreased. They find that the reduction in payers comes from firms that paid very small dividends and that the increase from the big dividend payers overwhelms the dividends not paid by the minor payers.

Baker and Wurgler (2004) present a theory that managers cater to investors by paying dividends when investors put a premium on dividend-paying stocks and by not paying dividends when investors prefer non-payers. They establish an empirical link between such catering and the change in propensity to pay dividends found in Fama and French (2001). Li and Lie (2006) extend the catering theory by finding support for the assertion that managers consider investor demand for dividends when changing existing payouts. They find that managers increase dividends when the dividend premium is high and increase repurchases when the dividend premium is low. Hoberg and Prabhala (2009) argue that such catering does not occur if adjustments for firm risk as proxied by stock price volatility are made. Hoberg and Prabhala (2009) find that approximately 40% of the disappearing dividends documented in Fama and French (2001) can be explained by firm risk as proxied by stock price volatility. Ferris, Jayaraman, and Sabherwal (2009) provide evidence of catering in common law countries, but not in civil law nations. Eije and Megginson (2008) demonstrate that dividend catering is not occurring in 15 European Union countries.

1.2.2 Hypotheses

Agency costs are incurred by investors when a firm's management uses its superior knowledge of the firm's business activities to make decisions that benefit management at the expense of shareholders. Agency-based free cash flow theory (Easterbrook (1984) and Jensen (1986)) suggests that firms with higher free cash flow and poor growth opportunities should have higher payouts (through higher dividends or stock repurchases). The higher payouts serve to prevent management from using discretionary funds to invest in projects that provide less benefit to shareholders than the higher payouts do. Therefore, institutional shareholders should attempt to reduce agency costs by encouraging management to raise payouts.

Agency-based theory implies that larger institutional investor holdings will lead to higher payouts. The relationship predicted by this theory should be stronger in firms with high free cash flow and poor investment opportunities. My first hypothesis is derived from the agency-based theory:

> **H1**: Greater institutional investor holdings will lead to *higher* payouts (through dividends or repurchases), especially in firms with high free cash flow and poor investment opportunities.

The adverse selection theory of Barclay and Smith (1988) and Brennan and Thakor (1990) asserts that stock repurchases create an opportunity for more informed shareholders to profit at the expense of less informed shareholders. In this theory, more informed investors can more capably ascertain the true value of the firm. If the firm is undervalued, more informed investors will not offer their shares for repurchase. If the firm is overvalued, more informed investors will offer their shares for repurchase. Less informed investors don't know enough about the company to judge if it is undervalued or overvalued.

Since the managers of a firm should be at least as well informed as institutional shareholders, the adverse selection theory relies on the presumption that managers will sometimes knowingly offer to repurchase shares that are overvalued. This is counterintuitive behavior that implies management is intentionally reducing the value of their firm. Yet, there is evidence that management engages in such behavior. D'Mello and Shroff (2000) find that insiders are net sellers in the year before repurchases of overvalued firms, while they are net buyers in the year before repurchases of undervalued firms. This evidence indicates that insiders are more knowledgeable about the true value of their firm and that they do sometimes conduct repurchases even though they are aware their firm is overvalued. D'Mello and Shroff (2000) provide one possible explanation for this behavior. They note that repurchases have been used to defend against hostile takeovers by increasing leverage and reducing the liquidity of the stock. In this case, management benefits from repurchasing overvalued shares because they are more likely to retain their lucrative executive positions if the hostile takeover does not occur.

The adverse selection theory predicts that institutional investors will prefer repurchases if they are more informed than other investors about a firm's true value. Previous research indicates that institutional investors are better informed than other investors. For example, Bennet, Sias, and Starks (2003) find that institutional investors have an informational advantage over other shareholders which varies with firm characteristics and information asymmetry. Institutions also have an informational advantage in newly public firms (Field and Lowry (2009)) and seasoned equity offerings (Chemmanura, He, and Hu (2009)) which is largely the result of better analysis of publicly available information.

According to the adverse selection theory, institutional shareholders prefer repurchases because their informational advantage allows them to ascertain the value of their shares more accurately than other shareholders. If a firm is difficult to value accurately, it is said to have higher information asymmetry (a larger information gap between informed and uninformed investors). Therefore, if the adverse selection theory holds, institutional investors should favor repurchases more in firms that have a higher degree of information asymmetry.

If institutions prefer repurchases equally in all firms, this could provide support for the adverse selection theory, but it also may provide evidence that institutions prefer repurchases for other reasons. For example, Bartov, Krinsky, and Lee (1998) find in a study of matched firms that firms with higher levels of institutional holdings repurchase more shares. They argue that institutions prefer repurchases over dividends to lower the tax burden on their taxable shareholders. Their reasoning can explain a preference for repurchases by institutions, but unlike the adverse selection theory, this tax effect should not be more pronounced in firms with higher information asymmetry. My next hypothesis is based on the adverse selection theory:

H2: Higher institutional investor ownership leads to a higher level of repurchases, especially in firms with higher asymmetric information.

If institutional investors prefer repurchases to dividends as predicted by the adverse selection theory, institutional investors may be the driving force behind the gradual substitution of repurchases for dividends found by Grullon and Michaely (2002). As a result, institutional investors may encourage repurchases over dividends as a method of payout. This substitution hypothesis predicts that an increase in institutional ownership will lead to an increase in repurchases as a percentage of total payout.

H3: Higher institutional investor ownership leads to a higher percentage of total payout going toward repurchases and a lower percentage of total payout going towards dividends.

An endogenous relationship exists between institutional investors and payout policy so simply showing a relationship between institutional investors and payout policy will not provide sufficient evidence to support any of the payout policy theories presented in this paper. Causality is also important. The causal relationships in the payout policy theories state that all else being equal: agency-based theory predicts that institutional investor changes influence total payout (dividends and stock repurchases) policy changes, adverse selection theory predicts that institutional investor changes influence stock repurchase policy changes, and the substitution hypothesis states that institutional investors have a positive influence on the percentage of total payout which is made up of stock repurchases.

1.3 Data, Methods, and Summary Statistics

1.3.1 Data and Methods

I gather yearly institutional and insider ownership data from CDA / Spectrum Compact Disclosure for each year from 1990 to 2005. Financial firms and utilities are excluded because they are highly regulated by the government. The ownership data is then merged with Compustat data. The final sample includes 10,668 firms and 79,890 firm-years. Some firms are missing data or not present in the sample for enough firm-years to perform certain analysis. In such cases, they are not used.

Annual dividends and stock repurchases are measured in dollars and scaled by the dollar book value of assets. Repurchases are defined as the dollar amount of stock repurchases minus the dollar amount of stock issues. If stock issues are greater than stock repurchases, the repurchase amount is set to zero. Changes in repurchases are measured as the repurchases of the current year minus repurchases of the previous year, divided by previous year book value of assets. Changes in dividends are measured similarly. Total payout is defined as the sum of the dollar value of common dividends and repurchases.

Fama and French (2001) find in a study of U.S. firms that dividends are trending through time. They also find that firm profitability, size and growth opportunities are related to dividends. Therefore, I control for differences across firms using variables that control for these relationships. Profitability is proxied by earnings before interest and taxes scaled by total assets. Size is measured using log of market value and log of revenue. I use q to control for growth opportunities. Following Dlugosz et al. (2006), I calculate the variable q as the ratio of the market value of assets to the book value of assets where market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock and deferred taxes. All regressions include dummy variables for each year of the data sample to control for time effects on the relationship between institutional ownership and payouts.

DeAngelo, DeAngelo, and Stulz (2006) report a strong association between a company’s earned/contributed equity mix, which they use as a proxy for the life-cycle stage of a company, and dividends. Therefore, the earned/contributed equity mix defined as retained earnings to the book value of total equity is used to control for firm life-cycle stage. Firm stock turnover is included as a control because Banerjee, Gatchev and Spindt (2007) find that turnover is related to dividends. Jensen (1986) proposes debt can substitute for dividends, so firm debt to asset ratio is included.

The measure of cash flow used in my analysis of agency-based free cash flow theory is net income plus depreciation and amortization minus capital expenditures. Notably, this cash flow measure does not subtract dividends or repurchases as many measures of cash flow do. This is done to simplify the analysis of dividends, repurchases or payouts as a percentage of free cash flow. The cash flow measure is divided by total book value of assets to provide scale. The detailed definitions of all variables are shown in Table 1 - 1.

If there is a relationship between institutional investors and payouts, it is difficult to discern if institutional investors influence payouts or if payouts influence institutional investors or both. Therefore, I have to adopt a regression methodology which accounts for endogeneity and establishes causality.[2]

To help address this causality issue, I run regressions on changes in dependent variables from year t – 1 to t on changes in independent variables from t – 2 to t – 1 to establish causality. All regressions use firm fixed effects. Firm fixed effect regressions are useful because they control for all stable characteristics of a firm (including industry), whether measured or not. This appealing feature of firm fixed effects regressions combined with the use of yearly dummy variables to control for time-varying omitted characteristics helps to control for endogeneity issues in my analysis. Using the yearly dummy

[2] I attempted two-stage least squares' (instrumental variables) regressions but was unable to come up with instrumental variables which were statistically and conceptually sound.

variables with fixed effects effectively gives each year its own intercept. Intercepts in fixed effects regressions are calculated as an average value of the unobserved fixed effects for each firm which is not relevant in my analysis. The yearly intercept values are also not relevant to my analysis. Therefore, the intercept term and yearly dummy coefficients are not reported in my regression results.

It is highly probable that the relationship between institutional ownership and payouts is an endogenous one. Although I use control variables in the change regressions to control for endogeneity, it is still desirable to use an alternate method to further address potential endogeneity. Therefore, I also use the Arellano and Bond (1991) difference Generalized Method of Moments (difference GMM) methodology. This methodology is ideal for use in panel samples with a limited number of time periods and a large number of firms. Difference GMM is useful when independent variables are not strictly exogenous and when firm fixed effects exist. An in-depth explanation of the difference GMM method used in this paper is included in Appendix C.

1.3.2 Summary Statistics and Data Correlations

Table 1 - 2 displays selected firm characteristics for my sample. Panel A includes all firms in the sample and panel B includes only firms that have a payout (either dividends or stock repurchases or both). Statistics are shown for

two time periods, 1990 – 1997 and 1998 – 2005, and for the total sample. Means are shown and medians are shown in parentheses below.

Some patterns appear in the data for all firms and in firms with a payout. The percentage ownership of institutional investors (*Inst*) increases over time. Firm size (*MktCap*) and *q* increase from the first time period to the next as well. Retained earnings to total equity (*LifeCycle*), a proxy for firm life-cycle, indicates that firms included in the sample are less mature in the later years. The median firm retained earnings to total equity is positive demonstrating that in most firm-years, firms are mature enough to have earned positive earnings during their lifetime. In contrast, the average retained earnings to total equity is negative indicating a skewness towards the large minority (over 38%) of the firm-years with negative retained earnings.

Firms with a payout have higher institutional ownership, a larger size and a lower *q* than those without a payout. Firms that have a payout have a higher median and slightly lower mean in retained earnings to total equity.

Table 1 - 2 also displays summary statistics for payout-related variables in Panels C and D. Only means are shown because medians are zero for almost all of the variables. As expected, all payout variables are lower in Panel C which includes all firms than in Panel D which only includes firms that have a payout. Consistent with Fama and French (2001), dividends to assets (*Div*) goes down over time as repurchases to assets (*Repurch*) goes up. Total payout increases (*PayIncr*) outnumber total payout decreases (*PayDecr*). The percentage of firms

increasing repurchases per share (*RepIncr*) is higher than the percentage of firms decreasing repurchases per share (*RepDecr*).

Table 1 - 3 presents a correlation table for selected firm variables which are important in my analysis. Correlations that are significant at the 5% level are marked with an asterisk. Total payout to assets (*Payout*) is significantly positively correlated with repurchases to assets (*Repurch*), institutional ownership (*Inst*) and market value of common stock (*MktCap*). Repurchases to assets is significantly positively correlated with institutional ownership and market value of common stock.

Institutional ownership is significantly positively correlated with market value of common stock and negatively correlated with Tobin's *q* (*q*). Market value of common stock, retained earnings to total equity and Tobin's *q* are all not significantly correlated with each other.

Table 1 - 1: Variable Definitions - Payouts

Variable	Description	Definition
Panel A: Summary Statistics and Correlation Table Variables		
N	Number of Firms	The number of firms.
Inst	Institutional Ownership	The fraction of shares owned by institutions.
MktCap	Market Capitalization	The dollar market value of common stock in millions.
LifeCycle	Firm Life-cycle	The ratio of retained earnings to total equity.
q	Investment Opportunities	Market value of assets to the book value of assets
CashFlow	Free Cash Flow	Free cash flow to total assets.
Div	Dividend Ratio	Dividends to book value of assets.
Payout	Payout Ratio	Total payout divided by book value of assets.
Repurch	Stock Repurchase Ratio	Stock repurchases to book value of assets.
PayIncr	Payout Increases	The percentage of firms which increased their total payout per share.
PayDecr	Payout Decreases	The percentage of firms which decreased their total payout per share.
RepIncr	Stock Repurchase Increases	The percentage of firms which increased their repurchases per share.
RepDecr	Stock Repurchase Decreases	The percentage of firms which increased their repurchases per share.
Panel B: Regression Dependent Variables (Measured as changes in values from year *t* – 1 to *t*.)		
Payout	Payout Ratio	Total payout divided by book value of assets.
Repurch	Stock Repurchase Ratio	Stock repurchases to book value of assets.
Panel C: Regression Independent Variables (Measured as changes in values from year *t* – 2 to *t* - 1.)		
Inst	Institutional Ownership	The fraction of shares owned by institutions.
CashFlow	Free Cash Flow	Free cash flow to total assets.
q	Investment Opportunities	Market value of assets to the book value of assets
Debt	Debt Ratio	Debt to assets.
Turnover	Stock Turnover	Firm common stock turnover.
LifeCycle	Firm Life-cycle	The ratio of retained earnings to total equity.
MktCap	Market Capitalization	The dollar market value of common stock in millions.
ROA	Return on Assets	Earnings before interest and taxes divided by total assets.
Insider	Insider Ownership	The fraction of shares owned by insiders.
Insider2	Insider Ownership Squared	The squared value of Insider.
Revenue	Revenue	The logarithm of firm revenue.

Table 1 - 2: Summary Statistics

Panel A: All Firms						
Years	***N***	***Inst***	***MktCap***	***LifeCycle***	***q***	***CashFlow***
1990 - 1997	37,492	28.9%	2,106	-0.69	2.81	-0.16
		(23.6%)	(163)	(0.29)	(1.85)	(0.01)
1998 - 2005	42,398	33.3%	4,891	-0.53	4.68	-0.39
		(25.8%)	(350)	(0.18)	(1.86)	(0.01)
Total	79,890	31.3%	3,603	-0.61	3.81	-0.28
		(24.6%)	(239)	(0.24)	(1.85)	(0.01)
Panel B: Firms with a Payout						
1990 - 1997	13,934	37.9%	4,858	0.46	2.07	0.03
		(38.0%)	(547)	(0.64)	(1.75)	(0.04)
1998 - 2005	15,716	42.8%	10,806	-1.49	2.22	0.02
		(43.9%)	(1,146)	(0.57)	(1.75)	(0.04)
Total	29,650	40.5%	8,030	-0.57	2.15	0.02
		(40.4%)	(816)	(0.61)	(1.75)	(0.04)

Panel C: All Firms						
Years	***Div***	***Repurch***	***PayIncr***	***PayDecr***	***RepIncr***	***RepDecr***
1990 - 1997	0.81%	0.60%	24.80%	18.70%	13.66%	12.79%
1998 - 2005	0.66%	1.04%	24.57%	20.65%	17.56%	16.58%
Total	0.73%	0.83%	24.67%	19.78%	15.82%	14.89%
Panel D: Firms with a Payout						
1990 - 1997	2.21%	1.64%	65.60%	33.06%	35.82%	21.84%
1998 - 2005	1.80%	2.82%	64.70%	34.83%	45.65%	26.90%
Total	2.00%	2.26%	65.10%	34.04%	41.29%	24.66%

Panels A and B, show means on the first row and medians in parentheses on the second row. In Panels C and D, means are shown.

Table 1 - 3: Correlations

	Payout	***Repurch***	***Inst***	***MktCap***	***LifeCycle***	***q***
Repurch	0.6528*					
Inst	0.0801*	0.0957*				
MktCap	0.0539*	0.0332*	0.0865*			
LifeCycle	0.0008	0.0004	0.0013	0.0009		
q	-0.0025	-0.0023	-0.0135*	-0.0019	0.0013	
CashFlow	0.0032	0.0024	0.0232*	0.0023	-0.0008	-0.4194*

* indicates two-tailed significance at 5%.

1.4 The Effect of Institutional Owners on Total Payouts

1.4.1 Do Institutional Owners Influence Total Payouts?

According to the agency-based free cash flow theory, current institutional owners positively influence future total payouts (dividends and repurchases). Since I have no predictions on how payouts affect institutional holdings, I only analyze the effect of institutional ownership on payouts. Institutional investor ownership and payout levels are almost certainly endogenously related. Firms with higher payout levels tend to have higher institutional ownership levels, so I need to combat the effect that this endogenous relationship has on my analysis. Therefore, I test the effect that changes in institutional ownership have on subsequent changes in payouts rather than looking at their levels.

To test the effect that changes in institutional ownership have on changes in payouts in the subsequent year, the following firm and year fixed effects model is estimated.

(1-1) $$Payout_{it} = Year_t + Firm_i + Inst_{it-1} + \beta \bullet Control_{it-1} + \varepsilon_{it}$$

$Payout_{it}$ represents the firm's payout to asset ratio. $Year_t$ represents year fixed effects and $Firm_i$ represents firm fixed effects. $Inst_{it-1}$ is the percentage of the firm's shares owned by institutional investors. $Control_{it-1}$ represents a vector of time-varying firm level control variables (*q*, debt, stock turnover, retained earnings to total equity, log of market capitalization, ROA, insider ownership, insider ownership squared, and log of revenue), and ε_{it} is the error term.

The independent variables are measured as the change from year *t* – 2 to year *t* – 1. The dependent payout variable is measured as the change from year *t* - 1 to year *t*.

Table 1 - 4 reports on the effect that changes in institutional ownership have on total payout to assets ratios (*Payout*) in the subsequent year using firm and year fixed effects model (1-1). The first regression only uses the control variables as independent variables. The statistically significant coefficients indicate that payouts increase as *q* decreases, debt decreases, market capitalization increases, and return on assets decreases. Payouts also increase for small decreases in insider ownership. The control variable results remain largely consistent in the other regressions shown in the table.

The second regression includes the variable (*Inst*) representing the change in the percentage of institutional ownership. The statistically significant coefficient shows that an increase in institutional ownership leads to an increase in payout levels in the subsequent year.

Statistical significance is important to my analysis, but practical (or economic) significance is as well. Therefore, I use an example to give some perspective as to the magnitude of the effect of institutional ownership on payouts. For this example, I use a hypothetical firm with an institutional ownership percentage (40%) and a payout to assets ratio (1.900%) quite close to the sample median for firms with payouts. It is important to note for this analysis that institutional ownership percentage is measured from 0% to 100% (or 0 to 1). Using the coefficient in the second regression (0.0106), a rise from 40% to 50% institutional ownership should lead to an additional 0.106% in the payout ratio, all else being equal. In this example, the firm's payout ratio would subsequently increase from 1.900% to 2.006%.

Institutional ownership percentages are higher in firms with payouts than in firms without payouts. Therefore, the results discussed thus far could be influenced by the tendency of institutional investors to invest more in firms that had a payout. To attenuate that influence, the third regression is ran only on firms that did not have a payout in year $t - 2$. Regression (3) shows that institutional owners have a significantly positive effect on future payouts in firms that did not have a payout in the previous year. The fourth regression shows that an increase in institutional ownership leads to an increase in payouts among firms that had a payout in the previous year as well. In this case though, the t-statistic shows that the coefficient falls just a little short of the 10% significance level (with a p-value of 0.103).

Institutional investors use their influence to raise total payouts. Results for robustness checks using the Arellano and Bond (1991) difference Generalized Method of Moments (difference GMM) methodology to further control for endogeneity and using data from the years 1990-1997 and 1998-2005 separately confirm this finding. Robustness tests are shown and discussed in Appendix A.

1.4.2 Are Potential Agency Problems a Factor?

According to agency-based theory, institutional investors should not only encourage higher payouts, they should encourage higher payouts primarily in firms with poor investment opportunities. I test this prediction using *q* as a proxy for investment opportunities. I sort the sample of firms each year into investment opportunity deciles. I assign each firm-year to one of three groups. Firms in the bottom three deciles (Low *q*) have poor investment opportunities, those in the next four deciles (Medium *q*) have moderate investment opportunities, and those in the highest three deciles (high *q*) have good investment opportunities.

I then run regressions using the firm and year fixed effects model (1-1) that show the effect that changes in institutional ownership have on total payout to assets ratios (*Payout*) in the subsequent year. I add a new control variable, free cash flow (*CashFlow*), to the model because of its importance to the agency-based theory. Regressions are run on the low *q*, medium *q*, and high *q* groups separately based on which group a firm is in during year $t-1$. The results are shown in Table 1 - 5.

The first and second regressions, which include only firms in the poor and moderate investment opportunities groups respectively, have a significantly positive coefficient for the variable *Inst*. This indicates that an increase in institutional ownership leads to an increase in payouts for these groups. The third regression indicates that institutional owners do not have a significant effect on payouts in firms with good investment opportunities. This pattern is consistent with the agency-based theory.

Agency-based theory also predicts that institutional investors should encourage higher payouts primarily in firms with high free cash flow. I test this prediction by assigning each firm-year to one of three groups: low cash flow (bottom three deciles), moderate cash flow (middle four deciles), and high cash flow (top three deciles). Once again, I use the firm and year fixed effects model (1-1) to access the impact institutional ownership has on payouts in the subsequent year. The results are shown in Table 1 - 6.

The first regression shows that institutional owners have no effect on payouts in firms with low free cash flow. Higher payouts are encouraged by institutional owners in the moderate cash flow firms. In the group of firms with the highest cash flow, institutional investors have the strongest positive influence on total payouts. Consistent with agency-based theory, the pattern indicates that an increase in institutional ownership leads to a stronger increase in payouts as free cash flow increases.

Institutional investors encourage higher payouts, especially in firms with poor investment opportunities or high free cash flow. Robustness checks using groups formed on the basis of a combination of firm investment opportunities and free cash flow and using difference GMM methodology support this result. The robustness tests are reported and discussed in Appendix A.

My results provide evidence that an increase in institutional investors leads to a subsequent increase in total payout. Additionally, the evidence demonstrates that institutional investors use their influence to encourage higher payouts primarily in firms that are the most prone to agency problems, those with poor investment opportunities and high free cash flow. The results support the agency-based theory prediction that institutional owners encourage higher payouts to prevent management from misusing discretionary funds.

Table 1 - 4: Institutional Ownership and Payouts

	(1)	(2)	(3)	(4)
	All Firms	All Firms	No Payout at year *t* - 2	Payout at year *t* - 2
	Payout	*Payout*	*Payout*	*Payout*
Inst		0.0106***	0.0072**	0.0182
		(2.75)	(2.19)	(1.63)
q	-0.0005***	-0.0004***	-0.0002**	-0.0063***
	(3.21)	(3.16)	(2.03)	(2.68)
Debt	-0.0114***	-0.0115***	-0.0031**	-0.1961***
	(3.08)	(3.01)	(2.21)	(4.64)
Turnover	0.0000	-0.0000	0.0000	-0.0043**
	(0.56)	(0.33)	(0.27)	(2.13)
LifeCycle	-0.0000	-0.0000	-0.0000	-0.0000*
	(0.95)	(1.05)	(0.15)	(1.82)
MktCap	0.0081***	0.0073***	0.0031***	0.0456***
	(6.48)	(6.58)	(3.11)	(6.16)
ROA	-0.0012**	-0.0012**	-0.0003	-0.0395***
	(2.16)	(2.25)	(1.03)	(3.10)
Insider	-0.0196*	-0.0205*	-0.0141	-0.0271
	(1.88)	(1.95)	(1.63)	(1.01)
Insider2	0.0137	0.0146	0.0158*	0.0189
	(1.29)	(1.36)	(1.72)	(0.68)
Revenue	-0.0014	-0.0015	-0.0018	-0.0090
	(1.19)	(1.24)	(1.32)	(1.64)
Observations	45,418	44,933	25,794	19,096
Firms	7,782	7,759	6,239	4,244
R-squared	0.06	0.16	0.34	0.17

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in total payout divided by book value of assets (*Payout*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regressions (1) and (2) include all firms. Regression (3) includes only firms that had no payout in year *t* - 2 and regression (4) includes only firms that had a payout in year *t* - 2.

Table 1 - 5: Institutional Ownership, Payouts and, Investment Opportunities

	Low *q*	Medium *q*	High *q*
	Payout	*Payout*	*Payout*
Inst	0.0173*	0.0188***	0.0080
	(1.91)	(2.97)	(1.07)
CashFlow	-0.0016	-0.0059*	0.0051***
	(1.15)	(1.72)	(3.28)
q	0.0058**	-0.0021***	-0.0004***
	(2.15)	(2.60)	(2.76)
Debt	-0.0132	-0.0296***	-0.0033*
	(1.42)	(2.61)	(1.95)
Turnover	-0.0000	-0.0014***	-0.0009**
	(0.12)	(2.86)	(2.44)
LifeCycle	-0.0000	0.0000	-0.0000
	(0.94)	(0.81)	(0.31)
MktCap	0.0046*	0.0209***	0.0073***
	(1.74)	(5.06)	(4.07)
ROA	0.0019	-0.0031	-0.0057***
	(0.28)	(0.55)	(3.80)
Insider	-0.0119	-0.0435**	0.0047
	(0.40)	(2.12)	(0.30)
Insider2	0.0094	0.0416*	-0.0154
	(0.34)	(1.95)	(0.72)
Revenue	-0.0023	-0.0063	0.0003
	(0.60)	(1.24)	(0.24)
Observations	13004	18829	12403
Number of Firms	3971	5504	3793
R-squared	0.25	0.25	0.42

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in total payout divided by book value of assets (*Payout*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Low, Medium and High *q* firms, respectively. The Low, Medium and High *q* groups include the lowest three, middle four, and highest three *q* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

Table 1 - 6: Institutional Ownership, Payouts, and Free Cash Flow

	(1)	(2)	(3)
	Low *CashFlow*	Medium *CashFlow*	High *CashFlow*
	Payout	*Payout*	*Payout*
Inst	0.0003	0.0093*	0.0271**
	(0.04)	(1.86)	(2.14)
CashFlow	-0.0008	-0.0002	0.0005
	(0.90)	(0.10)	(0.35)
q	-0.0003	-0.0008**	-0.0025***
	(1.50)	(2.42)	(3.24)
Debt	-0.0003	-0.0643***	-0.0788*
	(0.54)	(4.54)	(1.75)
Turnover	-0.0000	-0.0006**	-0.0027
	(0.19)	(2.17)	(1.63)
LifeCycle	-0.0000	-0.0000	0.0000
	(0.08)	(0.48)	(1.00)
MktCap	0.0033	0.0076***	0.0260***
	(1.60)	(5.26)	(4.76)
ROA	0.0003	-0.0009	-0.0217***
	(0.37)	(0.17)	(2.61)
Insider	-0.0075	-0.0129	-0.0229
	(0.25)	(0.80)	(1.33)
Insider2	0.0010	0.0089	0.0155
	(0.03)	(0.53)	(0.80)
Revenue	-0.0010	-0.0038**	-0.0061
	(0.62)	(1.98)	(0.81)
Observations	11014	18905	14317
Number of Firms	4530	5591	4457
R-squared	0.47	0.43	0.25

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in total payout divided by book value of assets (*Payout*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Low, Medium and High *CashFlow* firms, respectively. The Low, Medium and High *CashFlow* groups include the lowest three, middle four, and highest three *CashFlow* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

1.5 The Effect of Institutional Owners on Stock Repurchases

1.5.1 Do Institutional Owners Influence Stock Repurchases?

The adverse selection model predicts that an increase in current institutional ownership will lead to an increase in future repurchases. Institutional ownership levels and stock repurchase levels have an endogenous relationship. Therefore, I test the effect that changes in institutional ownership have on subsequent changes in repurchases.

To test the influence that institutional owners have on future repurchases, the following firm and year fixed effects model is estimated.

(1-2) $$Rpurch_{it} = Year_t + Firm_i + Inst_{it-1} + \beta \bullet Control_{it-1} + \varepsilon_{it}$$

This model is identical to model (1-1) except for the dependent variable. In this model, $Rpurch_{it}$ represents the change in the repurchase to asset ratio for each firm in each year. As in model (1-1), the independent variables are measured as the change from year t – 2 to year t – 1. The dependent repurchase variable is measured as the change from year t - 1 to year t.

Table 1 - 7 reports on the effect that changes in institutional ownership have on stock repurchases (*Repurch*) in the subsequent year. The first regression only uses the control variables as independent variables. The

statistically significant coefficients indicate that repurchases increase as *q* decreases, debt decreases, retained earnings to total equity decreases, market capitalization increases, and return on assets decreases. The results for the control variables remain largely consistent throughout the rest of the regressions shown in the table.

In the second regression, I add a variable (*Inst*) representing the change in total institutional ownership. There is a positive and significant relationship between institutional ownership and subsequent stock repurchases.

Institutional owners prefer to own firms that repurchase stock. Therefore, the results in the second regression could be influenced by the tendency of institutional investors to invest more in firms that have repurchased stock previously. To alleviate that influence, the third regression is ran only on firms that did not have a repurchase in year $t - 2$. The third regression demonstrates that institutional owners have a significantly positive influence on future stock repurchases in firms that did not repurchase stock in the previous year. The fourth regression shows that institutional owners encourage higher repurchases in firms that had repurchases in the previous year.

Institutional investors encourage firm management to increase stock repurchases. Results for robustness checks, which are shown in Appendix A, using data from the years 1990-1997 and 1998-2005 separately confirm this result.

1.5.2 *Is Information Asymmetry a Factor?*

Adverse selection theory predicts that institutional investors will use their influence to persuade management to increase repurchases. Additionally, the theory predicts that institutional investors will find repurchases more attractive as information asymmetry increases. I test this prediction using retained earnings to total equity (*LifeCycle*) as a proxy for information asymmetry. DeAngelo, DeAngelo and Stulz (2006) use this measure as a proxy for firm life-cycle. They assert that this is a valid proxy for firm information asymmetry. This relationship between firm life-cycle and information asymmetry seems logical because the further along a firm is in its life-cycle the more information an investor will have about the firm to judge its prospects, all else being equal.

I sort the sample of firms each year into information asymmetry deciles. I assign each firm-year to one of three groups. Firms in the bottom three deciles (Early *LifeCycle*) have high information asymmetry, those in the next four deciles (Middle *LifeCycle*) have moderate information asymmetry, and those in the highest three deciles (Late *LifeCycle*) have low information asymmetry.

I then run regressions using the firm and year fixed effects model (1-2) that show the effect that changes in institutional ownership have on repurchases in the subsequent year. Regressions are run on the high, moderate, and low information asymmetry groups separately based on which group a firm is in during year $t - 1$. The results are shown in Table 1 - 8.

The first two regressions show that institutional investors encourage increased repurchases in firms with high and moderate information asymmetry. The third regression shows a statistically weak positive relationship between institutional ownership and future stock repurchases in low information asymmetry firms. It is notable that the *Inst* coefficient for the low information asymmetry firms group is higher than for the other two groups despite not being statistically significant. This may be explained by the higher propensity of firms with low information asymmetry to make repurchases. This higher propensity is shown in the average repurchase to asset ratios for the three groups (not shown): high information asymmetry (0.36%), moderate information asymmetry (0.64%), and low information asymmetry (1.55%). The results shown in this table provide evidence that supports the adverse selection theory. A robustness test using the difference GMM methodology confirms this result. It is shown in Appendix A.

Institutional investors use their influence to persuade management to increase repurchases. This relationship is more significant in firms with higher information asymmetry. This evidence provides support for the adverse selection theory which predicts that institutional owners encourage higher stock repurchases to gain an advantage over other less informed investors.

Table 1 - 7: Institutional Ownership and Stock Repurchases

	(1)	(2)	(3)	(4)
	All Firms	All Firms	No Repurchase at year *t* - 2	Repurchase at year *t* - 2
	Repurch	*Repurch*	*Repurch*	*Repurch*
Inst		0.0104***	0.0098***	0.0220*
		(3.15)	(3.16)	(1.66)
q	-0.0004***	-0.0003***	-0.0002**	-0.0108***
	(3.03)	(2.96)	(2.20)	(4.69)
Debt	-0.0099***	-0.0099***	-0.0057**	-0.2002***
	(2.99)	(2.92)	(2.21)	(5.31)
Turnover	0.0000	-0.0000	0.0000	-0.0046***
	(0.68)	(0.43)	(0.49)	(2.97)
LifeCycle	-0.0000**	-0.0000***	-0.0000	-0.0000**
	(2.51)	(2.75)	(0.47)	(1.97)
MktCap	0.0066***	0.0058***	0.0035***	0.0527***
	(6.41)	(6.83)	(4.24)	(7.56)
ROA	-0.0011**	-0.0011**	-0.0005	-0.0647***
	(2.27)	(2.34)	(1.54)	(4.97)
Insider	-0.0110	-0.0119	-0.0045	-0.0557
	(1.51)	(1.62)	(0.86)	(1.47)
Insider2	0.0085	0.0094	0.0076	0.0404
	(1.12)	(1.23)	(1.37)	(1.02)
Revenue	-0.0010	-0.0011	-0.0020	-0.0044
	(0.93)	(1.02)	(1.64)	(0.72)
Observations	45611	45126	34083	11043
Firms	7801	7778	7525	3588
R-squared	0.05	0.19	0.33	0.25

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in repurchases divided by book value of assets (*Repurch*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regressions (1) and (2) include all firms. Regression (3) includes only firms that had no payout in year *t* - 2 and regression (4) includes only firms that had a payout in year *t* - 2.

Table 1 - 8: Institutional Ownership, Repurchases, and Firm Life-cycle

	(1)	(2)	(3)
	Early *LifeCycle*	Middle *LifeCycle*	Late *LifeCycle*
	Repurch	*Repurch*	*Repurch*
Inst	0.0131**	0.0058*	0.0216
	(2.01)	(1.94)	(1.48)
q	-0.0004	-0.0009***	-0.0003*
	(1.23)	(4.85)	(1.79)
Debt	-0.0025	-0.0298***	-0.0071*
	(0.63)	(6.01)	(1.96)
Turnover	-0.0001	-0.0006***	-0.0039*
	(0.42)	(3.03)	(1.67)
LifeCycle	-0.0000***	0.0001	-0.0000
	(2.68)	(0.63)	(0.77)
MktCap	0.0020	0.0077***	0.0173***
	(1.48)	(6.19)	(5.02)
ROA	0.0005	0.0026	-0.0014**
	(0.25)	(0.45)	(2.13)
Insider	0.0093	-0.0017	-0.0457*
	(0.96)	(0.23)	(1.83)
Insider2	-0.0117	0.0016	0.0346
	(0.83)	(0.19)	(1.45)
Revenue	-0.0015	-0.0018	-0.0005
	(0.89)	(0.60)	(0.29)
Observations	11505	18633	14988
Number of Firms	3639	4730	3093
R-squared	0.17	0.28	0.32

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in repurchases divided by book value of assets (*Repurch*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Early, Middle and Late *LifeCycle* firms, respectively. The Early, Middle and Late *LifeCycle* groups include the Earliest three, Middle four, and Latest three *LifeCycle* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

1.6 The Effect of Institutional Owners on Payout Composition

Grullon and Michaely (2002) find that repurchases are gradually being substituted for dividends. The substitution hypothesis suggests that institutional shareholders are encouraging the trend towards increased repurchases in lieu of dividends. This hypothesis predicts that an increase in institutional ownership will lead to an increase in repurchases as a percentage of total payout.

To test this prediction, I use a measure of payout composition that evaluates the contribution to total payout made by dividends and stock repurchases equally. The measure which is calculated for each firm for each year is represented by *PayComp* and is shown in equation (1-3).

$$\text{(1-3)} \quad PayComp = \frac{Rpurch - Div}{Rpurch + Div}$$

In equation (1-3), *Rpurch* is the dollar value of stock repurchases and *Div* is the dollar value of common stock dividends. *PayComp* is undefined for firms with no payouts. It is equal to zero for firm-years with an equal dollar value of repurchases and dividends (this only occurs six times in my sample).

If the majority of a firm’s payout in a given year is made through dividends, *PayComp* will be a negative number. If the majority of the payout is made through repurchases, *PayComp* will be a positive number. If the entire payout is made using dividends, *PayComp* will have a value of negative one. If stock repurchases are the only means of payout, *PayComp* will have a value of positive one. In my sample, the median and mean for *PayComp* are -0.51 and -0.16 respectively. This indicates firms are more likely to use dividends over repurchases as their primary method of payout for the full sample period.

I use the following firm and year fixed effects model to estimate the influence that institutional owners have on a firm's choice between the use of repurchases or dividends in determining their payout composition.

(1-4) $$PayComp_{it} = Year_t + Firm_i + Inst_{it-1} + \beta \bullet Control_{it-1} + \varepsilon_{it}$$

This model is identical to models (1-1) and (1-2) except for the dependent variable. In this model, $PayComp_{it}$ represents the change in the payout composition measure for each firm in each year. As in the earlier models, the independent variables are measured as the change from year *t* – 2 to year *t* – 1. The dependent payout variable is measured as the change from year *t* - 1 to year *t*.

Table 1 - 9 reports on the influence that institutional ownership changes have on payout composition (*PayComp*) in the following year. The first regression uses only control variables as independent variables. The statistically significant coefficients indicate that payout composition tilts toward dividends as *q*, debt, retained earnings to total equity (a proxy for firm maturity), and return on

assets increase. Payouts tilt toward stock repurchases as market capitalization or revenue increases.

In the second regression, I add a variable (*Inst*) for institutional ownership. The result indicates a significantly positive relationship between institutional owners and an ensuing tendency to use repurchases as a greater part of the total payout composition. This tendency holds regardless of whether the majority of the firm's payout was dividends or repurchases in the previous year. The third regression shows that institutional owners encourage an increase in repurchases as part of total payout composition in firms that favored dividends as a means of payout in the previous year. The fourth regression provides evidence that institutional owners also encourage repurchases over dividends in firms that favored repurchases as a means of payout in the previous year.

The substitution hypothesis is supported because institutional investors prefer repurchases over dividends and they use their influence to tilt payout composition towards repurchases. For robustness, I test this assertion using difference GMM and separately for the years 1990 – 1997 and 1998 – 2005. The results which are shown and discussed in Appendix A support the substitution hypothesis and indicate that institutional investors encouraged an increase in repurchases as a part of total payout more intensely during the latter period.

Table 1 - 9: Institutional Ownership and Payout Composition

	(1)	(2)	(3)	(4)
	All Firms	All Firms	Dividends > Repurchases at year *t* - 2	Dividends ≤ Repurchases at year *t* - 2
	PayComp	*PayComp*	*PayComp*	*PayComp*
Inst		0.2701***	0.2244***	0.3739***
		(4.17)	(2.69)	(2.59)
q	-0.0184**	-0.0175**	-0.0196**	-0.0170
	(2.29)	(2.27)	(2.06)	(0.90)
Debt	-0.9427***	-0.9430***	-1.0601***	-0.6407***
	(10.17)	(10.05)	(9.18)	(2.91)
Turnover	0.0090	0.0071	-0.0426**	0.0266*
	(0.71)	(0.52)	(2.47)	(1.85)
LifeCycle	-0.0000***	-0.0000***	0.0027	-0.0001***
	(5.62)	(5.48)	(0.47)	(26.31)
MktCap	0.2515***	0.2447***	0.2601***	0.2935***
	(8.81)	(8.67)	(7.41)	(3.90)
ROA	-0.2041*	-0.2163**	0.1117	-0.7461***
	(1.89)	(2.01)	(0.72)	(3.13)
Insider	-0.1804	-0.1730	-0.1760	-0.1015
	(1.35)	(1.28)	(1.01)	(0.35)
Insider2	0.0351	0.0355	0.1468	-0.2353
	(0.20)	(0.20)	(0.69)	(0.63)
Revenue	0.0731**	0.0685**	0.0324	0.1428**
	(2.17)	(2.05)	(0.73)	(2.40)
Observations	16095	15933	9969	4282
Number of Firms	3245	3217	1849	1690
R-squared	0.13	0.13	0.16	0.34

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in a measure of payout composition (*PayComp*). *PayComp* is equal to -1 if payout is composed entirely of dividends and 1 if payout is composed entirely of stock repurchases. All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regressions (1) and (2) include all firms. Regression (3) includes only firms in which dividends exceeded repurchases in year t - 2 and regression (4) includes only firms in which repurchases exceeded dividends in year t - 2.

1.7 Conclusion

Institutions own almost 70% of U.S. public corporations. They have an informational advantage over other investors and have the capability to be better monitors of corporate management than individual investors. I test several theories about the relationship between institutional investors and payout policy in this paper.

The agency-based free cash flow theory (Jensen (1986)) suggests that firms with higher free cash flow and poor growth opportunities should have higher payouts (through higher dividends or stock repurchases). I find that higher institutional ownership leads to increases in total payouts, especially in firms with high free cash flow and poor investment opportunities.

The adverse selection theory of Barclay and Smith (1988) and Brennan and Thakor (1990) predicts that institutional investors will encourage repurchases, especially in firms with high information asymmetry. This prediction holds as higher institutional ownership causes firms to increase repurchases and this relationship is stronger in firms with higher information asymmetry. I find no evidence that institutional investors encourage dividend increases.

Grullon and Michaely (2002) argue that firms have been increasingly using funds that would have previously been used for dividends to make repurchases. My evidence that an increase in institutional ownership leads to an increase in the proportion of total payout going towards repurchases and consequently a decrease in the proportion of payout going towards dividends provides support for their argument.

Institutional investors have a large and growing position as owners of public corporations. My results provide evidence that institutional investors are engaged in corporate governance and corporate payout policy.

2 Institutional Investors and R&D Investment

2.1 Introduction

In many firms, one of the most important financial decisions made by management executives is deciding how much the firm should invest in research and development (R&D). Generally, R&D investment is beneficial to shareholders. For example, Chan, Lakonishok, and Sougiannis (2001) provide evidence that the level and changes of R&D investment are positively associated with future returns. Still, the benefits of R&D investment may not be experienced by management or shareholders until after an extended period of time. Eberhart, Maxwell, and Siddique (2004) find that investors underreact to the benefits of R&D increases. They find evidence that firms experience abnormally positive stock returns for the 5-year period following an R&D increase. R&D investment is more likely to offer little or no return than comparable investments. Kothari, Laguerre, and Leone (2002) demonstrate that the future benefits from R&D are far more uncertain than benefits from many other uses of funds such as investments in property, plant, and equipment.

The delayed and risky benefits of R&D can cause agency problems. Agency problems arise when managers act in their own interests at the expense of shareholders' interests. Underinvestment in R&D may be advantageous to management but not shareholders. Underinvestment may increase short-term earnings at the expense of long-term value because R&D investment is expensed immediately, but the payoff from R&D is rarely realized in the same accounting period as when the investment is made. Therefore, short-term earnings move inversely to R&D investment.

Porter (1992) argues that because U.S. institutional managers are measured on their short-term performance that they focus on short-term returns in their investments. This drives them to focus on near-term indicators that provide limited information like current earnings when valuing investments. Management reacts to this pressure by decreasing investment in R&D. He contends that in comparison to European and Japanese companies which tend to have long-term shareholders with larger stakes, U.S. firms invest less in R&D and their investment projects are of shorter duration. He notes that both U.S. and foreign CEOs believe that U.S. companies have shorter investment horizons than their international competitors.

There is evidence that managers sometimes intentionally invest at less than the optimal level. Graham, Harvey, and Rajgopal (2005) interview executives and find out that approximately 80% of them would reduce R&D to meet an earnings target. Bhojraj and Libby (2005) conduct an experiment in which 89 experienced financial managers choose between projects where a conflict exists between near-term earnings and total cash flow. In the experiment, managers favor projects that will maximize short-term earnings over projects which will maximize total cash flows when increased capital market pressure resulting from a pending stock issuance is present. Management reduces R&D investment when the investment is likely to jeopardize reporting positive or increasing income in the near term (Baber, Fairfield and Haggard (1991)). Harter and Harikumar (2004) find evidence that managers with greater earnings-based compensation tend to invest in projects with more immediate payoffs. Bhojraj et al. (2009) argue that dedicated earnings guiders engage in myopic R&D to beat analysts' forecasts. Additionally, they find that managers know they are underinvesting as evidenced by increased insider selling following underinvestment in R&D.

Institutional investors may help mitigate the potential problem of underinvestment in R&D or they may exacerbate it. Institutional investors pool large sums of money which they then invest in various investments including equity. Common institutional investors include banks, insurance companies, mutual funds, investment advisors, pension funds, hedge funds and university endowments. Institutions own nearly 70% of the shares of U.S. corporations.[3]

The empirical evidence on the relationship between institutional investors and R&D is mixed. Bange and De Bondt (1998) find in a study of 100 firms with large R&D budgets that management is less likely to manage earnings by cutting R&D if institutional ownership is higher. Conversely, in a study of 557 manufacturing firms from 1985 – 1990, Samuel (2000) finds that institutional ownership has a negative effect on R&D expenditures.

Still, institutional investors are generally believed to be more effective monitors of firm management than other investors. One reason for this is that the

[3] Bogle, John C. (2010) Restoring Faith in Financial Markets, *Wall Street Journal* (January 19).

relative cost of monitoring and influencing management is higher for non-institutional shareholders than for institutions because costs are spread across fewer shares (Parrino, Sias and Starks (2003), Almazan, Hartzell, and Starks (2005) and Maug (1998)).

I examine the effect that institutions have on R&D. First, I determine if institutional investors use their influence to persuade management to invest more in R&D. I then analyze the effect that firm stock liquidity, information asymmetry, free cash flow, and investment opportunities have on the relationship between institutional investors and R&D investment.

Edmans (2009) creates a model which predicts that investors that hold a large proportion of a firm's shares (blockholders) can encourage managers to invest for long-run growth at the expense of current earnings as long as a firm has sufficient stock liquidity. In the Edmans' model, blockholders can encourage investment by influencing current stock prices to capture its long-term effect. The blockholders ability to exert this encouragement is positively related to the liquidity of the firm's common stock. An interesting aspect of this model which is pertinent to my paper is that it demonstrates that investors can add value to a firm even if they do not directly intervene in a firm's management.

Edmans' model could apply to institutional investors if institutional investors act in unison to affect investment policy. These actions do not even have to be coordinated as long as institutional investors tend to behave similarly. There is evidence that institutional investors sometimes act in near unison or "herd". Sias (2004) provides evidence that institutions garner information from each others' trades which results in herding. Institutional investors herd into and out of the same industries (Choi and Sias (2009)). Mutual fund investors have been found to herd into small stocks (Wermers (1999)). Institutional investors herd on dividend signals (Rubin and Smith (2009)) and into stocks with positive return momentum (Nofsinger and Sias (1999)).

Edmans conducts no empirical investigation of his theory in his paper. He does note that others have conducted empirical studies in which the findings are congruent with his theory. For example, Lee and O'Neill (2003) find that ownership concentration as proxied by blockholders that own more than 3% of a firm is positively related to R&D investment. Cronqvist and Fahlenbrach (2009) provide evidence that an increase in certain categories of blockholders leads to higher investment in R&D. These studies do not investigate the effect that liquidity has on the relationship between blockholders and R&D. My research is novel in that I look specifically at the effect that liquidity has on the relationship between institutional investors and subsequent R&D investment.

Edmans' theory leads to the hypothesis that institutional investors will encourage R&D investment more in firms with greater stock liquidity. In this theory, the managers of firms with high institutional ownership invest more in R&D to raise firm value because they realize that institutional owners will be able to discern the true value of the investments. High firm stock liquidity is an important aspect of the theory because it allows institutional investors to divest their shares if they discern that managers are not investing properly and thus offers the institutional investors an incentive to gather costly information required to monitor the firm effectively.

Bhide (1993) offers a countervailing argument to Edmans' theory about the relationship between blockholders and investment which I also expand to include institutional investors. Bhide does not provide extensive empirical evidence for his theory, instead relying on logic and specific examples. Bhide notes that U.S. regulations provide a wedge between investors and management, thus encouraging institutions to prefer dispersed arm's-length holdings over long-term concentrated holdings. The regulations that encourage institutions to disperse their holdings among firms that they have an arm's-length relationship include: pension and mutual funds are required to have diversified holdings, ERISA discourages pension managers from sitting on boards by holding them to a higher standard than other directors, insider-trading rules place special restrictions on investors that hold more than 10% of a company's stock or serve on its board.

These regulations increase the costs and reduce the benefits to institutional investors of monitoring management. Bhide asserts that higher liquidity allows large investors to divest their shares rather than expend resources to acquire the information necessary to monitor a firm effectively. He argues that since the large investors cannot sell their shares in firms with lower liquidity without accepting a significant discount, they prefer to expend effort to encourage management to invest more to enhance the value of their long-term investment. Bhide's argument provides the basis for my hypothesis that institutional investors will encourage R&D more in firms with low liquidity.

The essential difference between the Edmans (2009) theory and the argument in Bhide (1993) can be summarized as follows. Bhide asserts that blockholders increase firm value by monitoring, and since monitoring and divestment are mutually exclusive, liquidity decreases the propensity of blockholders to monitor. Edmans argues that blockholder loyalty to a firm that makes sound investment decisions at the expense of weak earnings allows the blockholder to increase firm value. Loyalty and divestment are again mutually exclusive, but the loyalty in the face of weaker earnings provides a particularly strong indicator of value which is strengthened if the blockholder could have easily sold their shares. Paradoxically, the power of blockholder loyalty to add value depends on the ease of divestiture.

If institutional investors affect R&D investment more in firms with high stock liquidity, a logical inference is that they influence management through the threat of divestment. On the other hand, if they affect R&D investment more in firms with low liquidity, then they are more likely to influence management using tactics such as proxy votes and shareholder proposals.

In addition to the effect that liquidity has on the relationship between institutional investors and R&D investment, I also examine the effect that information asymmetry has on the relationship. Firms in which investors know relatively more about the firm's future prospects are considered low information asymmetry firms. The importance of information asymmetry in R&D budgets to investors is demonstrated by Aboody and Lev (2000) who find that R&D is a major contributor to insider gains and information asymmetry between insiders and investors.

Information asymmetry is likely to be important to the relationship between institutional investors and R&D. Institutional investors have an informational advantage over other shareholders which varies with firm characteristics and information asymmetry (Bennet, Sias, and Starks (2003)). Institutions have an informational advantage in newly public firms (Field and Lowry (2009)) and seasoned equity offerings (Chemmanura, He, and Hu (2009)) which is largely the result of better analysis of publicly available information. If institutional investors encourage R&D investment more in low information asymmetry firms, it indicates that they are not more effective than other investors at monitoring firms which are difficult to monitor. Conversely, if institutional investors have a more positive effect on R&D investment in high information asymmetry firms, it shows that institutional investors are effective monitors of firms that are difficult for other investors to monitor.

Finally, I test a hypothesis that institutional investors will encourage R&D more in firms that are less prone to overinvestment problems. This theory is derived from the work of Jensen (1986) which asserts that managers that put their interests above shareholders' interests will be more prone to overinvest if their firm has high free cash flow and poor investment opportunities. Jensen uses empirical evidence involving debt and acquisitions to support his theory. According to my hypothesis, institutional investors should encourage R&D

investment primarily in firms that have good investment opportunities and not simply because a firm has high free cash flow (available funds). If institutional investors don't take investment opportunities into account when using their influence to convince management to increase R&D, then the relationship between institutional shareholders and R&D does not provide evidence of superior monitoring ability.

My results indicate that institutional investors encourage higher R&D investment in general. I also find that institutional investors positively influence R&D investment primarily in firms with high liquidity. This provides empirical support for my hypothesis based on the Edmans (2009) model which predicts that shareholders that lack control rights can help control managerial investment myopia in firms with high liquidity by gathering information about the fundamental value of investment policies and impounding them into stock prices.

I also provide evidence that institutional investors induce R&D investment more effectively in firms with high information asymmetry. Finally, I find that institutional investors encourage R&D investment more as investment opportunities rise, but not as free cash flow rises. Jensen (1986) provides evidence that managers tend to overinvest if they have free cash flow even if they do not have adequate investment opportunities. He finds that debt helps to control this tendency. My results provide evidence that institutional investors help control managerial overinvestment by only encouraging higher R&D investment in firms that have adequate investment opportunities.

I conclude that, holding other factors constant, higher institutional investor ownership leads to higher R&D investment. I also find that this relationship strengthens as firm stock liquidity increases, information asymmetry increases and investment opportunities increase.

2.2 Literature Review and Hypotheses

2.2.1 Literature Review

Investment in R&D is essential to many firms and an important factor for success in many others. Generally, markets view increased R&D investment as a signal that a firm has good long-term opportunities. For example, Sundaram, John, and John (1996) find that the percentage change in R&D expenditures of firms announcing R&D increases has a positive impact on the stock price of the announcing firm. Yet, the stock market's valuation of the intangible capital created by R&D varies widely by time period (Hall (1993)). Also, market reaction to R&D increase announcements is not uniform for all firms. Chan, Martin, and Kensinger (1990) find that markets react positively when high-technology firms announce increases and negatively when low-technology firms announce increases. This indicates that generally investors believe that high-technology firms do not invest enough in R&D and that low-technology firms invest too much. Despite the generally favorable view of R&D investment, economists have developed theories that explain how firm management might be motivated to underinvest in R&D.

Management can be susceptible to pressure to underinvest because of concerns about avoiding hostile takeovers and the time horizons of influential investors (Froot, Perold and Stein (1992) and Stein (1988)). Also, managers may underinvest because their concentration of wealth in a single firm makes them more risk averse (Stein (1988)) or to mislead the market about their firms' worth by managing earnings (Stein (1989)). Tying management salary and bonuses to earnings can also create incentives to underinvest (Bange and De Bondt (1998)). On the other hand, managers may have an incentive to invest too much because increased corporate investment leads to increased firm size which often leads to increased power and compensation for managers (Jensen (1986)).

Empirical studies have found evidence that managers sometimes underinvest (engage in managerial myopia) to improve short-term results at the expense of long-term firm value. Cheng, Subramanyam, and Zhang (2007) find that firms that frequently issue earnings guidance invest significantly less in R&D to meet or beat analysts' earnings forecasts. Holden and Lundstrum (2009) report that managers increase R&D and their firms become less likely to beat analysts' earnings forecasts after the introduction of long-term stock options (LEAPS) for their firm. They argue that the decline in the use of sub-optimal R&D investment to manage earnings is caused by the new-found ability of informed traders to profit from their long-term superior information through the use of LEAPS.

If management's income is tied to short-term earnings or if a manager will not be around by the time a long-term investment begins to pay off, management may have an incentive to manage earnings through underinvestment. CEO turnover rates are increasing and are becoming more strongly related to firm stock performance (Jensen, Murphy, and Wruck (2005) and Kaplan and Minton (2006)). This trend may be increasing the likelihood that managers' will invest myopically. It has been demonstrated that late career-stage CEOs manage earnings while early career stage CEOs do not (Demers and Wang (2010)) and CEOs spend less on R&D near the end of their careers (Dechow and Sloan (1991)). Peng and Roell (2008) find that option-based pay increases the probability of securities class action litigation and earnings manipulation. This result suggests that option-based compensation gives executives an incentive to focus on short-term stock prices.

Although there is substantial evidence that management of some firms systematically underinvest, there is also considerable evidence that managers do not methodically underinvest. Cazier (2009) follows CEOs throughout time and finds no evidence that they reduce spending on R&D as they near retirement, although he does find that older CEOs spend less on R&D in general. On the other hand, in a study on data from 1970 to 1989, Gibbons and Murphy (1992) find that R&D spending tends to be the largest during a CEO's final years in office. They offer three explanations for this somewhat puzzling result: CEOs may believe R&D offers a more immediate payoff than other projects, R&D is formulated by a group of executives that are likely to have different retirement dates than the CEO, and the potential impact on the CEO's wealth from R&D is too small to justify manipulative behavior. Their results could also be explained by the finding in Cheng (2004) that board compensation committees recognize the potential for CEOs nearing retirement to underinvest in R&D and mitigate underinvestment through compensation incentives.

The use of long-term compensation incentives is increasing. Stock-based pay for executives rose in both new and old economy firms from 1992 - 2001 (Murphy (2003)). Stock-based pay may alleviate underinvestment problems. Coles, Daniel, and Naveen (2006) find that higher sensitivity of CEO wealth to stock volatility results in riskier policy choices, including relatively more investment in R&D. Kang, Kumar, and Lee (2006) also provide evidence that long-term investment is positively related to equity-based incentive compensation.

R&D investment can also be impacted by the monitoring influence of institutional shareholders. Many studies have found evidence that institutional investors influence R&D investment. Yet, these studies have offered mixed results as to the effectiveness of institutional investors as monitors of R&D investment.

For example, Aghion, Van Reenen, and Zingales (2009) argue that institutional investors have a positive impact on R&D and its productivity by reducing the career risk faced by CEOs who invest in risky R&D projects. They find that CEOs are less likely to be fired after profit downturns resulting from such projects if institutional ownership is higher. Huang and Shiu (2009) assert that foreign institutional investor ownership in Taiwanese firms is positively associated with R&D investment and subsequent firm performance indicating that the institutional investors have an informational advantage over domestic investors. Szewczyk, Tsetsekos, and Zantout (1996) find that abnormal returns from announced increases in R&D expenditures were positively related to institutional ownership indicating that the market views institutional owners as effective monitors of R&D. David, Hitt, and Gimeno (2001) observe that institutional ownership does not lead to increased R&D unless the institutional owners attempt to influence R&D by resorting to activist actions such as public announcements, shareholder proposals, proxy contests or direct negotiations with managers. Bushee (1998) finds that greater institutional ownership decreases the likelihood that R&D will be cut following a poor earnings performance. Wahal and McConnell (2000) find no support for the assertion that that high transient institutional ownership leads to lower R&D. In a study of technology and healthcare firms, Le, Walters, and Kroll (2006) find that transient and long-term institutional investors actively monitor and influence R&D spending.

On the other hand, there is evidence that institutional investors are not effective monitors of R&D investment. Chung, Wright, and Kedia (2003) find that institutional holdings had no effect on the market valuation of R&D investments. Jones and Danbolt (2003) argue that U.K. institutional investors react to short-term performance measurement pressures by taking a myopic view of R&D expenditures. They find that firms with higher institutional ownership have a less positive stock price response to R&D increase announcements. You, Chen, and Holder (2008) demonstrate that institutional investors have no effect on R&D levels in American pharmaceutical firms. They also find that institutional ownership leads to less efficient R&D in American and Korean pharmaceutical firms indicating support for a myopic influence on management by institutional investors. Using a sample which only includes firms that experience an earnings decline, Bushee (1998) argues that managers reduce R&D to boost earnings in firms with high levels of transient institutional ownership

It may be difficult for even large investors to monitor R&D. Zeckhauser and Pound (1990) hypothesize that firms in industries with high R&D investment to sales levels have higher information asymmetry and are thus more difficult to monitor. Using blockholders' effect on earnings growth as a measure of monitoring ability, they found that investors that own over 15% of a company are effective monitors in firms that are in industries with low R&D levels (and thus low information asymmetry) but not in industries with high R&D levels.

2.2.2 Hypotheses

Shleifer and Vishny (1986) and others have theorized that large investors are important monitors of firm management. Institutional investors can influence management through proxy votes, shareholder proposals, publicity generation or the threat of "voting with their feet" thus depressing stock share price as the shares are sold. The influence of institutions is demonstrated by the fact that their shareholder proposals get more votes and a more positive stock price reaction (Gillan and Starks (2000)). Ryan and Wiggins (2002) find that institutional owners influence R&D directly by monitoring management and indirectly by influencing compensation policy. The influence institutional investors can wield is reflected in the view of CFOs that institutional investors are the most important marginal investors (Graham, Harvey, and Rajgopal (2005)). This influence gains empirical evidence from the finding of Gillan and Starks (2007) that institutional investors can influence management through the threat of divesting their shares. CFO interviews point out other reasons that institutional investors are important: they can lower stock price by herding out of a stock after an earnings miss or they can provide easier access to capital leading to a lower future cost of capital if they are pleased with firm management (Graham, Harvey, and Rajgopal (2005)).

If institutional investors herd, then they may have an influence that is similar to that of large shareholders. Evidence has been found that institutions or large shareholders influence corporate governance. Chen, Harford and Li (2007) find that monitoring by institutions with concentrated long-term holdings improves the performance of firms involved in mergers. Cronqvist and Fahlenbrach (2009) find that large shareholders influence corporate investment, financial and executive compensation policies.

Wahal and McConnell (2000) and Lee and O'Neill (2003) find a positive relationship between institutional investors and R&D investment. They do not establish that institutional investors use their influence to persuade management to increase R&D investment. Given that the market generally rewards increased

R&D investment and that institutional investors have been shown to effectively monitor management, I hypothesize that the influence of institutional investors will lead to higher R&D investment.

> **H1**: Institutional investors will encourage higher R&D investment, after controlling for firm characteristics.

In a model proposed by Edmans (2009), investors with large holdings in a firm have strong incentives to monitor the firm. They use private information that they gather as a result of these incentives to make trading decisions. Therefore, they make trading decisions based on the fundamental value of the firm rather than current earnings. This encourages management to invest for the long-term rather than for short-term profits. Management can thus avoid a depressed stock share price that results from large investors divesting their shares. In Edmans' model, the ability of blockholders to influence management is enhanced by high firm stock liquidity. Although Edmans' model is built upon the actions of blockholders, his model demonstrates how shareholders can influence management even if they do not have control rights. Therefore, institutional investors that demonstrate herding behavior because of similar motives can effectively act as blockholders. Therefore, I test an extension of the Edmans' model by investigating if the ability of institutional investors to encourage higher R&D investment is enhanced by high stock liquidity.

According to Bhide (1993), greater liquidity allows large investors to divest their shares rather than expend costly resources to monitor management and encourage investment. An implication I have derived from this assertion is that high stock liquidity increases the incentives for institutional investors to divest their shares rather than expend costly effort encouraging higher R&D investment.

Although Edmans presented evidence of empirical research by others that is consistent with his model and Bhide provided logic and specific incidents that supported his model, the contradictory predictions that I derive from these two papers has not been directly tested to my knowledge. My application of the Edmans' model to institutional investors leads to hypothesis H2A and the predictions that I derive from Bhide's theory leads to hypothesis H2B.

H2A: Institutional investors will encourage R&D investment more as firm stock liquidity *increases*.

H2B: Institutional investors will encourage R&D investment more as firm stock liquidity *decreases*.

Previous research has provided evidence that institutional investors' informational advantage over other investors gives them the ability to be more effective monitors. The superior monitoring ability of institutional investors may vary with the level of firm information asymmetry between insiders and outside shareholders. Zeckhauser and Pound (1990) provide evidence that monitoring by another group of informed investors, shareholders that own more than 15% of a firm, is only effective in firms with low information asymmetry. This indicates that it is possible that institutional shareholders will not be able to effectively monitor R&D investment in firms with high information asymmetry. On the other hand, institutional investors may be able to more effectively exploit their informational advantage in firms with high information asymmetry leading to more effective monitoring of R&D in such firms. These two conflicting possibilities are the basis for my next two hypotheses.

H3A: Institutional investors will encourage R&D investment more as information asymmetry *decreases*.

H3B: Institutional investors will encourage R&D investment more as information asymmetry *increases*.

Agency costs are incurred by investors when a firm's management uses its superior knowledge of the firm's business activities to make decisions that benefit management at the expense of shareholders. Agency-based free cash flow theory (Easterbrook (1984) and Jensen (1986)) suggests that firms with higher free cash flow and poor growth opportunities have higher discretionary funds that can be misused by management.

If institutional investors are better monitors than other investors, agency-based theory implies that institutional investors will encourage R&D

investment more in firms with good investment opportunities, but they will not encourage R&D investment more in firms with high free cash flow (unless the high free cash flow is accompanied by good investment opportunities). This leads to my final hypothesis.

> **H4**: Institutional investors will encourage R&D investment more as investment opportunities increase. In the absence of increased investment opportunities, institutional investors will not encourage R&D investment more as free cash flow increases.

An endogenous relationship probably exists between institutional investors and investment policy so simply showing a relationship between institutional investors and R&D investment will not provide sufficient evidence to support any of the investment policy theories. Causality is also important. In all my hypotheses, a change in institutional ownership leads to a change in R&D investment policy.

2.3 Data, Methods and Summary Statistics

2.3.1 Data and Methods

I compile yearly ownership data for institutional and insider ownership from CDA / Spectrum Compact Disclosure from 1990 to 2005. Utilities and financial firms are excluded because they are highly regulated. The ownership data and Compustat data are then merged. The final sample includes 10,668 firms and 79,890 firm-years. If a firm is missing data or is not present in the sample for enough firm-years to perform certain analysis, it is not used.

Following Bushee (1998), I use R&D investment per share (adjusting for stock splits) as my primary measure of R&D investment. I also use R&D to assets as a measure of R&D investment for some of my robustness checks. Many others have used R&D to sales as a measure of R&D investment, but my sample includes numerous small firms with negligible sales. Therefore, results using R&D to sales as a dependent variable tend to be dominated by firms with the lowest sales figures. R&D investment per share is an effective measure to use in discerning if a firm increased or decreased R&D investment, but it does not provide a proper scale for use in linear regressions. Therefore, I use logit regressions in my analysis using a binary dependent variable which indicates either R&D increases or decreases. As in previous studies, missing values of R&D expenditures are assumed to be zero (e.g., Coles, Daniel, and Naveen (2006) and Cheng (2008)).

Since a variety of factors can jointly affect institutional ownership and investment levels, thus inducing a spurious correlation, several control variables must be used in my regressions. I start with the same control variables used by Wahal and McConnell (2000) in their study of the effects of institutional investors on R&D and capital investment with one exception; I substitute *q* for the book-to-market ratio. Following Dlugosz et al. (2006), I calculate the variable *q* as the ratio of the market value of assets to the book value of assets where market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock and deferred taxes.

I use total debt to total assets because firms may forego R&D investment if funds are required to service debt. I include earnings before interest and taxes (EBIT) scaled by total assets because the availability of internally generated firms may have an impact on R&D investment decisions. I use insider percentage ownership and insider percentage ownership squared because insider owners are widely documented to have an effect on corporate policies and firm value (e.g. Morck, Shleifer and Vishny (1988)). I also use log of sales as an independent control variable to control for firm size.

I add some control variables that were not used by Wahal and McConnell (2000). Capital expenditures scaled by assets is used to control for funds required for this use that are not available for R&D investment and for transition into a more mature firm life-cycle which requires a different investment mix (Bushee (1998)). I also use a proxy for firm life-cycle, retained earnings to the book value of total equity (DeAngelo, DeAngelo, and Stulz (2006)), because R&D investment may vary as a firm becomes more mature. I use the log of market capitalization of equity because smaller firms are more likely to suffer cash flow constraints that may limit cash available for R&D investment (Jalilvand and Harris (1984)). I use free cash flow scaled by total assets because firms with negative free cash flow may be forced to curtail R&D expenditures to preserve funds (Bushee (1998)). Free cash flow is defined as net income plus depreciation and amortization minus capital expenditures.

In some of my analysis, I determine if liquidity has an effect on the relationship between institutional investors and R&D investment. Therefore, I use firm stock turnover as a proxy for liquidity as a control variable. Firm stock turnover is defined as the number of common shares traded in a year divided by common shares outstanding. The detailed definitions of all variables are shown in Table 2 - 1.

The relationship between institutional investors and R&D investment is almost certainly endogenous and my hypotheses are contingent on institutional investors influencing R&D. Therefore, I must use a regression methodology which accounts for endogeneity and establishes causality.[4]

I run regressions on changes in dependent variables from year $t - 1$ to t on changes in independent variables from $t - 2$ to $t - 1$ to establish causality. I use firm fixed effect regressions to control for all stable characteristics of a firm (including industry), whether measured or not. I use yearly dummy variables to control for time-varying omitted characteristics. Firm and year fixed effects alleviate endogeneity problems. Firm fixed effects regressions with yearly dummy variables effectively give a separate intercept to each year. Intercepts in fixed effects regressions are calculated as an average value of the unobserved fixed effects for each firm. This intercept and the yearly intercept values are not

---

[4] I attempted two-stage least squares' (instrumental variables) regressions but was unable to come up with instrumental variables which were statistically and conceptually sound.

relevant to my analysis. Therefore, the intercept term and yearly dummy coefficients are not reported in my regression results.

Although I use firm and year fixed effects and control variables in the change regressions to control for endogeneity, I also use the Arellano and Bond (1991) difference Generalized Method of Moments (difference GMM) methodology for robustness. Difference GMM is ideal for use in panel data with limited time periods, a large number of firms, independent variables that are not strictly exogenous, and firm fixed effects. The difference GMM method I use is explained in-depth in Appendix C.

2.3.2 Summary Statistics and Data Correlations

Table 2 - 2 displays sample summary statistics. Panel A includes all firms and panel B includes only firm-years in which the firm made R&D investments. Statistics are shown for two time periods, 1990 – 1997 and 1998 – 2005, and for the total sample. Means are shown and medians are shown in parentheses below.

There are patterns in the data for all firms and in firms with R&D investment. The percentage ownership of institutional investors increases over time. Institutional ownership for all firms and for firms that invest in R&D is quite similar. R&D expenses to sales increases from the first period to the next. Notably, the average R&D to sales ratio is much higher than the median R&D to sales ratio in all groups. This is an indication of skewness. The average is dominated by a few firms with very large R&D to sales ratios.

Firm size and *q* increase from the first time period to the next as well. Retained earnings to total equity is a proxy for firm life-cycle in which a more positive number indicates a more mature firm. Overall, firms included in the sample are less mature in the later years. This is probably because of the large number of firms which came public during the run-up to the internet bubble. Compared to the entire sample, firms with R&D expenses are less mature (earlier in their life-cycle) and have higher liquidity.

Table 2 - 3 displays correlations for selected firm variables. Correlations that are significant at the 5% level are marked with an asterisk. R&D to sales (*R&D*) is significantly negatively correlated with institutional ownership (*Inst*). Institutional ownership (*Inst*) is significantly negatively correlated with Tobin's *q* (*q*) and significantly positively correlated with free cash flow to assets (*FCF*). Institutional ownership is significantly positively related to Market value of common stock (*MktCap*).

Free cash flow to assets is significantly negatively related to Tobin's *q*. Retained equity to total equity (*LifeCycle*) and firm stock turnover (*Liquidity*) are not significantly correlated with any of the other variables.

Table 2 - 1: Variable Definitions - R&D

Variable	Description	Definition
Panel A: Summary Statistics and Correlation Table Variables		
N	Number of Firms	The number of firms.
Inst	Institutional Ownership	The fraction of shares owned by institutional investors.
R&D	R&D Expenses	Research and development expenses divided by previous year's sales
q	Investment Opportunities	Market value of assets to the book value of assets
MktCap	Market Capitalization	The dollar market value of common stock in millions.
LifeCycle	Firm Life-cycle	The ratio of retained earnings to total equity.
Liquidity	Stock Turnover	Number of common shares traded in a year divided by common shares outstanding
FCF	Free Cash Flow	Net income plus depreciation and amortization minus capital expenditures scaled by total assets.
Panel B: Regression Dependent Variables (Measured as changes in values from year *t* – 1 to *t*.)		
R&D_Incr	R&D Increase	Binary variable equal to one if there is an increase in R&D expenses per split-adjusted common share and zero otherwise.
R&D_Decr	R&D Decrease	Binary variable equal to one if there is a decrease in R&D expenses per split-adjusted common share and zero otherwise.
R&D_Assets	R&D to Assets	R&D expenses divided by previous year's total assets
Panel C: Regression Independent Variables (Measured as changes in values from year *t* – 2 to *t* - 1.)		
Inst	Institutional Ownership	The fraction of shares owned by institutional investors.
q	Investment Opportunities	Market value of assets to the book value of assets
Debt	Debt Ratio	Debt to assets.
ROA	Return on Assets	Earnings before interest and taxes divided by total assets.
Insider	Insider Ownership	The fraction of shares owned by insiders.
Insider2	Insider Ownership Squared	The squared value of Insider.
MktCap	Market Capitalization	The dollar market value of common stock in millions.
CapEx	Capital Expenditures	Capital expenditures to total assets
FCF	Free Cash Flow	Net income plus depreciation and amortization minus capital expenditures scaled by total assets.
Liquidity	Stock Turnover	Number of common shares traded in a year divided by common shares outstanding
LifeCycle	Firm Life-cycle	The ratio of retained earnings to total equity.
Revenue	Revenue	The logarithm of firm revenue.

Table 2 - 2: Summary Statistics

Years	N	Inst	R&D	q	MktCap	LifeCycle	Liquidity	FCF
Panel A: All Firms								
1990 - 1997	37492	28.9%	1.155	2.81	2106	-0.69	4.46	-0.16
		(23.6%)	(0.000)	(1.85)	(163)	(0.29)	(0.64)	(0.01)
1998 - 2005	42398	33.3%	1.656	4.68	4891	-0.53	4.80	-0.39
		(25.8%)	(0.003)	(1.86)	(350)	(0.18)	(0.86)	(0.01)
Total	79890	31.3%	1.433	3.82	3603	-0.61	4.64	-0.28
		(24.6%)	(0.000)	(1.85)	(239)	(0.24)	(0.74)	(0.01)
Panel B: Firms with R&D Expenses								
1990 - 1997	17240	29.8%	2.479	3.04	3007	-1.75	6.88	-0.11
		(24.1%)	(0.059)	(2.12)	(157)	(0.26)	(0.75)	(0.02)
1998 - 2005	21751	33.3%	3.197	3.97	6360	-0.48	6.30	-0.33
		(25.8%)	(0.096)	(2.23)	(317)	(0.01)	(1.01)	(-0.00)
Total	38991	31.8%	2.896	3.56	4894	-1.04	6.55	-0.24
		(24.9%)	(0.078)	(2.18)	(226)	(0.14)	(0.88)	(0.01)

Means are shown on the first row and medians are shown in parentheses on the second row.

Table 2 - 3: Correlations

	R&D	Inst	q	MktCap	LifeCycle	Liquidity
Inst	-0.0133*					
q	0.0028	-0.0135*				
MktCap	-0.0049	0.0865*	-0.0019			
LifeCycle	-0.0010	0.0013	0.0013	0.0009		
Liquidity	-0.0002	-0.0009	-0.0003	-0.0008	0.0002	
FCF	-0.0032	0.0232*	-0.4194*	0.0023	-0.0008	0.0000

* indicates two-tailed significance at 5%.

2.4 The Effect of Institutional Owners on R&D Investment

2.4.1 Does Increased R&D Lead to Lower Earnings?

It is generally assumed that corporate investment in R&D will have a long-term payoff in the aggregate. Otherwise, there would be no reason to make such investments. An essential component of arguing that a reduction in such investment is myopic in nature is an existence of a negative relationship between investment and short-term reported earnings. This link seems clear because, as noted in Wahal and McConnell (2000), accounting methods decrease short-term earnings as R&D spending is expensed immediately, but an increase in earnings from these investments may not occur for years. Nevertheless, I use a method similar to the one they used to show a negative relationship between investment spending and short-term earnings for my sample.

I run firm fixed effect regressions using current year net income before extraordinary items divided by total assets from the previous year as the dependent variable. The only independent variable is current R&D expenditures divided by the previous year's sales. The results for these regressions are not shown in any table, but are described here.

I run the regression for the entire sample, for years 1990 – 1997, and for years 1998 – 2005. The coefficient is significantly negative in all three regressions with *t*-statistics of 8.58, 3.80 and 5.67 respectively. I also run the regression on a year-by-year basis. The coefficients for the R&D variables on a year-by-year basis are all negative with a minimum *t*-statistic of 2.10. The value for R^2 is over 0.05 for all but two of the years. The evidence indicates that R&D expenditures reduce current reported earnings.

2.4.2 Do Institutional Owners Influence R&D Investment?

I investigate the influence that institutional investors have on R&D investment by estimating the following firm and year fixed effects logit model.

$$(2\text{-}1)\quad RDChg_{it} = Year_t + Firm_i + Inst_{it-1} + \beta \bullet Control_{it-1} + \varepsilon_{it}$$

The dependent variable $RDChg_{it}$ is a binary variable set to either zero or one. In most of my analysis, it is set to one if there is an increase in R&D investment per share and to zero if not. In a robustness check, it is set to one if there is a decrease in R&D investment per share and to zero if not. The independent variable of interest ($Inst_{it-1}$) represents the effect of changes in institutional ownership percentage on changes in R&D investment in the following year.

In model (2-1), $Year_t$ represents year fixed effects, $Firm_i$ represents firm fixed effects, $Control_{it-1}$ represents a vector of time-varying firm level control variables (*q*, debt, ROA, insider ownership, insider ownership squared, log of market capitalization, capital expenditures to assets, free cash flow to assets, stock turnover, retained equity to total equity, and log of revenue), and ε_{it} is the error term.

The dependent variable is calculated on the change in R&D from year *t* - 1 to year *t*. The independent variables are measured as the change from year *t* – 2 to year *t* – 1. The logit model drops firms from the regression that never have a change in the dependent variable. This means that when the dependent variable is an R&D increase binary variable, firms that increase their R&D investment in every year of the sample and firms that don't increase their R&D investment in any year of the sample are dropped from the regression. I consider this an advantage to the model since only firms that change R&D policy are included in regression samples.

Table 2 - 4 reports results on the influence that changes in institutional ownership have on R&D investment per share increases in the subsequent year. The first regression uses only control variables as independent variables. Increases in R&D investment occurs more often as return on assets, market capitalization, free cash flow, and revenue increase and as *q* decreases,.

The second regression shows that an increase in institutional ownership leads to an increased probability that a firm will increase R&D investment in the ensuing year. This result could simply be a byproduct of a tendency of institutional investors to invest more in firms that regularly increase their investment in R&D. To control for this possibility, the third regression is run only on firms that did not increase R&D investment in year *t* – 2. The third regression indicates that an increase in institutional investor ownership has a positive effect on the probability of an R&D investment increase even if the firm did not increase R&D investment in the year preceding the increase in institutional ownership. The fourth regression is run only on firms that increased R&D investment in year $t - 2$. The evidence indicates that institutional investors encourage R&D investment increases in this group as well.

The results for one of the control variables appear to be counterintuitive and deserve some discussion. It seems that R&D investment should go up as *q* increases. But, *q* is largely a ratio of market capitalization to book value of assets. Therefore, the counterintuitive coefficient for *q* could be a function of the effect of *q* on R&D investment levels being overwhelmed by the effect of other control variables, particularly market capitalization. I tested this possibility by substituting total assets for market capitalization as a proxy for firm size. After the substitution, the results were very similar to the ones shown in Table 2 - 4 except that the coefficient for *q* switched from significantly negative to significantly positive indicating that the strength of the market capitalization control variable was causing the counterintuitive result for the *q* control variable.

Institutional investors use their influence to persuade management to raise R&D investment. This holds true whether or not the firm increased their R&D investment in the previous year. Results for robustness checks using data from the years 1990-1997 and 1998-2005 separately confirm that institutional investors encourage higher R&D. Another robustness check confirms that institutional investors discourage R&D cuts as well. A final robustness test using R&D to assets as the dependent variable and the Arellano and Bond (1991) difference Generalized Method of Moments (difference GMM) methodology to further control for endogeneity also confirms that institutional ownership increases are positively related to subsequent R&D. Robustness results are shown and discussed in Appendix B.

Table 2 - 4: Institutional Ownership and R&D

	(1)	(2)	(3)	(4)
	All Firms	All Firms	No R&D Incr. in year *t* - 2	R&D Incr. in year *t* - 2
	R&D_Incr	*R&D_Incr*	*R&D_Incr*	*R&D_Incr*
Inst		0.8576***	0.8496***	0.6722***
		(5.54)	(3.13)	(2.95)
q	-0.0406***	-0.0374***	-0.0366***	-0.0470***
	(4.97)	(4.64)	(2.94)	(3.23)
Debt	-0.0920	-0.0807	0.1262	-0.5816**
	(1.18)	(1.04)	(1.10)	(2.39)
ROA	0.1942*	0.1969*	-0.0509	0.1756
	(1.84)	(1.85)	(0.40)	(0.75)
Insider	-0.1552	-0.1622	-0.6080	0.8499
	(0.46)	(0.48)	(1.12)	(1.57)
Insider2	0.3269	0.3213	1.0153	-0.7765
	(0.74)	(0.72)	(1.39)	(1.10)
MktCap	0.6717***	0.6324***	0.6192***	0.6859***
	(15.48)	(14.48)	(9.16)	(9.06)
CapEx	0.2181	0.1729	0.1679	-0.0410
	(0.96)	(0.76)	(0.47)	(0.12)
FCF	0.1560**	0.1637***	0.1714*	0.3113**
	(2.54)	(2.59)	(1.89)	(2.27)
Liquidity	-0.0001	-0.0001	-0.0001	0.0188
	(0.24)	(0.23)	(0.18)	(0.98)
LifeCycle	0.0001	0.0001	0.0001	-0.0025**
	(0.66)	(0.64)	(0.91)	(2.21)
Revenue	0.0912**	0.0849**	0.0272	0.2382***
	(2.47)	(2.30)	(0.53)	(3.37)
Observations	18434	18215	6627	8630
Number of Firms	2769	2757	1607	1814
Pseudo R-sqr.	0.04	0.05	0.06	0.07

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of increases (from year *t* - 1 to *t*) in R&D expenditures (*R&D_Incr*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regressions (1) and (2) include all firms. Regression (3) includes only firms that had no R&D increase in year *t* - 2 and regression (4) includes only firms that had an R&D increase in year *t* - 2.

2.4.3 *Is Stock Liquidity a Factor?*

According to my hypothesis derived from a model proposed by Edmans (2009), institutional investors positive influence on subsequent R&D investment should primarily be concentrated in firms with high stock liquidity. According to my interpretation of Bhide (1993), this relationship should be stronger in firms with low stock liquidity. I test these predictions using firm stock turnover as a proxy for firm stock liquidity. I sort the sample of firms each year into liquidity deciles. I assign each firm-year to one of three groups. Firms in the bottom three deciles have low liquidity, those in the next four deciles have medium liquidity, and those in the highest three deciles have high liquidity.

The median R&D to sales ratio for firm-years in which the firm made an R&D investment in the low, medium, and high liquidity groups are 3.48%, 5.90% and 14.76% respectively. The percentage of firm-years in which the firm made an R&D investment in the low, medium, and high liquidity groups are 41%, 49% and 59% respectively. Thus, firms with greater liquidity are prone to invest more and more often in R&D.

I run regressions using the firm and year fixed effects logit model (2-1) that shows the effect that changes in institutional ownership have on R&D investment per share increases (*R&D_Incr*) in the subsequent year. Regressions are run on the low liquidity, medium liquidity, and high liquidity groups separately based on which group a firm is in during year t – 1. Results are shown in

Table 2 - 5.

The first and second regression, which includes only firms in the low and medium liquidity groups respectively, shows that institutional investors have no significant effect on R&D increases in these two groups. On the other hand, the third regression shows that institutional investors encourage R&D increases in firms with high liquidity. These results are consistent with the hypothesis derived from the Edmans' (2009) model which predicts that institutional investors will encourage R&D in firms with high stock liquidity. A robustness check using difference GMM supports this finding. It is discussed in Appendix B. The hypothesis derived from the arguments of Bhide (1993) is not supported.

Table 2 - 5: Institutional Ownership, R&D, and Stock Liquidity

	(1) Low *Liquidity*	(2) Medium *Liquidity*	(3) High *Liquidity*
	R&D_Incr	*R&D_Incr*	*R&D_Incr*
Inst	-0.2674	0.2409	1.1890***
	(0.47)	(0.72)	(5.45)
q	-0.0656**	-0.0267	-0.0315***
	(2.02)	(1.46)	(2.60)
Debt	0.0463	-0.4591*	-0.8957***
	(0.68)	(1.76)	(3.13)
ROA	-0.1388	0.2399	0.4805**
	(0.51)	(1.17)	(2.24)
Insider	-0.3025	-0.4556	0.0283
	(0.43)	(0.74)	(0.04)
Insider2	0.2158	0.9333	-0.0420
	(0.24)	(1.10)	(0.05)
MktCap	0.5437***	0.6311***	0.6303***
	(4.31)	(6.77)	(9.05)
CapEx	0.5539	1.0343**	-0.3959
	(0.79)	(2.00)	(1.18)
FCF	0.5882***	0.1642	-0.0129
	(2.67)	(1.52)	(0.09)
Liquidity	0.1066	-0.0779	-0.0001
	(0.48)	(1.50)	(0.13)
LifeCycle	-0.0001	-0.0003	0.0002
	(0.16)	(0.38)	(0.43)
Revenue	0.1478	0.0440	0.0425
	(1.45)	(0.59)	(0.68)
Observations	3224	6166	5521
Number of Firms	741	1303	1127
Pseudo R-squared	0.03	0.04	0.09

Absolute value of z statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of increases (from year *t* - 1 to *t*) in R&D expenditures (*R&D_Incr*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Low, Medium and High *Liquidity* firms, respectively. The Low, Medium and High *Liquidity* groups include the lowest three, middle four, and highest three *Liquidity* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

2.4.4 Is Information Asymmetry a Factor?

Zeckhauser and Pound (1990) find that large shareholders (holding over 15% of a firm) are not effective monitors of firms with high information asymmetry between managers and investors. Their result raises the possibility that institutional investors will be ineffective monitors of firms with high information asymmetry. If this is true, institutional investors will not encourage increased R&D investment in firms with high information asymmetry because they will not be able to ascertain the true value of R&D spending in such firms. A countervailing possibility is that institutional investors will encourage R&D investment more in firms that have high information asymmetry because their superior monitoring ability will allow them to discern the value of R&D investments more readily in such firms.

I test these contradictory hypotheses using retained earnings to total equity (*LifeCycle*) as a proxy for information asymmetry. DeAngelo, DeAngelo and Stulz (2006) use this measure as a proxy for firm life-cycle. They assert that this is a valid proxy for firm information asymmetry. This assertion appears logical because the more mature a firm is the more information an investor will have about the firm to judge its prospects, all else being equal.

I sort the sample of firms each year into information asymmetry deciles. I assign each firm-year to one of three groups. Firms in the bottom three deciles (Early *LifeCycle*) have high information asymmetry, those in the next four deciles

(Middle *LifeCycle*) have moderate information asymmetry, and those in the highest three deciles (Late *LifeCycle*) have low information asymmetry.

The median R&D to sales ratio for firm-years in which a firm made an R&D investment in the early, middle, and late *LifeCycle* groups are 19.26%, 6.95% and 3.40% respectively. The percentage of firm-years in which the firm made an R&D investment in the early, middle, and late *LifeCycle* groups are 60%, 44% and 47% respectively. Thus, firms earlier in their *LifeCycle* (with higher information asymmetry) are prone to invest more and more often in R&D.

I run regressions using the firm and year fixed effects model (2-1) that shows the effect that changes in institutional ownership have on R&D investment increases in the subsequent year. Regressions are run on the early, middle, and late *LifeCycle* groups separately based on which group a firm is in during year t – 1. The results are shown in Table 2 - 6.

The first two regressions show that institutional investors encourage R&D increases in firms with high and moderate information asymmetry. The third regression shows that institutional investors do not encourage R&D investment increases at a significant level in firms with low information asymmetry. The pattern indicates that institutional investors encourage R&D investment more in firms with higher information asymmetry. This is consistent with the assertion that the superior monitoring ability of institutional investors allows them to discern the value of R&D investments more readily than other investors, even in firms with high information asymmetry.

A robustness check using the difference GMM methodology confirms this result. Zeckhauser and Pound (1990) used R&D levels as a proxy for information asymmetry. Therefore, I also use R&D to assets as a proxy for information asymmetry to add robustness to my results. This robustness check also confirms that institutional investors encourage increased R&D in firms with high information asymmetry. Robustness checks are displayed and discussed in Appendix B.

Table 2 - 6: Institutional Ownership, R&D, and Firm Life-cycle

	(1) Early *LifeCycle*	(2) Middle *LifeCycle*	(3) Late *LifeCycle*
	R&D_Incr	*R&D_Incr*	*R&D_Incr*
Inst	0.6381**	0.7078***	0.4883
	(2.09)	(2.80)	(1.43)
q	-0.0458***	-0.0334*	-0.0017
	(3.35)	(1.83)	(0.09)
Debt	-0.3202	-1.0502***	0.0176
	(1.08)	(2.89)	(0.26)
ROA	0.5454***	0.6316	-0.1661
	(3.55)	(1.37)	(0.97)
Insider	0.3653	-0.0498	-0.6912
	(0.62)	(0.08)	(0.99)
Insider2	-0.1883	0.2393	1.0595
	(0.23)	(0.30)	(1.18)
MktCap	0.5805***	0.6403***	0.5050***
	(8.46)	(6.70)	(4.64)
CapEx	0.6182	0.1985	-0.6114
	(1.58)	(0.50)	(0.91)
FCF	0.0582	0.6432**	0.2967*
	(0.73)	(1.97)	(1.91)
Liquidity	0.0847***	0.0017	-0.0929**
	(3.84)	(0.09)	(2.03)
LifeCycle	0.0002	-0.0460	-0.0002
	(1.12)	(1.13)	(0.52)
Revenue	-0.0130	0.1008	0.3387**
	(0.30)	(0.85)	(2.41)
Observations	4637	5793	5693
Number of Firms	1028	1154	855
Pseudo R-squared	0.09	0.06	0.03

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of increases (from year *t* - 1 to *t*) in R&D expenditures (*R&D_Incr*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Early, Middle, and Late *LifeCycle* firms, respectively. The Early, Middle, and Late *LifeCycle* groups include the lowest three, middle four, and highest three *LifeCycle* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

2.4.5 Are Potential Agency Problems a Factor?

According to agency-based theory, institutional investors will encourage R&D investment more in firms with good investment opportunities, but they will not encourage R&D investment more in firms with high free cash flow (unless the high free cash flow is accompanied by good investment opportunities).

I test this prediction using *q* as a proxy for investment opportunities. I sort the sample of firms each year into investment opportunity deciles. I assign each firm-year to one of three groups. Firms in the bottom three deciles (Low *q*) have poor investment opportunities, those in the next four deciles (Medium *q*) have moderate investment opportunities, and those in the highest three deciles (high *q*) have good investment opportunities.

The median R&D to sales ratio for firm-years in which the firm made an R&D investment in the low, medium, and high *q* groups are 2.75%, 5.66% and 16.70% respectively. The percentage of firm-years in which the firm made an R&D investment in the low, medium, and high *q* groups are 34%, 49% and 65% respectively. Thus, firms with higher *q*'s (and better investment opportunities) are unsurprisingly prone to invest more and more often in R&D.

I run regressions using the firm and year fixed effects logit model (2-1) that shows the effect that changes in institutional ownership have on R&D investment increases in the subsequent year. Regressions are run on the low, medium, and high *q* groups separately based on which group a firm is in during year $t - 1$. The results are shown in Table 2 - 7.

The first regression indicates that for firms with poor investment opportunities, there is not a significant relationship between institutional ownership changes and the probability of an R&D increase in the following year. The second and third regressions indicate that institutional investors encourage R&D investment increases in firms with moderate and good investment opportunities. These results are consistent with agency-based theory. Institutional investors appear to only use their influence to persuade management to increase R&D when sufficient investment opportunities exist.

Agency-based theory also predicts that institutional investors will not encourage higher R&D simply because high free cash flow increases the amount of discretionary cash that is available to management. I test this prediction by assigning each firm-year to one of three groups: low cash flow (bottom three deciles), moderate cash flow (middle four deciles), and high cash flow (top three deciles). Once again, I use the firm and year fixed effects logit model (2-1). The results are shown in Table 2 - 8.

The median R&D to sales ratio for firm-years in which the firm made an R&D investment in the low, medium, and high free cash flow groups are 24.34%, 4.27% and 5.87% respectively. The percentage of firm-years in which the firm made an R&D investment in the low, medium, and high *FCF* groups are 56%, 43% and 50% respectively. Thus, firms with the lowest free cash flow to asset ratios are prone to invest more and more often in R&D than the other two groups.

The first and second regressions show that institutional investors have a positive effect on R&D investment in firms with low and medium free cash flow rates. The third regression indicates that institutional investors do not have a significant effect on R&D investment in firms with high free cash flow. The pattern indicates that institutional investors' encouragement of R&D investment does not increase as firm free cash flow rises. In fact, it wanes in the highest free cash flow firms.

The evidence indicates that an increase in institutional investors leads to an increase in R&D investment, especially in firms with good investment opportunities. Institutional investors do not encourage R&D investment in firms with high free cash flow. Therefore, institutional investors help to control agency problems by encouraging management to invest more in R&D in firms because good investment opportunities exist, but not simply because cash is available.

A robustness check using difference GMM confirms this result. An additional robustness check using a combination of investment opportunities and free cash flow is also supportive. Robustness checks are shown and discussed in Appendix B.

Table 2 - 7: Institutional Ownership, R&D, and Investment Opportunities

	(1)	(2)	(3)
	Low *q*	Medium *q*	High *q*
	R&D_Incr	*R&D_Incr*	*R&D_Incr*
Inst	0.3045	0.7199**	0.7077***
	(0.77)	(2.54)	(2.64)
q	-0.1544	-0.1929***	-0.0359***
	(1.49)	(3.54)	(3.77)
Debt	0.0290	0.1851	-0.6954***
	(0.10)	(1.05)	(3.13)
ROA	1.0324**	0.6358**	0.2255
	(2.24)	(2.18)	(1.38)
Insider	0.5603	-0.6163	-0.7136
	(0.66)	(1.06)	(1.15)
Insider2	0.1019	0.5233	1.1121
	(0.09)	(0.70)	(1.31)
MktCap	0.2639**	0.8201***	0.6156***
	(2.53)	(6.24)	(7.93)
CapEx	0.6142	0.0936	-0.1428
	(1.01)	(0.17)	(0.44)
FCF	0.2224	0.1549	0.0788
	(1.49)	(1.12)	(0.63)
Liquidity	0.0224	0.0296	-0.0082
	(0.64)	(1.27)	(0.40)
LifeCycle	0.0046*	-0.0008	0.0001
	(1.89)	(1.37)	(0.74)
Revenue	0.1569	-0.1148	0.0238
	(1.23)	(1.09)	(0.48)
Observations	3019	6272	5507
Number of Firms	676	1312	1108
Pseudo R-squared	0.03	0.05	0.05

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of increases (from year *t* - 1 to *t*) in R&D expenditures (*R&D_Incr*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Low, Medium and High *q* firms, respectively. The Low, Medium and High *q* groups include the lowest three, middle four, and highest three *Liquidity* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

Table 2 - 8: Institutional Ownership, R&D, and Free Cash Flow

	(1) Low *FCF*	(2) Medium *FCF*	(3) High *FCF*
	R&D_Incr	*R&D_Incr*	*R&D_Incr*
Inst	0.6301*	0.7130**	0.2497
	(1.84)	(2.45)	(0.78)
q	-0.0273***	-0.0413*	-0.0292
	(2.62)	(1.75)	(0.92)
Debt	0.0424	-0.6562*	-0.3594
	(0.63)	(1.92)	(0.89)
ROA	0.3599**	-0.2821	-0.7376**
	(2.39)	(0.76)	(2.09)
Insider	0.2562	-0.1966	-0.2641
	(0.36)	(0.31)	(0.39)
Insider2	-0.5947	0.5828	0.0960
	(0.64)	(0.71)	(0.10)
MktCap	0.5052***	0.6855***	0.4233***
	(6.78)	(6.68)	(3.34)
CapEx	0.3918	0.3994	0.6130
	(1.12)	(0.84)	(0.73)
FCF	0.1237	0.0297	0.0732
	(1.24)	(0.33)	(0.86)
Liquidity	-0.0001	-0.0095	-0.0271
	(0.17)	(0.43)	(0.93)
LifeCycle	-0.0000	0.0005	-0.0007
	(0.17)	(0.40)	(0.76)
Revenue	-0.0831*	0.0474	0.3471**
	(1.75)	(0.40)	(2.00)
Observations	3341	5458	4877
Number of Firms	828	1245	967
Pseudo R-squared	0.09	0.04	0.03

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of increases (from year *t* - 1 to *t*) in R&D expenditures (*R&D_Incr*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Low, Medium and High *FCF* firms, respectively. The Low, Medium and High *FCF* groups include the lowest three, middle four, and highest three *Liquidity* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

2.5 Conclusion

Research and development (R&D) investment is an important determinant of the future growth in revenue and earnings for many corporations. The amount of financial resources which are allocated to R&D is an important financial decision for those corporations and a key to survival for many of them. Since institutions own almost 70% of U.S. public corporations, their effect on R&D decisions is important to the success of U.S. corporations. In this paper, I test several hypotheses about the influence institutional investors have on R&D investment policy.

I find that companies with higher institutional investor ownership, holding other factors constant, invest more in R&D than companies with lower institutional ownership. I find that an increase in institutional ownership leads to an increase in R&D investment.

I expand a model that Edmans (2009) proposes about the effect of blockholders on long-term investment. In his model, blockholders make their trading decisions based on the fundamental value of the firm rather than current earnings. The superior monitoring ability of blockholders enables them to discern the benefit of the firm investing for the long-term to enhance firm value. Management, which is cognizant of the large shareholders' ability to determine the firm's true value, is thus encouraged to invest for the long-term rather than for short-term profits. Management can thus avoid a depressed stock share price that results from the blockholders divesting their shares if management chooses to invest at a sub-optimal level. I argue that if institutional investors herd, they can have an impact similar to the one predicted of blockholders in this model.

A prediction of the Edmans (2009) model is that the ability of large shareholders to encourage higher investment is enhanced by higher firm stock liquidity because the higher liquidity heightens the threat of divestment. I find that higher firm stock liquidity enhances the ability of institutional investors to use their influence to persuade management to increase their investment in R&D. Thus, my results support the Edmans (2009) model.

Institutional investors are better informed than other investors. Institutional owners should be able to gauge the long-term benefit of R&D investment more precisely than non-institutional investors. Therefore, I propose a hypothesis that predicts that the positive relationship between institutional investors and future R&D investment will strengthen in firms with higher information asymmetry. My results support this prediction. I find that Institutional investors encourage higher R&D investment primarily in firms with high information asymmetry indicating they have an advantage in discerning the value of R&D investments in such firms.

Firms with higher free cash flow and poor growth opportunities are susceptible to agency problems because they have higher discretionary funds that can be misused by management. Agency-based free cash flow theory predicts that if institutional investors are better monitors than other investors, they will encourage R&D investment in firms with good investment opportunities, but they will not encourage R&D investment simply because a firm has higher free cash flow. My results support this prediction indicating that institutional investors help to control agency problems in R&D investment decisions.

Institutional investor increases precede increases in research and development (R&D) investment overall and specifically in firms with higher stock liquidity, higher information asymmetry, lower free cash flow, and better investment opportunities. Institutional investors effectively encourage management to pursue long-term R&D investment policies that are beneficial to shareholders.

List of References

Aboody, David and Baruch Lev, 2000, Information Asymmetry, R&D, and Insider Gains, *Journal of Finance* 55, 2747-2766.

Aggarwal, Reena, Isil Erel, Miguel Ferreira, and Pedro Matos, 2010, Does Governance Travel Around the World? Evidence from Institutional Investors, Working Paper.

Aghion, Philippe, John Van Reenen, and Luigi Zingales, 2009, Innovation and Institutional Ownership, NBER Working Paper No. 14769.

Ajinkya, Bipin, Sanjeev Bhorjraj, and Partha Sengupta, 2005, The Association between Outside Directors, Institutional Investors and the Properties of Management Earnings Forecasts, *Journal of Accounting Research* 43, 343-376.

Allen, Franklin, Antonio E. Bernardo, and Ivo Welch, 2000, A theory of dividends based on tax clienteles, *Journal of Finance* 55, 2499-2536.

Almazan, Andres, Jay C. Hartzell, and Laura T. Starks, 2005, Active Institutional Shareholders and Costs of Monitoring: Evidence from Executive Compensation, *Financial Management*, 5-34.

Almeida, Heitor, Murillo Campello, and Antonio F. Galvao Jr., 2010, Measurement Errors in Investment Equations, *Review of Financial Studies* 23, 3279-3328.

Amihud, Yakov, and Kefei Li, 2006, The Declining Information Content of Dividend Announcements and the Effects of Institutional Holdings, *Journal of Financial and Quantitative Analysis* 41, 637-660.

Arellano, Manuel, and Stephen Bond, 1991, Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations, *Review of Economic Studies* 58, 277-297.

Baber, William R., Patricia M. Fairfield, and James A. Haggard, 1991, The Effect of concern about Reported Income on Discretionary Spending Decisions: The Case of Research and Development, *The Accounting Review* 66, 818-829.

Baker, Malcolm, and Jeffrey Wurgler, 2004, A Catering Theory of Dividends, *Journal of Finance* 59, 1125-1165.

Banerjee, Suman, Vladimir A. Gatchev, and Paul A. Spindt, 2007, Stock Market Liquidity and Firm Dividend Policy, *Journal of Financial and Quantitative Analysis* 42, 369-398.

Bange, Mary M., and Werner F.M. De Bondt, 1998, R&D budgets and corporate earnings targets, *Journal of Corporate Finance* 4, 153-184.

Barclay, Michael J., and Clifford W. Smith Jr., 1988, Corporate payout policy: Cash dividends versus open-market repurchases, *Journal of Financial Economics* 22, 61-82.

Bartov, Eli,Itzhak Krinsky and Jason Lee, 1998, Evidence on How Companies Choose Between Dividends and Open-Market Stock Repurchases, *Journal of Applied Corporate Finance* 11, 89-96.

Becht, Marco, Patrick Bolton, Alisa Röell, 2003, Corporate Governance and Control, in George Constantinides, Milton Harris, and Rene Stulz, eds.: *Handbooks of Economics* (North-Holland, Amsterdam, The Netherlands).

Bennet, James A., Richard W. Sias, and Laura T. Starks, 2003, Greener Pastures and the Impact of Dynamic Institutional Preferences, *The Review of Financial Studies* 16,1203-1238.

Bhattacharya, Sudipto, 1979, Imperfect information, dividend policy, and the "bird-in-hand" fallacy, *Bell Journal of Economics* 10, 259-270.

Bhide, Amar, 1993, The hidden costs of stock market liquidity, *Journal of Financial Economics* 34, 31-51.

Bhojraj, S., Hribar, P., Picconi, M. and McInnis, J., 2009, Making Sense of Cents: An Examination of Firms That Marginally Miss or Beat Analyst Forecasts. The *Journal of Finance* 64: 2361–2388.

Bhojraj, Sanjeev, and Robert Libby, 2005, Capital Market Pressure, Disclosure Frequency-Induced Earnings/Cash Flow Conflict, and Managerial Myopia, *The Accounting Review* 80, 1-20.

Bhojraj, Sanjeev, and Partha Sengupta, 2003, Effect of Corporate Governance on Bond Ratings and Yields: The Role of Institutional Investors and outside Directors, The *Journal of Business* 76, 455-475.

Black, Fischer, 1976, The dividend puzzle, *Journal of Portfolio Management* 2, 5-8.

Boudoukh, Jacob, Roni Michaely, Matthew Richardson, and Michael R. Roberts, 2007, On the Importance of Measuring Payout Yield: Implications for Empirical Asset Pricing, *Journal of Finance* 62, 877-915.

Brockman, Paul, John S. Howe, and Sandra Mortal, 2008, Stock market liquidity and the decision to repurchase, *Journal of Corporate Finance* 14, 446–459.

Brava, Alon, John R. Graham, Campbell R. Harvey, and Roni Michaely, 2005, Payout policy in the 21st century, *Journal of Financial Economics* 77, 483–527.

Brennan, Michael J., and Anjan V. Thakor, 1990, Shareholder preferences and dividend policy, *Journal of Finance* 45, 993-1018.

Brown, James R., Steven M. Fazzari, and Bruce C. Petersen, 2009, Financing Innovation and Growth: Cash Flow, External Equity, and the 1990s R&D Boom, *Journal of Finance* 64, 151-185.

Burns, Natasha, Simi Kedia, and Marc Lipson, 2010, Institutional ownership and monitoring: Evidence from financial misreporting, *Journal of Corporate Finance* 16, 443-455.

Bushee, Brian J., 1998, The Influence of Institutional Investors on Myopic R&D Investment Behavior, *Accounting Review* 73(3): 305-333.

Carleton, Willard T., James M. Nelson, and Michael S. Weisbach, 1998, The Influence of Institutions on Corporate Governance through Private Negotiations: Evidence from TIAA-CREF, *Journal of Finance* 53, 1335-1362.

Cazier, Richard, 2009, R&D Spending among Short-Horizon CEOs: A Reexamination, Dissertation.

Chan, Louis K. C., Josef Lakonishok and Theodore Sougiannis, 2001, The Stock Market Valuation of Research and Development Expenditures, *The Journal of Finance* 56, 2431-2456.

Chan, Su Han, John D. Martin, and John W. Kensinger, 1990, Corporate research and development expenditures and share value, *Journal of Financial Economics* 26, 255-276.

Chay, J.B., and Jungwon Suh, 2009, Payout policy and cash-flow uncertainty, *Journal of Financial Economics* 93, 88-107.

Chemmanura, Thomas J., Shan He, and Gang Hu, 2009, The role of institutional investors in seasoned equity offerings, *Journal of Financial Economics* 94, 384–411.

Chen, Xia, Jarrad Harford, and Kai Li, 2007, Monitoring: Which institutions matter?, *Journal of Financial Economics* 86, Pages 279-305.

Cheng, Mei, K.R. Subramanyam, and Yuan Zhang, 2007, Earnings Guidance and Managerial Myopia, Working Paper.

Cheng, Shijun, 2004, R&D Expenditures and CEO Compensation, *The Accounting Review* 79, 305-328.

Cheng, Shijun, 2008, Board size and the variability of corporate performance, *Journal of Financial Economics* 87, 157–176.

Choi, Nicole, and Richard W. Sias, 2009, Institutional industry herding, *Journal of Financial Economics* 94, 469 – 491.

Chung, Kee H., Peter Wright, and Ben Kedia, 2003, Corporate governance and market valuation of capital and R&D investments, *Review of Financial Economics* 12, 161-172.

Chung, Richard, Michael Firth, and Jeong-Bon Kim, 2002, Institutional monitoring and opportunistic earnings management, *Journal of Corporate Finance* 8, 29–48.

Chung, Kee H. and Hao Zhang, 2011, Corporate Governance and Institutional Ownership, *Journal of Financial and Quantitative Analysis*, forthcoming.

Coles, Jeffrey L., Naveen D. Daniel, and Lalitha Naveen, 2006, Managerial incentives and risk-taking, *Journal of Financial Economics* 79, 431-468.

Cornett, Marcia Millon, Alan J. Marcus, Anthony Saunders, and Hassan Tehranian, 2007, The impact of institutional ownership on corporate operating performance, *Journal of Banking & Finance* 31, 1771-1794.

Cornett, Marcia Millon, Alan J. Marcus, and Hassan Tehranian, 2008, Corporate governance and pay-for-performance: The impact of earnings management, *Journal of Financial Economics* 87, 357-373.

Cronqvist, Henrik and Rudiger Fahlenbrach, 2009, Large Shareholders and Corporate Policies, *Review of Financial Studies*, forthcoming.

Cuñat, Vicente, 2007, Trade Credit: Suppliers as Debt Collectors and Insurance Providers, *Review of Financial Studies* 20, 491-527.

D'Mello, Ranjan and Pervin K. Shroff, 2000, Equity Undervaluation and Decisions Related to Repurchase Tender Offers: An Empirical Investigation, *Journal of Finance* 55, 2399-2424.

David, Parthiban, Michael A. Hitt, and Javier Gimeno, 2001, The Influence of Activism by Institutional Investors on R&D, *The Academy of Management Journal* 44, 144-157.

DeAngelo, Harry, Linda DeAngelo, and Douglas J. Skinner, 2000, Special dividends and the evolution of dividend signaling, *Journal of Financial Economics* 57, 309-354.

DeAngelo, Harry, Linda DeAngelo, and Douglas J. Skinner, 2004, Are dividends disappearing? Dividend concentration and the consolidation of earnings, *Journal of Financial Economics* 72, 425–456.

DeAngelo, Harry, Linda DeAngelo, and Rene M. Stulz, 2006, Dividend policy and the earned/contributed capital mix: a test of the life-cycle theory, *Journal of Financial Economics* 81, 227-254.

Dechow, Patricia M., and Richard G. Sloan, 1991, Executive incentives and the horizon problem: An empirical investigation, *Journal of Accounting & Economics* 14, 51-89.

Demers, Elizabeth, and Chong Wang, 2010, The Impact of CEO Career Concerns on Accruals Based and Real Activities Earnings Management, Working Paper.

Denis, David J., and Igor Osobov, 2008, Why do firms pay dividends? International evidence on the determinants of dividend policy, *Journal of Financial Economics* 89, 62– 82.

Dhaliwal, Dan, and Oliver Zhen Li, 2006, Investor Tax Heterogeneity and Ex-Dividend Day Trading Volume, *Journal of Finance* 61, 463-490.

Dlugosz, Jennifer, Rudiger Fahlenbrach, Paul Gompers, and Andrew Metrick, 2006, Large blocks of stock: Prevalence, size, and measurement, *Journal of Corporate Finance* 12, 594-618.

Easterbrook, Frank H., 1984, Two agency-cost explanations of dividends, *American Economic Review* 74, 650-659.

Eberhart, Allan C., William F. Maxwell, and Akhtar R. Siddique, 2004, An Examination of Long-Term Abnormal Stock Returns and Operating Performance Following R&D Increases, *Journal of Finance* 59, 623-650.

Edmans, Alex, 2009, Blockholder Trading, Market Efficiency, and Managerial Myopia, *Journal of Finance* 64, 2481-2513.

Eije, Henk von, and William L Megginson, 2008, Dividends and share repurchases in the European Union. *Journal of Financial Economics* 89, 347–374.

Elyasiani, Elyas, and Jingyi Jia, 2010, Distribution of institutional ownership and corporate firm performance, *Journal of Banking & Finance* 34, 606-620.

Fama, Eugene F., and Kenneth R. French, 2001, Disappearing dividends: Changing firm characteristics or lower propensity to pay?, *Journal of Financial Economics* 60, 3-43.

Ferreira, Miguel A., Massimo Massa, and Pedro Matos, 2010, Shareholders at the Gate? Institutional Investors and Cross-Border Mergers and Acquisitions, *Review of Financial Studies* 23, 601 – 644.

Ferreira, Miguel A., and Pedro Matos, 2008, The color of investors' money: The role of institutional investors around the world, *Journal of Financial Economics* 88, 499-533.

Ferris, Stephen P., Narayanan Jayaraman, Sanjiv Sabherwal, 2009, Catering effects in corporate dividend policy: The international evidence, *Journal of Banking & Finance* 33, 1730–1738.

Fidrmuc, Jana P. Marc Goergen, and Luc Renneboog, 2006, Insider Trading, News Releases, and Ownership Concentration, *Journal of Finance* 61, 2931-2973.

Field, Laura Casares and Michelle Lowry, 2009, Institutional versus Individual Investment in IPOs: The Importance of Firm Fundamentals, *Journal of Financial and Quantitative Analysis* 44, 489-516.

Froot, Kenneth A., Andre F. Perold and Jeremy C. Stein, Shareholder Trading Practices and Corporate Investment Horizons, *Journal of Applied Corporate Finance* 5, 42-58.

Fuller, Kathleen, and Benjamin M. Blau, 2010, Signaling, Free Cash Flow and "Nonmonotonic" Dividends, *The Financial Review* 45, 21-56.

Gibbons, Robert, and Kevin J. Murphy, 1992, Does Executive Compensation Affect Investment?, *Journal of Applied Corporate Finance* 5, 99-109.

Gillan, Stuart, and Laura T. Starks, 2000, Corporate governance proposals and shareholder activism: the role of institutional investors, *Journal of Financial Economics* 57, 275-305.

Gillan, Stuart, and Laura Starks, 2007, The Evolution of Shareholder Activism in the United States, *Journal of Applied Corporate Finance* 19, 55-73.

Graham, John R., Campbell R. Harvey, and Shiva Rajgopal, 2005, The economic implications of corporate financial reporting, *Journal of Accounting and Economics* 40, 3-73.

Grinstein, Yaniv, and Roni Michaely, 2005, Institutional Holdings and Payout Policy, *Journal of Finance* 60, 1389-1426.

Grullon, Gustavo and David L. Ikenberry, 2000, What Do We Know About Stock Repurchases?, *Journal of Applied Corporate Finance* 13, 31-51.

Grullon, Gustavo, and Roni Michaely, 2002, Dividends, repurchases, and the substitution hypothesis, *Journal of Finance* 57, 1649-1684.

Grullon, Gustavo, and Roni Michaely, 2004, The Information Content of Share Repurchase Programs, *Journal of Finance* 59, 651-680.

Grullon, Gustavo, Roni Michaely, and Bhaskaran Swaminathan, 2002, Are Dividend Changes a Sign of Firm Maturity?, *Journal of Business* 387-424.

Grullon, Gustavo, Bradley Paye, Shane Underwood, and James P. Weston, Forthcoming, Has the Propensity to Pay Out Declined?, *Journal of Financial and Quantitative Analysis*.

Guay, Wayne and Jarrad Harford, 2000, The Cash-Flow Permanence and Information Content of Dividend Increases Versus Repurchases, *Journal of Financial Economics* 57, 385-415.

Gugler, Klaus, 2003, Corporate governance, dividend payout policy, and the interrelation between dividends, R&D, and capital investment, *Journal of Banking & Finance* 27, 1297–1321.

Gupta, Nandini, 2005, Partial Privatization and Firm Performance, *Journal of Finance* 60, 987-1015.

Hall, Bronwyn H., 1993, The Stock Market's Valuation of R&D Investment During the 1980's, *The American Economic Review* 83, 259-264.

Hankins, Kristine Watson, Mark J. Flannery, and M. Nimalendran, 2008, The Effect of Fiduciary Standards on Institutions' Preference for Dividend-Paying Stocks, *Financial Management*, 647–671.

Harford, Jarrad, Sattar A. Mansi, and William F. Maxwell, 2008, Corporate governance and firm cash holdings in the US, *Journal of Financial Economics* 87, 535–555.

Harter, Charles I., and T. Harikumar, 2004, Management Compensation and Project Life, *Journal of Applied Business Research* 20, 65-71.

Hartzell, Jay C., Starks, Laura T., 2003, Institutional investors and executive compensation, *Journal of Finance* 58, 2351–2374.

Hoberg, Gerard, and Nagpurnanand R. Prabhala, 2009, Disappearing Dividends, Catering, and Risk, *Review of Financial Studies* 22, 79 – 116.

Holden, Craig W., and Leonard L. Lundstrum, 2009, Costly trade, managerial myopia, and long-term investment, *Journal of Empirical Finance* 16, 126–135.

Holtz-Eakin, Douglas, Whitney Newey, and Harvey.S. Rosen, 1988, Estimating Vector Autoregressions with Panel Data, *Econometrica* 56, 1371–1395.

Huang, Roger D., and Cheng-Yi Shiu, 2009, Local Effects of Foreign Ownership in an Emerging Financial Market: Evidence from Qualified Foreign Institutional Investors in Taiwan, *Financial Management*, 567-602.

Jagannathan, Murali, Clifford P. Stephens, and Michael S. Weisbach, 2000, Financial flexibility and the choice between dividends and stock repurchases, *Journal of Financial Economics* 57, 355-384.

Jain, Ravi, 2007, Institutional and individual investor preferences for dividends and share repurchases, *Journal of Economics and Business* 59, 406–429.

Jensen, Michael C., 1986, Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers, *American Economic Review* (May), 323-329.

Jensen, Michael, Kevin Murphy, and Eric Wruck, 2005, CEO Pay…and How to Fix It, Working paper, Harvard Business School.

Jones, Edward and Jo Danbolt, 2003, R&D project announcements and the impact of ownership structure, *Applied Economics Letters* 10, 933-936.

Kane, Gregory D., and Uma Velury, 2004, The role of institutional ownership in the market for auditing services: an empirical investigation, *Journal of Business Research* 57, 976– 983.

Kang, Sok-Hyon, Praveen Kumar, Hyunkoo Lee, 2006, Agency and Corporate Investment: The Role of Executive Compensation and Corporate Governance, *Journal of Business* 79, 1127-1147.

Kaplan, Steven, and Bernadette Minton, 2006, How has CEO turnover changed? Increasingly performance sensitive boards and increasingly uneasy CEOs, Working paper, University of Chicago.

Kothari, S.P., Ted E. Laguerre, and Andrew J. Leone, 2002, Capitalization versus Expensing: Evidence on the Uncertainty of Future Earnings from Capital Expenditures versus R&D Outlays, *Review of Accounting Studies* 7, 355-382.

La Porta, Rafael, Florencio Lopez-De-Silanes, Andrei Shleifer and Robert W. Vishny, 2000, Agency Problems and Dividend Policies around the World, *Journal of Finance* 55, 1-33.

Le, Son Anh, Bruce Walters, and Mark Kroll, 2006, The moderating effects of external monitors on the relationship between R&D spending and firm performance, *Journal of Business Research* 59, 278 – 287.

Lee, Peggy M., and Hugh M. O'Neill, 2003, Ownership Structures and R&D Investments of U.S. and Japanese Firms: Agency and Stewardship Perspectives, *Academy of Management Journal* 46, 212-225.

Lee, Yi-Tsung, Yu-Jane Liu, Richard Roll, and Avanidhar Subrahmanyam, 2006, Taxes and dividend clientele: Evidence from trading and ownership structure, *Journal of Banking & Finance* 30, 229–246.

Li , Kai, and Xinlei Zhao, 2008, Asymmetric Information and Dividend Policy, *Financial Management*, 673-694.

Li, Wei, and Erik Lie, 2006, Dividend changes and catering incentives, *Journal of Financial Economics* 80, 293–308.

Lie, Erik, and Heidi J. Lie, 1999, The Role of Personal Taxes in Corporate Decisions: An Empirical Analysis of Share Repurchases and Dividends, *Journal of Financial and Quantitative Analysis* 34, 533-552.

Lintner, John, 1956, Distribution of income of corporations among dividends, retained earnings, and taxes, *American Economic Review* 46, 97-113.

Massa, Massimo, Zahid Rehman, and Theo Vermaelen, 2007, Mimicking repurchases, *Journal of Financial Economics* 84, 624–666.

Maug, Ernst, 1998, Large shareholders as monitors: is there a trade-off between liquidity and control,? *Journal of Finance* 53, 65– 98.

Miller, Merton, and Franco Modigliani, 1961, Dividend policy, growth, and the valuation of shares, *Journal of Business* 34, 411-433.

Miller, Merton, and Kevin Rock, 1985, Dividend policy under asymmetric information, *Journal of Finance* 40, 1031-1051.

Morck, Randall, Andrei Shleifer and Robert W., Vishny, 1988. Management Ownership and Market Valuation: An Empirical Analysis, *Journal of Financial Economics* 20, 293–315.

Moser, William J., 2007, The Effect of Shareholder Taxes on Corporate Payout Choice, *Journal of Financial and Quantitative Analysis* 42, 991-1020.

Murphy, Kevin, 2003, Stock-based pay in new economy firms, *Journal of Accounting and Economics* 34, 129–147.

Nofsinger, John R., and Richard W. Sias, 1999, Herding and Feedback Trading by Institutional and Individual Investors, *Journal of Finance* 54, 2263-2295.

Ofer, Aharon R., and Anjan V. Thakor, 1987, A Theory of Stock Price Responses to Alternative Corporate Cash Disbursement Methods: Stock Repurchases and Dividends, *Journal of Finance* 62, 365-394.

Officer, Micah S., 2010, Overinvestment, corporate governance, and dividend initiations, *Journal of Corporate Finance* Forthcoming.

Parrino, Robert, Richard W. Sias, and Laura T. Starks, 2003, Voting with their feet: institutional ownership changes around forced CEO turnover, *Journal of Financial Economics* 68, 3-46.

Peng, Lin, and Ailsa Roell, 2008, Executive pay, earnings manipulation and shareholder litigation, *Review of Finance* 12, 141–184.

Porter, Michael, 1992, Capital disadvantage: America's failing capital investment system, *Harvard Business Review* 70, 65–82.

Poterba, James, and Lawrence Summers, 1984, New evidence that taxes affect the valuation of dividends, *Journal of Finance* 39, 1397-1415.

Renneboog, Luc, and Grzegorz Trojanowski, 2010, Patterns in payout policy and payout channel choice, *Journal of Banking & Finance*, Forthcoming.

Roodman, David, 2009, How to do xtabond2: An introduction to difference and system GMM in Stata. *Stata Journal* 9, 86-136.

Rubin, Amir, 2007, Ownership level, ownership concentration and liquidity, *Journal of Financial Markets* 10, 219-248.

Rubin, Amir, and Daniel R. Smith, 2009, Institutional ownership, volatility and dividends, *Journal of Banking & Finance* 33, 627–639.

Ryan, Jr., Harley E., and Roy A. Wiggins, III, 2002, The Interactions between R&D Investment Decisions and Compensation Policy, *Financial Management* 31, 5-29.

Samuel, Cherian, 2000, Does shareholder myopia lead to managerial myopia? A first look, A*pplied Financial Economics* 10, 493-505.

Scholz, John Karl, 1992, A direct examination of the dividend clientele hypothesis, Journ*al of Public Economics* 49, 261-285.

Shefrin, Hersh M., and Meir Statman, 1984, Explaining investor preference for cash dividends, *Journal of Financial Economics* 13, 253-282.

Shleifer, Andrei, and Robert W. Vishny, 1986, Large shareholders and corporate control, *Journal of Political Economy* 94, 461-488.

Sias, Richard W., 2004, Institutional herding, *Review of Financial Studies* 17, 165 - 206.

Skinner, Douglas J., 2008, The evolving relation between earnings, dividends, and stock repurchases, *Journal of Financial Economics* 87, 582–609.

Stein, Jeremy C., 1988, Takeover Threats and Managerial Myopia, *The Journal of Political Economy* 96, 61-80.

Stein, Jeremy C., 1989, Efficient Capital Markets, Inefficient Firms: A Model of Myopic Corporate Behavior, *The Quarterly Journal of Economics* 655-669.

Sulaeman, Johan Arifin, 2008, Essays on the Impact of Institutional Investors on Market Efficiency and Corporate Policies. Dissertation.

Sundaram, Anant K., Teresa A. John, and Kose John, 1996, An empirical analysis of strategic competition and firm values: The case of R&D competition, *Journal of Financial Economics* 40, 459-486.

Szewczyk, Samuel H., George P. Tsetsekos, and Zaher Zantout, 1996, The Valuation of Corporate R&D Expenditures: Evidence from Investment Opportunities and Free Cash Flow, *Financial Management* 25, 105-110.

Vermaelen, Theo, 1984, Repurchase Tender Offers, Signaling and Managerial Incentives, *Journal of Financial and Quantitative Analysis* 19, 163-181.

Wahal, Sunil and John J. McConnell, 2000, Do institutional investors exacerbate managerial myopia?, *Journal of Corporate Finance* 6, 307-329.

Wermers, Russ, 1999, Mutual fund herding and the impact on stock prices, *Journal of Finance* 54, 581 - 622.

Xu, Xiaoyan, 2008, Three Essays on Corporate Governance, Management Incentives, and Government Expenditures, Dissertation.

You, Taewoo, Xiaoying Chen and Mark E. Holder, 2008, Efficiency and its determinants in pharmaceutical industries: ownership, R&D and scale economy, *Applied Economics*, 1-25.

Zeckhauser, Richard, and John Pound, 1990, Are large shareholders effective monitors? An investigation of share ownership and corporate performance, in R. G. Hubbard, ed.: *Asymmetric information, Corporate Finance, and Investment*) University of Chicago Press, Chicago).

Appendices

Appendix A: Payout Robustness Tests

This appendix includes robustness checks for tests on the influence institutional investors have on payout policy. These robustness checks have been moved from the main text to this appendix to improve the flow and clarity of the main text. In all cases, results from the main text are supported.

The results in Table A - 1, Table A - 2, and Table A - 3 provide support for agency-based theory. Table A - 1 provides evidence that an increase in institutional ownership leads to an increase in total payout for two separate time periods: 1990 – 1997 and 1998 – 2005. Table A - 2 indicates that an increase in institutional investors leads to a stronger increase in payouts in firms with poor investment opportunities and high free cash flow. Institutional investors do not have an effect on payouts in firms with good investment opportunities or low free cash flow.

I employ the Arellano and Bond (1991) difference linear GMM dynamic panel data methodology to obtain the results shown in Table A – 3. This difference GMM methodology attenuates endogeneity problems between dependent and independent variables. Difference GMM methodology is explained in greater detail in Appendix C. The results indicate that an increase in institutional shareholders leads to an increase in payouts, especially in firms with poor investment opportunities and high free cash flow.

Table A - 4 and Table A - 5 display results that provide evidence for the adverse selection theory. Table A - 4 demonstrates that an increase in institutional ownership precedes a subsequent increase in stock repurchases in both the 1990 – 1997 and 1998 – 2005 time periods. Difference GMM is used to produce the results displayed in Table A - 5 which indicate that institutional investors encourage stock repurchases primarily in firms with higher information asymmetry.

Support for the substitution hypothesis is provided by the results displayed in Table A - 6 and Table A - 7. The substitution hypothesis asserts that the influence of institutional investors will lead to an increased percentage of total payout going towards repurchases. In Table A - 6, support is shown for the hypothesis in both the 1990 – 1997 and 1998 – 2005 time periods, although the evidence is stronger and more convincing for the latter period.

The results for the earlier period are somewhat surprising since this time period is entirely included in Fama and French (2001) which finds a decrease in propensity to pay dividends and an increase in repurchases. A closer examination of their study indicates that during the 1990 – 1997 time period, the propensity to pay dividends changed very little (see Table 6 of their study). It also indicates that repurchases declined from the 1988 – 1992 period to the 1993 – 1998 period (see Table 12 of their study). My results for the earlier time period seem less surprising in light of this information.

Still, the contrast between my weak results in the early time period and exceptionally strong results in the latter time period raises a question. Why? It could just be a result of the vagaries of the trend noted in Fama and French (2001). Jagannathan, Stephens, and Weisbach (2000) showed that repurchases are very cyclical with firms increasing stock repurchases after poor stock market performances. They also found that dividend increases were more common following good performance. Their findings could explain the different results for the two time periods.

Table A - 7 display results for difference GMM regressions using payout composition as the dependent variable. The results indicate that institutional investors encourage an increased use of stock repurchases as a percentage of total payout, especially in firms which previously used stock repurchases for more than 50% of their total payout.

Table A - 1: Payouts and Time Periods

	(1)	(2)
	1990 - 1997	1998 - 2005
	Payout	*Payout*
Inst	0.0118**	0.0138**
	(2.21)	(2.43)
q	0.0000	-0.0007***
	(0.30)	(5.14)
Debt	-0.0501***	-0.0080**
	(3.60)	(2.47)
Turnover	-0.0000*	-0.0012***
	(1.77)	(2.87)
LifeCycle	0.0000	-0.0000
	(1.27)	(1.14)
MktCap	0.0040*	0.0098***
	(1.88)	(6.74)
ROA	-0.0034**	-0.0018***
	(2.07)	(2.94)
Insider	-0.0243	-0.0184
	(1.39)	(1.24)
Insider2	0.0281	0.0037
	(1.64)	(0.23)
Revenue	0.0005	-0.0014
	(0.36)	(0.89)
Observations	17682	27251
Firms	4809	6128
R-squared	0.13	0.22

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in total payout divided by book value of assets (*Payout*) by time period. All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regression (1) includes the years from 1990 to 1997. Regression (2) includes the years from 1998 to 2005.

Table A - 2: Payouts, Investment Opportunities, and Free Cash Flow

	(1)	(2)	(3)	(4)
	High *CashFlow* Low *q*	High *CashFlow* High *q*	Low *CashFlow* Low *q*	Low *CashFlow* High *q*
	Payout	*Payout*	*Payout*	*Payout*
Inst	0.0305**	0.0059	0.0033	0.0080
	(2.00)	(0.61)	(0.54)	(1.20)
CashFlow	-0.0005	0.0122**	-0.0039	0.0019*
	(0.53)	(2.50)	(1.63)	(1.72)
q	0.0038	-0.0021***	0.0005	-0.0004
	(0.87)	(4.21)	(0.42)	(1.54)
Debt	-0.0638*	-0.1122***	-0.0075	0.0000
	(1.82)	(5.66)	(1.46)	(0.01)
Turnover	-0.0054	-0.0016***	0.0000	-0.0010*
	(1.30)	(3.07)	(0.52)	(1.90)
LifeCycle	-0.0000	0.0000	0.0000	0.0000
	(0.95)	(0.29)	(0.39)	(0.11)
MktCap	0.0128**	0.0225***	0.0062*	0.0043**
	(2.37)	(7.20)	(1.96)	(2.09)
ROA	-0.0156	-0.0356***	0.0043	-0.0022**
	(0.93)	(2.76)	(0.73)	(2.09)
Insider	-0.0082	-0.0134	0.0047	0.0027
	(0.53)	(0.73)	(0.17)	(0.18)
Insider2	0.0087	0.0016	-0.0043	-0.0006
	(0.51)	(0.07)	(0.16)	(0.04)
Revenue	-0.0010	0.0055	-0.0071*	-0.0003
	(0.18)	(1.45)	(1.73)	(0.21)
Observations	10924	13122	11558	8632
Number of Firms	3757	3831	4565	3496
R-squared	0.49	0.20	0.42	0.77

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in total payout divided by book value of assets (*Payout*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), (3) and (4) include only firms that are in the High *CashFlow* and Low *q*, High *CashFlow* and High *q*, Low *CashFlow* and Low *q*, and Low *CashFlow* and High *q* groups, respectively. The Low *CashFlow* and High *CashFlow* groups include the lowest five and highest five *CashFlow* deciles, respectively. The Low *q* and High *q* groups include the lowest five and highest five *q* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

Table A - 3: Payouts, Investment Opportunities and Free Cash Flow (GMM)

	(1)	(2)	(3)	(4)	(5)
	All Firms	Low *q*	High *q*	Low *CashFlow*	High *CashFlow*
	Payout	*Payout*	*Payout*	*Payout*	*Payout*
Inst	0.0199**	0.0150**	0.0205	0.0127	0.0266**
	(2.37)	(2.19)	(1.56)	(1.48)	(2.33)
Payout	0.0755	0.0585	0.0809***	0.0492	0.1196***
	(2.35)	(1.35)	(2.56)	(1.38)	(3.30)
q	-0.0009	0.0004	-0.0005	-0.0006	0.0006
	(0.49)	(0.11)	(0.30)	(0.32)	(0.23)
Debt	-0.4795	-0.0518	-0.0003	0.0343	-0.0848
	(1.05)	(1.18)	(0.01)	(0.83)	(1.43)
Turnover	0.0000	-0.0000	-0.0041*	0.0000	-0.0000
	(0.15)	(0.24)	(1.70)	(0.61)	(0.51)
LifeCycle	-0.0001	-0.0000	-0.0001	-0.0001	-0.0001
	(0.93)	(0.87)	(0.93)	(1.11)	(0.84)
MktCap	-0.0069	-0.0164*	0.0041	-0.0122	0.0050
	(0.62)	(1.66)	(0.28)	(1.37)	(0.33)
ROA	0.0301	0.0318	0.0026	0.0408	0.0050
	(1.26)	(0.94)	(0.14)	(1.01)	(0.17)
Insider	-0.1504**	-0.0754	-0.1278	-0.0221	-0.1984
	(1.99)	(1.26)	(1.21)	(0.25)	(2.05)
Insider2	0.1619	0.0703	0.1386	-0.0092	0.2234*
	(1.50)	(1.01)	(0.82)	(0.08)	(1.77)
Revenue	-0.0544***	-0.0102	-0.0374***	-0.0218	-0.0986
	(4.07)	(0.91)	(3.04)	(0.89)	(4.29)
Observations	35255	18203	17052	16320	20387
Number of Firms	6796	4897	4532	5393	5129
Chi2 (*p*-value)	0.000	0.000	0.000	0.000	0.049
J p-value	0.161	0.899	0.106	0.530	0.182
AR(2) *p*-value	0.190	0.296	0.161	0.187	0.585
Inst lag limits	None	None	None	3	None
Payout lag limits	None	None	None	None	None

Robust z stats in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates generated by Arellano-Bond difference GMM of changes (from year *t* - 1 to *t*) in total payout divided by book value of assets (*Payout*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (2) and (3) include only Low and High *q* firms (the lowest and highest five q deciles from year t - 1), respectively. Sample firms used in regressions (4) and (5) include only Low and High *CashFlow* firms (the lowest and highest five CashFlow deciles from year t - 1), respectively. Deciles are formed on a yearly basis. *J* is the Hansen-Sargan test of overidentifying restrictions. AR(2) is the Arellano-Bond test of second-order autocorrelation in the errors. Independent variables *Inst* and *Payout* are instrumented using GMM-type instrument lags. All available lags are used unless validity tests are rejected, in which case lags are restricted to the highest number of lags which produce a valid model.

Table A - 4: Repurchases and Time Period

	(1)	(2)
	1990 - 1997	1998 - 2005
	Repurch	*Repurch*
Inst	0.0065*	0.0152***
	(1.89)	(2.87)
q	-0.0000	-0.0006***
	(0.29)	(4.64)
Debt	-0.0279***	-0.0079**
	(4.46)	(2.49)
Turnover	-0.0000	-0.0010**
	(1.52)	(2.56)
LifeCycle	0.0000	-0.0000***
	(0.78)	(2.60)
MktCap	0.0038***	0.0077***
	(4.44)	(6.12)
ROA	-0.0020*	-0.0016***
	(1.67)	(2.85)
Insider	-0.0087	-0.0156
	(1.16)	(1.31)
Insider2	0.0117	0.0085
	(1.53)	(0.65)
Revenue	0.0014*	-0.0017
	(1.72)	(1.13)
Observations	17721	27405
Firms	4813	6157
R-squared	0.11	0.26

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in repurchases divided by book value of assets (*Repurch*) by time period. All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regression (1) includes the years from 1990 to 1997. Regression (2) includes the years from 1998 to 2005.

Table A - 5: Repurchases and Firm Life-cycle (GMM)

	(1)	(2)	(3)
	All Firms	Early *LifeCycle*	Late *LifeCycle*
	Repurch	*Repurch*	*Repurch*
Inst	0.0181**	0.0178**	0.0090
	(2.08)	(2.00)	(1.03)
Repurch	0.0665**	-0.0161	0.0553**
	(2.31)	(0.27)	(2.00)
q	-0.0014	0.0029	0.0029
	(0.87)	(1.12)	(1.01)
Debt	-0.0677	-0.0097	-0.0348
	(1.34)	(0.22)	(0.76)
Turnover	-0.0000	0.0000	0.0000
	(0.14)	(0.48)	(0.19)
LifeCycle	-0.0001	0.0000	0.0000
	(0.98)	(0.16)	(0.18)
MktCap	-0.0014	-0.0317*	-0.0031
	(0.12)	(1.68)	(0.22)
ROA	-0.0125	-0.0049	0.0282
	(0.43)	(0.20)	(1.25)
Insider	-0.0948	-0.0864	-0.0790
	(1.17)	(0.85)	(0.66)
Insider2	0.0714	0.0970	0.1026
	(0.64)	(0.62)	(0.53)
Revenue	-0.0492***	0.0252	-0.0916***
	(3.59)	(1.16)	(3.65)
Observations	35430	15167	20981
Number of Firms	6823	4359	4285
Chi2 (*p*-value)	0.000	0.000	0.000
J p-value	0.140	0.902	0.466
AR(2) *p*-value	0.404	0.349	0.458
Inst lag limits	3	3	3
Repurch lag limits	None	3	None

Robust z statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates generated by Arellano-Bond difference GMM of changes (from year *t* - 1 to *t*) in repurchases divided by book value of assets (*Repurch*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (2) and (3) include only Early and Late *LifeCycle* firms, respectively. The Early and Late LifeCycle groups include the lowest and highest five *LifeCycle* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis. *J* is the Hansen-Sargan test of overidentifying restrictions. AR(2) is the Arellano-Bond test of second-order autocorrelation in the errors. Independent variables *Inst* and *Repurch* are instrumented using GMM-type instrument lags. All available lags are used unless validity tests are rejected, in which case lags are restricted to the highest number of lags which produce a valid model.

Table A - 6: Payout Composition and Time Period

	(1)	(2)
	1990 - 1997	1998 - 2005
	PayComp	*PayComp*
Inst	0.1695	0.3920***
	(1.55)	(4.28)
q	-0.0224	-0.0160**
	(1.17)	(2.03)
Debt	-1.0381***	-0.8678***
	(6.17)	(7.01)
Turnover	-0.0707***	0.0199
	(3.03)	(1.60)
LifeCycle	-0.0045	-0.0000***
	(1.27)	(5.23)
MktCap	0.2622***	0.2691***
	(4.42)	(7.60)
ROA	-0.2876	-0.1346
	(1.54)	(0.95)
Insider	-0.2815	-0.1641
	(1.42)	(0.80)
Insider2	0.3399	-0.0744
	(1.35)	(0.27)
Revenue	0.1279**	0.0547
	(2.25)	(1.20)
Observations	6937	8996
Firms	1874	2541
R-squared	0.16	0.19

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; ***significant at 1%

This table reports estimates of firm and year fixed effect regressions of changes (from year *t* - 1 to *t*) in a measure of payout composition (*PayComp*). *PayComp* is equal to -1 if payout is composed entirely of dividends and 1 if payout is composed entirely of stock repurchases. All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regression (1) includes the years from 1990 to 1997. Regression (2) includes the years from 1998 to 2005.

Table A - 7: Payout Composition (GMM)

	(1) All Firms	(2) Dividends > Repurchases at year *t* - 2	(3) Dividends ≤ Repurchases at year *t* - 2
	PayComp	*PayComp*	*PayComp*
Inst	0.1522*	0.2270	0.6629**
	(1.80)	(1.46)	(2.42)
PayComp	0.2868***	0.3703***	-0.0287
	(9.40)	(4.10)	(0.17)
q	-0.1498*	-0.2565	0.1344
	(1.95)	(1.52)	(0.51)
Debt	-0.6513	-1.9627	-5.7731**
	(1.01)	(1.49)	(2.22)
Turnover	-0.1335**	-0.3778**	-0.1906
	(2.16)	(2.05)	(0.94)
LifeCycle	-0.0002	0.0025	-0.0000
	(0.90)	(0.03)	(0.01)
MktCap	0.3528	0.6304	-1.4589
	(1.45)	(1.37)	(1.63)
ROA	0.7810	-0.9096	-4.2384
	(0.90)	(0.48)	(1.28)
Insider	0.6801	0.5352	-1.2360
	(0.70)	(0.26)	(0.39)
Insider2	-1.4212	-0.1379	1.2102
	(1.01)	(0.05)	(0.24)
Revenue	-0.4184	0.5868	1.6611
	(1.62)	(1.15)	(1.24)
Observations	11911	8328	3583
Number of Firms	2355	1700	1489
Chi2 (*p*-value)	0.000	0.000	0.000
J p-value	0.168	0.558	0.612
AR(2) *p*-value	0.121	0.389	0.103
Inst lag limits	2	3	1
PayComp lag limits	None	1	1

Robust z statistics in parentheses, *significant at 10%; **significant at 5%; ***significant at 1%

This table reports estimates generated by Arellano-Bond difference GMM of changes (from year *t* - 1 to *t*) in in a measure of payout composition (*PayComp*). *PayComp* is equal to -1 if payout is composed entirely of dividends and 1 if payout is composed entirely of stock repurchases. All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regression (2) includes only firms in which dividends exceeded repurchases in year t - 2 and regression (3) includes only firms in which repurchases exceeded dividends in year t - 2. *J* is the Hansen-Sargan test of overidentifying restrictions. AR(2) is the Arellano-Bond test of second-order autocorrelation in the errors. Independent variables *Inst* and *PayComp* are instrumented using GMM-type instrument lags. All available lags are used unless validity tests are rejected, in which case lags are restricted to the highest number of lags which produce a valid model.

Appendix B: R&D Robustness Tests

Robustness checks for tests on the influence that institutional investors have on investment in R&D are included in this appendix. These checks have been moved here to improve the clarity and flow of the main text. In all cases, results from the main text are supported.

Previous results indicate that an increase in institutional ownership leads to a subsequent R&D investment increase. A logical inference from this result is that institutional owners will discourage R&D decreases. The results in Table B - 1 confirm that institutional investors dissuade R&D cuts. Table B - 2 provides evidence that higher institutional ownership results in increased R&D for two separate time periods: 1990 – 1997 and 1998 – 2005.

I use the Arellano and Bond (1991) difference linear GMM dynamic panel data methodology to obtain the results displayed in Table B - 3. This methodology alleviates endogeneity problems. Difference GMM is a linear method so I use changes in R&D to assets as my dependent variable when using this method. Difference GMM methodology is explained in greater detail in Appendix C. The results indicate that a rise in institutional investors leads to a rise in R&D investment, especially for firms with high stock liquidity or high information asymmetry.

I use an alternate proxy for information asymmetry, R&D intensity (R&D to total assets) instead of firm life-cycle (retained earnings to the book value of total equity) to produce the results shown in Table B - 4. Firms with high R&D intensity have higher information asymmetry. The results indicate that institutional investors encourage R&D in firms with high and low information asymmetry, but this effect appears stronger in firms with high information asymmetry.

The difference GMM regressions shown in Table B – 5 indicate that an increase in institutional investors leads to increased R&D in firms with good investment opportunities and low free cash flow. Institutional investors have no significant effect on R&D in firms with poor investment opportunities or high free cash flow.

Table B - 1: R&D Decreases

	(1) All Firms	(2) All Firms	(3) No R&D Decr. in year *t* - 2	(4) R&D Decr. in year *t* - 2
	R&D_Decr	*R&D_Decr*	*R&D_Decr*	*R&D_Decr*
Inst		-0.8551***	-0.6268***	-0.9682***
		(5.54)	(2.91)	(3.30)
q	0.0492***	0.0461***	0.0554***	0.0521***
	(5.70)	(5.37)	(3.91)	(3.53)
Debt	0.0359	0.0470	0.2919	-0.2044
	(0.55)	(0.70)	(1.56)	(1.53)
ROA	-0.2533**	-0.2658***	-0.2621	0.0181
	(2.50)	(2.63)	(1.42)	(0.13)
Insider	-0.1508	-0.1669	-0.9825**	0.4669
	(0.45)	(0.49)	(1.96)	(0.78)
Insider2	0.0302	0.0541	1.0471	-0.9110
	(0.07)	(0.12)	(1.61)	(1.13)
MktCap	-0.6769***	-0.6399***	-0.6934***	-0.6477***
	(15.35)	(14.39)	(9.85)	(8.55)
CapEx	-0.3083	-0.2568	0.1101	-0.4327
	(1.38)	(1.15)	(0.37)	(0.99)
FCF	-0.1100**	-0.1088**	-0.1227	-0.1785*
	(2.02)	(2.00)	(1.26)	(1.81)
Liquidity	0.0001	0.0001	-0.0204	0.0001
	(0.24)	(0.23)	(1.10)	(0.18)
LifeCycle	-0.0001	-0.0001	0.0021**	-0.0001
	(0.50)	(0.48)	(2.00)	(0.72)
Revenue	-0.0461	-0.0374	-0.1426**	0.0351
	(1.24)	(1.00)	(2.35)	(0.59)
Observations	18440	18215	9858	5389
Number of Firms	2781	2768	1993	1444
Pseudo R-sqr.	0.04	0.04	0.06	0.08

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of decreases (from year *t* - 1 to *t*) in R&D expenditures (*R&D_Incr*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regressions (1) and (2) include all firms. Regression (3) includes only firms that had no R&D decrease in year *t* - 2 and regression (4) includes only firms that had an R&D decrease in year *t* - 2.

Table B - 2: R&D and Time Period

	(1)	(2)
	1990 - 1997	1998 - 2005
	R&D_Incr	*R&D_Incr*
Inst	0.8601***	0.8353***
	(2.73)	(4.30)
q	-0.0797***	-0.0290***
	(3.17)	(3.46)
Debt	-0.7951**	-0.0231
	(2.27)	(0.33)
ROA	0.8265**	0.1590
	(2.30)	(1.36)
Insider	-0.8434	0.5605
	(1.36)	(1.28)
Insider2	1.2460*	-0.7551
	(1.66)	(1.24)
MktCap	0.5291***	0.5797***
	(4.93)	(11.33)
CapEx	-0.2828	0.5615*
	(0.67)	(1.77)
FCF	0.5970**	0.1402**
	(2.46)	(2.04)
Liquidity	-0.0001	0.0215*
	(0.13)	(1.65)
LifeCycle	0.0001	0.0001
	(0.21)	(0.78)
Revenue	-0.0477	0.0572
	(0.57)	(1.27)
Observations	4888	10919
Number of Firms	1236	2126
Pseudo R-squared	0.04	0.06

Absolute value of z statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of increases (from year *t* - 1 to *t*) in R&D expenditures (R&D_Incr) by time period. All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Regression (1) includes the years from 1990 to 1997. Regression (2) includes the years from 1998 to 2005.

Table B - 3: R&D, Stock Liquidity and Firm Life-cycle (GMM)

	(1)	(2)	(3)	(4)	(5)
	All Firms	Low *Liquidity*	High *Liquidity*	Early *LifeCycle*	Late *LifeCycle*
	R&D_Assets	*R&D_Assets*	*R&D_Assets*	*R&D_Assets*	*R&D_Assets*
Inst	0.0744**	0.0275	0.0713*	0.0950*	0.0537
	(2.02)	(0.39)	(1.85)	(1.73)	(0.95)
R&D_Assets	0.2364**	-0.0375	0.1785**	0.2167**	-0.0971
	(2.43)	(0.20)	(2.12)	(2.45)	(0.55)
q	0.0392***	0.0431*	0.0268***	0.0357***	0.0415*
	(2.73)	(1.80)	(3.89)	(3.77)	(1.95)
Debt	-0.0442	0.0301	0.0395	0.1095	-0.0130
	(0.29)	(1.19)	(0.29)	(0.63)	(0.28)
ROA	0.1129	0.0697**	-0.1460	-0.0665	0.0741
	(1.21)	(2.13)	(1.58)	(0.62)	(1.15)
Insider	0.9170*	-0.1522	0.7406	0.6558*	-0.0378
	(1.72)	(0.46)	(1.54)	(1.79)	(0.07)
Insider2	-1.6853**	0.4782	-1.3710**	-1.2905**	-0.0613
	(2.15)	(1.00)	(2.02)	(2.18)	(0.08)
MktCap	-0.1634**	-0.2276*	-0.1101**	-0.1351***	-0.1605
	(2.49)	(1.70)	(2.25)	(2.99)	(1.43)
CapEx	-0.0658	0.9977*	0.0609	-0.1652	0.5296
	(0.30)	(1.81)	(0.31)	(0.45)	(1.60)
FCF	-0.0575	-0.0324	0.0387	0.0729	-0.0562
	(0.61)	(0.90)	(0.48)	(1.02)	(0.77)
Liquidity	0.0000	-0.0083	0.0000	0.0000	0.0000
	(0.13)	(0.12)	(0.05)	(0.01)	(0.68)
LifeCycle	0.0000	0.0000	-0.0000	0.0000	-0.0004
	(0.22)	(0.03)	(0.02)	(0.21)	(0.74)
Revenue	0.0074	-0.0313	0.0506*	0.1379***	-0.0850
	(0.21)	(1.08)	(1.82)	(3.04)	(1.45)
Observations	14341	5987	8354	6759	7859
Firms	3127	1931	2276	2029	1768
Chi2 (*p*-value)	0.000	0.000	0.000	0.000	0.049
J *p*-value	0.343	0.862	0.307	0.676	0.569
AR(2) *p*-value	0.610	0.129	0.958	0.189	0.213
Inst lag limits	None	3	None	None	None
R&D lag limit	3	None	3	1	None

Robust z stats in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates generated by difference GMM of changes (from year *t* - 1 to *t*) in R&D expenditures divided by assets (*R&D_Assets*). All independent variable values are changes from year *t* - 2 to *t* - 1. Regressions (2) and (3) include only Low and High *Liquidity* firms (the lowest and highest five deciles from year t - 1), respectively. Regressions (4) and (5) include only Early and Late *LifeCycle* firms, respectively. Deciles are formed on a yearly basis. *J* is the Hansen-Sargan test of overidentifying restrictions. AR(2) is the Arellano-Bond test of second-order autocorrelation in the errors. Independent variables *Inst* and *R&D_Assets* are instrumented using GMM-type instrument lags. The maximum available lags which produce a valid model are used.

Table B - 4: R&D and R&D Intensity

	(1) Low *R&D_Assets*	(2) Medium *R&D_Assets*	(3) High *R&D_Assets*
	R&D_Incr	*R&D_Incr*	*R&D_Incr*
Inst	0.6061*	0.6958**	1.3596***
	(1.90)	(2.48)	(4.41)
q	-0.0992*	-0.1526***	-0.0467***
	(1.71)	(5.61)	(4.22)
Debt	-0.1701	-0.1101	0.0520
	(0.52)	(0.37)	(0.45)
ROA	0.2177	0.8210**	-0.0103
	(0.50)	(2.47)	(0.06)
Insider	-0.7198	0.1148	0.8346
	(1.08)	(0.18)	(1.15)
Insider2	0.9051	-0.0948	-0.9809
	(1.05)	(0.11)	(1.00)
MktCap	0.7306***	0.9929***	0.7954***
	(5.15)	(9.19)	(9.95)
CapEx	0.8465	0.7958	0.8958**
	(1.45)	(1.62)	(1.97)
FCF	0.0500	0.1900	0.4066***
	(1.05)	(1.25)	(2.76)
Liquidity	0.0199	0.0156	-0.0001
	(0.49)	(0.83)	(0.16)
LifeCycle	0.0036	0.0003	-0.0000
	(1.50)	(0.84)	(0.09)
Revenue	0.0361	0.1874*	0.0331
	(0.26)	(1.69)	(0.60)
Observations	4848	6044	3856
Number of Firms	828	1145	817
Pseudo R-squared	0.03	0.08	0.12

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates of firm and year fixed effect logit regressions of increases (from year *t* - 1 to *t*) in R&D expenditures (*R&D_Incr*). All independent variable values are calculated as changes in that independent variable from year *t* - 2 to *t* - 1. Sample firms used in regressions (1), (2), and (3) include only Low, Medium and High *R&D_Assets* firms, respectively. The Low, Medium and High *R&D_Assets* groups include the lowest three, middle four, and highest three *Liquidity* deciles from year *t* - 1, respectively. Deciles are formed on a yearly basis.

Table B - 5: R&D, Investment Opportunities and Free Cash Flow (GMM)

	(1)	(2)	(3)	(4)
	Low *q*	High *q*	Low *CashFlow*	High *CashFlow*
	R&D_Assets	*R&D_Assets*	*R&D_Assets*	*R&D_Assets*
Inst	0.0098	0.0679*	0.1319**	0.0177
	(0.50)	(1.84)	(2.31)	(1.27)
R&D_Assets	0.0416	0.2505**	0.1845*	0.1843***
	(0.33)	(2.48)	(1.93)	(3.09)
q	0.0271	0.0401***	0.0404**	0.0149***
	(1.44)	(2.65)	(2.37)	(4.47)
Debt	0.0574*	0.0011	0.1759	0.0745
	(1.83)	(0.02)	(1.29)	(1.17)
ROA	0.2186*	0.1417*	0.0939	-0.0200
	(1.72)	(1.76)	(1.01)	(0.75)
Insider	-0.1224	1.0092**	0.4731	0.1663
	(0.42)	(2.52)	(1.11)	(1.10)
Insider2	0.0528	-1.7979***	-1.0685	-0.2886
	(0.13)	(2.65)	(1.49)	(1.17)
MktCap	-0.0502*	-0.1706***	-0.1673**	-0.0371**
	(1.72)	(3.11)	(2.29)	(2.07)
CapEx	0.0911	-0.1571	0.0591	-0.0631
	(0.53)	(0.89)	(0.27)	(0.54)
FCF	-0.0517	-0.1097	-0.0388	-0.0034
	(1.32)	(1.13)	(0.43)	(0.37)
Liquidity	0.0000	-0.0000	-0.0000	-0.0037
	(0.72)	(0.59)	(0.68)	(1.06)
LifeCycle	-0.0001	-0.0001	-0.0003	-0.0000
	(1.08)	(0.71)	(0.56)	(1.18)
Revenue	0.0033	0.0361	-0.0223	-0.0025
	(0.06)	(1.27)	(0.77)	(0.11)
Observations	5966	9045	6231	8110
Number of Firms	1867	2409	2355	2228
Chi2 (*p*-value)	0.000	0.000	0.000	0.000
J p-value	0.505	0.181	0.673	0.247
AR(2) *p*-value	0.349	0.431	0.520	0.164
Inst lag limits	None	None	None	None
R&D lag limits	None	None	3	3

Robust z stats in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

This table reports estimates generated by difference GMM of changes (from year *t* - 1 to *t*) in R&D expenditures divided assets (*R&D_Assets*). Independent variable values are changes from year *t* - 2 to *t* - 1. Regressions (1) and (2) include only Low and High *q* firms (the lowest and highest five deciles from year t - 1), respectively. Regressions (3) and (4) include only Low and High *CashFlow* firms, respectively. Deciles are formed on a yearly basis. *J* is the Hansen-Sargan test of overidentifying restrictions. AR(2) is the Arellano-Bond test of second-order autocorrelation in the errors. Independent variables *Inst* and *R&D_Assets* are instrumented using GMM-type instrument lags. The maximum available lags which produce a valid model are used.

Appendix C: Difference GMM Methodology

Some of the robustness checks that I use in this paper use a difference generalized method of moments (GMM) methodology that is based on the methodology employed in Holtz-Eakin, Newey and Rosen (1988). Refinements and validity tests developed in Arellano and Bond (1991) are also used. I implement the methodology using the Stata command xtabond2 which was developed by David Roodman. This command and its proper implementation are described in great detail by Roodman (2007).

Difference GMM removes fixed effects and uses lagged values of the dependent variable and independent variables of interest as instruments. This method avoids endogeneity problems associated with using fixed-effects when there is autocorrelation in the dependent variable. It also corrects for any concurrent endogeneity problems associated with the inclusion of lagged independent variables.

Recently, many notable research papers have used difference GMM in their analysis including Gupta (2005), Cuñat (2007), and Brown, Fazzari, and Petersen (2009). Almeida, Campello, and Galvao (2010) assess the performance of difference GMM and find that its results conform to theoretical expectations in regressions that use data which contains firm-fixed effects and heteroskedasticity.

This difference GMM methodology is designed for use with panel data containing few time periods and a large number of individuals or firms. My data consists of a maximum of 16 years of data for over 10,000 firms. Difference GMM is also designed to be implemented in situations with the following characteristics: a dependent variable that depends on past realizations of itself, independent variables that are not strictly exogenous, and firm fixed effects (Roodman (2007)). If conceptually and statistically sound instruments for endogenous independent variables are available, firm-fixed effects regressions using those instruments would be preferable to using difference GMM. Unfortunately, I was unable to find valid instruments. Difference GMM uses lags of the endogenous regressors as instruments. The use of lags as instruments shrinks the size of the dataset because at least one year of data has to be dropped for each firm. In my implementation of difference GMM, only one year has to be dropped for each firm.

The dependent variables in my regressions depend on past realizations because current payout policy is largely dependent on past payout policy and current R&D investment policy is largely dependent on past R&D policy. In my robustness checks that use difference GMM, the independent variables of interest are assumed to be endogenous. In fact, the main purpose of my difference GMM robustness checks is to control for the potential (and likely) endogenous relationship between payout policy and institutional ownership or between R&D investment policy and institutional ownership.

My implementation of difference GMM starts with the following basic model which will be transformed by the difference GMM process.

(C-1) $Policy_{it} = Policy_{it-1} + Inst_{it-1} + \beta \bullet Control_{it-1} + \nu_i + \varepsilon_{it}$

In this model, $Policy_{it}$ represents the change in the firm policy that I am using as a dependent variable in a given regression: either payout, repurchases, payout composition or R&D to assets. $Policy_{it-1}$ represents the change in that firm policy in the previous year. The independent variable $Inst_{it-1}$ represents the change in institutional ownership percentage in the previous year. $Control_{it-1}$ represents a vector of time-varying firm level control variables. Year dummies are included as control variables to remove time-related shocks that affect all firms. Firm-specific (fixed effects) errors are represented by v_i and ε_{it} represents a time-varying observation-specific error term.

Several econometric problems which are endemic to model C-1 can be corrected by difference GMM. The change in institutional ownership percentage ($Inst_{it-1}$) is assumed to be endogenous. Therefore, it is instrumented with lagged changes in institutional ownership. This predetermines the institutional ownership variable thus rendering it uncorrelated with the error term. Similarly, the use of the lagged dependent variable ($Policy_{it-1}$) as an independent variable leads to autocorrelation. This variable is also instrumented with lags of itself. Firm-fixed effects are contained in the error term v_i. The difference GMM methodology uses first-differences to transform model C-1 thus removing the firm-fixed effects error term because it is time invariant. The new model is shown below.

(C-2) $\Delta Policy_{it} = \Delta Policy_{it-1} + \Delta Inst_{it-1} + \beta \bullet \Delta Control_{it-1} + \Delta\varepsilon_{it}$

The transformed model addresses potential causation and endogeneity problems that may exist in the relationship between the policy and institutional ownership. Firm-fixed effects are differenced out. Institutional ownership changes predate policy changes indicating causation. Previous policy changes are controlled for decreasing the probability that coefficients for changes in institutional ownership are simply a result of previous policy changes. Potentially endogenous independent variables are instrumented to control for endogeneity.

I was able to use the first lag of independent policy and institutional variables in all my regressions as an instrument. In the difference GMM model, efficiency can be improved by including additional lags. Including the additional lags introduces new information which is useful to the model. In conventional two-stage least squares regressions, including additional lags shrinks the sample size which means additional efficiency comes at a steep cost. Difference GMM does not suffer from this trade-off. In difference GMM, additional lags can be included as instruments when available without shrinking the sample size. Therefore, it is generally preferable to include as many lags as instruments as possible. I use this tactic.

Unfortunately, the inclusion of additional lags as instruments is not problem-free. Too many instruments can result in overidentification of the model invalidating its results. Therefore, if tests indicate that a model is overidentified, I reduce the number of lags used until the tests no longer indicate that the model is overidentified.

I employ two important tests of difference GMM model validity which are strongly recommended by Roodman (2007) among others: the Hansen-Sargan *J*-test and the Arellano-Bond test for second-order autocorrelation in differenced residuals. For both tests, a higher *p*-value indicates a valid model while *p*-values of less than 0.10 indicate an invalid model.

The null hypothesis of the Hansen-Sargan *J*-test is that the instruments as a group are exogenous. A rejection of this null hypothesis indicates an invalid model. Therefore, I do not use any model in which the *p*-value for the *J*-test is less than 0.10.

The *J* statistic's ability to detect overidentification can be weakened by too many instruments. A general rule of thumb is that the number of firms in the panel should outnumber the number of instruments used in a difference GMM regression. The minimum number of firms for any regression I run is 1,489 while the maximum number of instruments is 208 indicating that the *J* statistic should retain its ability to detect overidentification in all of these regressions.

AR(1) autocorrelation in differenced residuals is expected. This is because the difference between an error term (ε_{it}) and the error term from the year before (ε_{it-1}) is expected to be related to the difference between the error term from the year before (ε_{it-1}) and the error term from two years before (ε_{it-2}) because both differences contain the error term from the year before (ε_{it-1}). The Arellano-Bond test for second-order autocorrelation is more important because AR(2) autocorrelation indicates an invalid model. The null hypothesis is that there is no autocorrelation. Therefore, I do not use any models in which the null is rejected at the 10% level.

About the Author

Ricky W. Scott has earned a B.A. Degree in Computer Science from the University of Georgia, a Masters in Project Management from Keller Graduate School, and a Masters in Finance from Georgia State University. He labored for over 15 years as a computer systems analyst at BellSouth, The Home Depot, and Publix Super Markets and served four honorable years in the U.S. Army. He has accepted an Assistant Professor position at Saint Leo University.