Internal Governance and

the Wealth Effect of R&D Expenditure Increases

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Abstract

We examine the influence of corporate internal governance on the wealth effect of corporate R&D expenditure increases. We find that stock markets respond more favorably to announcements of R&D expenditure increase by firms with stronger internal governance. The evidence further indicates that a firm's growth opportunity has a positive interaction effect with internal governance in explaining the variation of market reactions to R&D expenditure increase. Our findings hold even after controlling for other potentially important variables.

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I. Introduction

Investments in research and development (R&D) are considered as a major source of inputs for sustained growth and competitiveness. It is particularly crucial to those firms operating in the technology and science-based industries. Despite its importance, the effect of R&D investments on shareholders wealth is less clear. Chan, Martin and Kensinger (1990) and Zantout and Tsetskos (1994) report positive market reactions to the announcements of R&D expenditure increases. On the contrary, Doukas and Switzer (1992) and Sundaram, John and John (1996) find insignificant announcement effects of R&D expenditure increases. The evidence suggests that, from investors' perspectives, R&D investments do not necessarily create shareholders wealth.

In this article we explore the influence of corporate internal governance mechanisms on the wealth effect of R&D expenditure increases. We argue that, upon the announcements of R&D spending increases, how investors assess the valuation of the investments may depend on the underlying motives of mangers as well as the availability of credible information for accurately evaluating the potential impacts on future earnings. The mechanisms of corporate internal governance can influence investor's assessment in both of these dimensions.

The first dimension involves information asymmetry between managers and investors. Although most investments are associated with certain degree of information asymmetry, this problem is particularly important for R&D investments because of the characteristics of R&D. For example, firms are not required to

disclosure information of R&D. For those firms that voluntarily make public R&D announcements, the detailed information is usually not available. Furthermore, a lot of R&D projects are unique to the developing firms only. It is often difficult to value R&D projects from observing the performance of R&Ds in other comparable firms (Abody and Lev, 2000). In addition, although the benefits of R&D usually last over an extended period of time, the reporting rules of accounting require R&D to be immediately expensed. Thus financial statements leave no trace on the stocks and performance of R&D capital over time. We argue that corporate internal governance can help reduce information risks of investors by inducing firms to disclosure credible information on a timely basis. Beasley (1996) documents that better corporate governance are less likely to be associated with financial statements fraud. Bhojraj and Sengupta (2003) show that firms with better corporate governance have better and bond ratings and lower yields.

The second dimension relates to agency costs that managers may act for pursuing their own private interest at the expense of shareholders (Jensen and Meckling, 1976). Prior studies have suggested that managers may invest in unprofitable projects in order to increase the size of recourse under managers' control (Myers and Majluf, 1984; Murphy, 1985; Jensen, 1986; Denis, 1994; and Lang, et al., 1991). Jensen (1993) provides direct evidence that R&D investments in many large firms failed to increase firm value, and argue that the ineffectiveness can be attributed to poorly functioning internal control system. In addition, R&D expenditure may be motivated by reasons related to earning management. When compensation is evaluated based on current reported net income, managers may have incentives to change the timing of R&D spending in order to increase their total compensation

(Healy, 1985).[1] Zantout and Tsetskos (1994) further suggest that if firms report lower-than-expected earnings as a result of the increase in R&D expenditures, advance disclosure of the decision may forestall a reduction in managerial compensation caused by downward assessment of the firm's market value. Klein (2002) and Peasnell, Pope and Young (2005) find that corporate internal governance is negatively related with earning management. Bushee (1998) provide evidence that firms with better governance are less likely to manipulate R&D spending for earning management.

By investigating the influence of corporate internal governance on the value assessment of R&D investments, this study attempts to add additional evidence that helps explain the empirical puzzle on the announcement effects of R&D expenditure increases. As suggested in the literature, a well-functioning internal governance mechanism plays a crucial role in providing credible information as well as reducing agency costs. Therefore, upon the announcements of R&D expenditure increases, the quality of internal governance may convey a strong signal to the markets on the possibility that the investments are for the best interest of shareholders. This role of information signaling is expected to be more important when there exists a strong information asymmetry between managers and investors in value estimation, such as R&D investments. Corenett, Hovakimian, Palia and Tehranian (2003) find that stock markets responds more strongly to the share prices of acquiring firms with better corporate governance mechanism. Therefore, to the extent that internal governance migrate information risks and agency costs, we expect that investors should have more confidence on R&D expenditures by firms with stronger internal governance

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[1] For example, if net income is below certain lever so that no bonus is to be received anyway, managers may increase R&D investments to increase the probability of receiving a greater bonus in the following year. Similarly, if net income is above such levels that a further increase in net income is not going to lead to higher bonus. Managers have incentive to prematurely spend on R&D since current expensing of R&D expenditure will reduce future expenses. (Bushee, 1998; and Baber, et al.,1991)

mechanism.

Furthermore, we postulate that the value creation of R&D projects may also depend on the market assessment about the quality of investment opportunities (Szewczyk, et al., 1996). While a strong internal governance mechanism helps reduce resources misallocation, to what extent the investments are able to create shareholders gains may be strongly related with the availability of profitable opportunities. For firms with limited growth potential, it is difficult to generate significant earnings even if there exists well-functioning internal governance mechanisms. Recent research shows that investment opportunity plays an important in assessing the wealth effect of corporate investments such as capital expenditures (Blose et al., 1997; Chung et al., 1998; Chen and Ho, 1997; Chen et al., 2001), international acquisitions (Doukas, 1995), joint ventures (Chen et al., 2000) and product strategy (Chen and Ho, 1997). We predict that R&D investments by firms with good internal governance and great investment opportunities will create greater shareholders wealth. On the contrary, R&D investments made by firms with poor governance and few growth potentials are not as worthwhile.

A sample of R&D expenditure increases announcements during the period of 1988-2001 is collected to test our conjectures. We find the average market reaction to R&D expenditure increases announcements is statistically insignificant, consistent with the findings in Doukas and Switzer (1992) and Sundaram, John and John (1996). When we compare the abnormal returns of subsamples based on different measures of corporate internal governance, the results show that better-governing firms consistently experience strong market responses and the poor-governing firms have weak and sometime negative announcement-period abnormal returns. A finer analysis suggests that growth opportunity positively interacts with the quality of internal

governance in the value creation of R&D investments. Our findings indicate that the strong market reactions associated with to better governance are partly attributed to those with greater growth opportunities. Our results hold for various measures of corporate internal governance, and remain unchanged after controlling for other variables that are found important to the announcements effects of R&D investment in prior literature.

The remainder of the paper is organized as follows. Section   describes the sample and presents summary statistics. Section   examines the relation between stock price response and the internal governance for the announcing firms. Section concludes.

. Sample and Descriptive Statistics

A. Sample Design

An initial sample of announcements of R&D expenditure increases over the period from 1988 to 2001 is collected from the Dow Jones News Retrieval database, which provides selected news service stories and articles from the *Dow Jones News Wire*, the *Wall Street Journal (WSJ)* and *the Barron's*. The sample consists of firms that voluntarily announced plans to increase R&D expenditures for the forthcoming fiscal year. We focus on firms listed in the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX) or the NASDAQ exchange. Following Sundaram, John and John (1996), we use the following criteria to select the final sample. (1) To avoid any confounding events that could distort the measurement of the valuation effects on the announcing firms, we exclude those announcements by firms that made other announcements three days before or three days after the initial announcement

dates.[2] (2) We exclude the noncompany-sponsored R&D expenditure plans, such as those involving customers or government contracts. (3) The announcements without specific information of the expenditures amounts or a percentage change over the previous year's spending are deleted. (4) We also exclude the sample firms without data of stock returns available from the returns files on the Center for Research in Securities Prices (CRSP) tape. (5) Announcing firms that have no data available from the Compustat files are deleted. (6) We exclude those announcements made by financial institutions (SIC code 60-69), and foreign companies.

Our final sample comprises 243 announcements of R&D expenditure increases. Table 1 provides the sample distribution by industry classification and announcement year. The majority of the announcements are made by firms in chemicals (SIC=28) and electric equipment (SIC=36) industries. These two industries constitute about 67.5% of the total sample. Therefore, similar to Sundaram, John and John (1996), the announcements in our sample are mainly from firms in R&D intensive industries that choose to voluntarily disclosure the R&D plans. Of the 243 announcements, about 43.6% of the samples are announced in the fiscal years of 1998, 1999, and 2000.

[Insert Table 1 here]

B. Computing Abnormal Stock Returns

We employ the standard event-study method to examine stock price responses to announcements of R&D expenditure increases. Day 0 is defined as the day in which the announcements appear in major publication. The abnormal return is calculated as the difference between the actual return and an expected return generated by the

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[2] Examples of major announcements include announcements of earnings, dividend change, share repurchase, financing plans, mergers and acquisitions and so on.

market model. We use the value weighted CRSP index as a proxy for market returns and estimate the parameters of the market model using the data over the period from 200 to 60 days before the initial announcement date. To estimate the wealth effect of R&D expenditure increases, we calculate the cumulative abnormal returns over the two-day announcement period that encompasses the day on which the announcement appeared in print plus the previous day. We use the two-day announcement period abnormal returns because the publication of an announcement generally occurs on the day after the information is actually released to the public. If the announcement occurs after the close of trading on the previous day, then the impacts on share prices will happen on the day in which the announcements appear in the publication. If the announcements are released prior to the close of trading hours, any immediate valuation effect will be reflected on share prices on the day before the announcement appears in print. Therefore, we use the cumulative abnormal returns over day 0 and day -1, CAR (-1, 0), to capture the announcement effects of R&D expenditure increases.

Table 2 present the market response to R&D expenditure increase announcements. The average two-day announcement-period abnormal return is 0.27% (t=0.73), and the median abnormal return is 0.08%, both insignificantly different from zero at the conventional level. The proportion of firms receiving positive market reactions is 51.8%. This finding is consistent with those in Doukas and Switzer (1992) and Sundaram, John and John, (1996) that announcements of R&D expenditure increases do not create significant wealth effects of shareholders wealth.

[Insert Table 2 here]

C. Measures of Internal Governance

We measure corporate internal governance from three different perspectives, (1) board size, (2) ownership structure, and (3) leadership structure (Lehn and Zhao, 2006). The data for variables internal governance are from Compact D database. The measures are estimated for the end of the fiscal year prior to R&D expenditure increase announcements.

Board Size

The corporate board of firm been identified a multiple of functions. A board may see its primary function as controlling the corporate performance and serving the corporation in controlling its external environment (Chaganti et al., 1985). Previous study show a summary of board's size, which relies upon a premise that monitoring by the board, can improve the quality of manager's decisions and provide the specialized operating opinion (Monks and Minow, 1995). The effect of board size on firm performance, however, is inconclusive. On one hand, larger board have valuable for the breadth of its services. Board size is a board attribute and affects board functioning and eventually corporate performance. The occurrence of a larger size board in a company might mean that the firm is coopting directors from wide ranging backgrounds and is using them rather profitably (Chaganti et al., 1985). Chaganti, Mahajan and Sharma (1985) suggest that the non-failed firms, as compared to failed ones, tend to have bigger board size. On the other hand, smaller board is manageable and plays a controlling function, whereas a larger board may not be able to function effectively as a controlling body leaving the management relatively frees (Jensen, 1993). Finally, Lehn, Patro and Zhao (2004) argue that if firms select board size that optimally balance the advantages and disadvantages, the size of board should be neutral to firm performance.

Ownership Structure

We consider the role of ownership structure related to the announcement return of R&D expenditure increases. Lehn and Zhao (2006) recognize that an inverse relation exists between the diffusion of equity ownership and the incentives that stockholders have to monitor managers. Under the view that the corporation with many small owners, it may not pay any one of them to monitor the performance of the management. It means that blockholder ownership have more incentive to monitor management and more ability to take the cost to monitor (Shleifer and Vishny, 1986). In general, blockholder ownership has the effect of monitor and then this will increase performance of firms. Shome and Singh (1995) and Allen and Phillips (2000) show that the positive relationship between blockholder ownership and financial performance. We measure blockholder ownership as the ratio of total more than 5% shareholdings to total common shares outstanding.

Alternatively we use insider ownership as another measure of ownership structure. If insider has adequately diversify risk, the insider has more stocks of the firm means the returns of investing in firm is better than other investment opportunity. It implies that insider provides a signal of high quality of the firm, and then the relationship between insider shareholdings and firm's performance is positive (Cho, 1998; Leland and Pyle, 1977; and Mehran, 1995). An increased insider ownership has the potential to both enhance firm performance because of the incentive effects of insider ownership and impair firm performance because the "entrenchment effect" of management ownership (Lehn and Zhao, 2006). We test whether the wealth effect of R&D expenditure increases announcement is related to the percentage of equity held by insiders. We use the measure of insider ownership, the percent of common equity held by the officers and directors.

Leadership Structure

Board structure control mechanism relates to duality, which occurs when the same person undertakes the combined roles of chief executive officer and chairman of the board. Many scholars and internal governance actives argue that consolidating the positions of CEO and chairman of the board in one person impairs the monitoring function of a board (Lehn and Zhao, 2006). The agency problem argues that boards dominated by executive directors are more difficult to control, a situation that would clearly apply to duality (Fama and Jensen, 1983 and Weir et al., 2002). Following those studies, we also argue that the separation of chairman of the board and the chief executive officer duties increases the effectiveness of monitoring. We measure duality as the dummy variable that equals one if a company combines the posts of chief executive officer and chairman of board and zero otherwise.

The descriptive statistics for internal governance proxies are shown in Table 2. Our sample firms on average have around 12 members on the board. The mean equity holding of blockholder ownership is 15%. Insiders of the sample firms hold 7% of equity ownership. There are 151 announcements of R&D expenditure increases made by firms that the chairman of board also serves as the CEO.

. Empirical results

A. Analysis of Subsamples Based on Internal Governance

Table 3 compares the difference in the announcement-period abnormal returns based on the quality of internal governance under different measures. In Panel A, we split the sample based on the median value of board size. The results indicate that upon the announcements of R&D expenditure increases, firms with larger board size

receive a positive mean abnormal return of 0.98%, significantly at the 1% level. In contrast, firms with smaller board size experience an average negative abnormal return of -0.83%. The mean difference in abnormal returns is statistically significant at the 5% level. This result is robust to possible deviations from non-normality, since it also holds for the non-parametric Kruskal-Wallis test statistic.

Panel B focuses on the measure of blockholder ownership. The high and low blockholder ownership subgroups are based on the sample median. The results show that firms with high blockholder ownership experience a significantly positive mean announcement effect of 2.22%, while those with low blockholder ownership have an insignificant market response of -0.44%. The difference is statistically significant at the 1% level. The results for the median announcement-period abnormal returns are similar. The results are consistent with those in Panel A. In Panel C, the comparison is made based on the median value of insider ownership. We find that high insider ownership firms receive a strongly positively market reaction of 1.31%. In a sharp contrast, low insider ownership firms experience a significantly negative abnormal return of -0.86%. The difference in average abnormal returns for high and low insider ownership groups is statistically significant at the 1% level. Panel D present the results of comparison based on duality. The results suggest that CEO as the chair of board is not a good arrangement for shareholders wealth. We find that firms that have the same people as CEO and chair of the board experience a significantly poorer value creation upon the announcements of R&D expenditure increases.

[Insert Table 3 here]

In summary, the results in Table 3 provide strong and consistent evidence on the importance of internal governance in explaining the wealth effect of R&D expenditure

increases announcements. Despite the overall insignificant market reaction to R&D expenditure increases, we find that internal governance help distinguish the differential market responses in the valuation of R&D investments. Announcements made by firms with better internal governance are awarded by investors, while those by firms with poorer internal governance are punished. Therefore, the results lend a strong support for the hypothesis that the quality of internal governance is an important consideration of investors in the value assessment of R&D investments.

B. Analysis of the Joint Effect of Growth Opportunity and Internal Governance

To investigate how growth opportunity influences the effect of internal governance on the market reaction to announcements of R&D expenditure increases, we measure firms' growth opportunity by Tobin's q ratio as in numerous prior studies (Lang et al., 1989, 1991; Howe et al., 1992; Doukas, 1995; Szewczyk et al., 1996; and others). The theoretical Tobin's q ratio is the ratio of the market value of a firm to the replacement costs of its assets. Because some data are not available, investment opportunities are often estimated by a simple measure of q (the "pseudo q"): the ratio of the market value to the book value of the firm's total assets, where the market value of total assets is evaluated as the book value of total assets minus the book value of common equity plus the market value of common equity.[3] We compute the pseudo q in the fiscal year prior to the announcement.

To test the effect of growth opportunity, we classify the sample based on pseudo q and internal governance. High (low) q firms are those with pseudo q above (below) the sample median. We predict investors should respond more positively to

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[3] The measure pseudo q is used extensively in previous research (e.g. Denis, 1994; Perfect and Wiles, 1994; Barclay and Smith, 1995a, b; Agrawal and Knoeber, 1996; Chen and Ho, 1997, and Holderness et al., 1999).

announcements by firms with better internal governance and greater growth potentials. The results in Panel A of Table 4 shows that for companies with high-q large board size are experienced significantly positive abnormal returns, but the market reaction to the low-q large board size firms is much weaker and not significantly different from zero. When we compare this result with those in panel A, table 3, the evidence suggests that the positive announcement period abnormal returns associated with large board size firms in table 3 could be attributed to those firms with good growth opportunities. For the subsample of small board size, the abnormal returns of high-q small board firms are insignificantly positive, but the abnormal returns for low-q small board firms are significantly negative. This finding indicates that the negative market reactions for small board size firms presented in Table 3 are contributed by those firms with little growth potential. The results further indicate that, among the four subgroups, high-q large board firms have the greatest mean (median) announcement period abnormal returns of 2.46% (0.95%), while the low-q, small board firms experience the worst mean (median) market response of -2.33% (-1.96%). The difference is statistically significant at the 1% level. In sum, the findings suggest that the availability of investment opportunities is an important factor influencing the effect of internal governance on the value creation of R&D expenditure increases.

[Insert Table 4 here]

Panel B, C and D present the evidence for other measures of internal governance. The results under different measures are consistent with those in Panel A. Firms with high growth opportunities and quality of internal governance experience the greatest announcement period abnormal returns among the four subgroups, and firms with low growth potentials and low quality of internal governance have the worst marker

responses. The results in Table 4 provide a strong support for our prediction on the joint influence of the investment opportunities and internal governance in explaining the wealth effect of R&D expenditure increases announcements.

C. Cross-Sectional regression Analyses

Even though the evidence supports our prediction, prior literature has documented other variables that are important in explaining the announcement effects of R&D expenditure increases. We further test the hypotheses by controlling these variables in the regression analysis.

Control Variables

In addition to the measures of internal governance, we further control for the effects of other important variables that could affect the wealth effect of R&D expenditure increases announcements, including investment opportunities, industry R&D intensity, relative firm R&D intensity, firm size, and industry concentration. Data of the control variables are obtained from the Compustat files.

Industry R&D intensity (IRI) is often taken as a measure of the technological opportunity in an environment (Hambrick and MacMillan, 1985). Firms operating in industries with high R&D intensity are more likely to produce value-creating innovation (Kelm et al., 1995). Thus, industry R&D intensity is expected to have a positive effect on the announcement abnormal returns of R&D expenditure increases. However, firms in high R&D industries are likely to make more frequent R&D investments, and the announcements of new investments may not surprise investors as much as those made by firms with infrequent R&D increases announcements. As a result, the effect of industry R&D intensity on the market reaction to R&D

expenditure increases is ambiguous. We estimate industry R&D intensity as the ratio of three-year average of R&D expenditures to net sales of all firms with same primary four-digit SIC code in Compustat.

Relative firm R&D intensity (FRI) measures a firm's financial resources allocated to R&D relative to its peers. Firms with larger relative R&D intensity may occupy the leading positions in technological advance (Baysinger & Hoskisson, 1989 and Kelm et al., 1995). Following Chan, et al., (1990), Kelm et al. (1995), and Szewczyk et al., (1996), we measure relative firm R&D intensity as the ratio of the three-year average of firm R&D intensity to industry R&D intensity.

Kelm, et al. (1995) argued that the benefits arising from R&D efforts are positively associated with market concentration. Investments of R&D in more concentrated industries are likely to generate greater abnormal rents. However, Chan et al (1990) find that when R&D intensity is controlled, industry concentration has little impact. We measure industry concentration (IC) by the sale-based Herfindahl index (Lang and Stulz, 1992; Baysinger and Hoskisson, 1989; and others), computed as the sum of the squared fraction of industry sales by all firms in the industry for the fiscal year prior to the announcement.

Finally we control for the effect of firm size in the analysis. Large firms' R&D expenditures might have less unanticipated information than those of small firms. This is because information production and dissemination is a positive function of firm size (Atiase, 1985; Hertzel ad Smith, 1993; Kang and Stulz, 1996). Therefore, we expect firm size to be inversely related to the market valuation of R&D expenditure increases. Firm size is the natural logarithm of the firm's market value of common equity for the year preceding the announcement.

[Insert Table 5 here]

Table 5 presents cross-sectional regression analyses the relationship between the announcement returns and internal governance for our sample. The number of observations varies across regressions because of data unavailability. In Model 1, we regress the announcement effect on board size, measured as the natural logarithm of the number of directors in the board (Yermack, 1996), and other control variables. The coefficient for board size is positive and statistically significant at the 1% level. This finding is consistent with those in Table 3 that the announcement effect of R&D expenditure increases is more favorable for firms with large board size. Model 2 tests the effect of blockholder ownership as measured by the percentage of equity held by shareholders owning 5% or more of the company stocks. The results suggest that blockholder ownership is significantly positively related to the announcing firms' announcement-period abnormal returns. Higher blockholder ownership creates greater wealth gains from the announcements of R&D expenditure increases. Model 3 examines the influence of internal governance as measured by insider ownership. Consistent with the results of other measures, we find that insider ownership is strongly and positively associated with announcing firms' value creation. In Model 4, we examine the explanatory power of duality. The coefficient of duality is negative and statistically significant at the 5% level, suggesting that the announcement effect of R&D expenditure increases is weaker when the chair of board also serves as the CEO of the announcing firm. This finding is consistent with those in other models.

As for the control variables, we find that pseudo q is important in explaining the wealth effect associated with R&D expenditure increases. The announcement-period abnormal returns are significantly positively related to the announcing firm's

investment opportunities. Consistent with Chan et al. (1990), Zantout and Tsetsekos (1994) and Szewczyk, John and John (1996), the result on pseudo q supports that increase R&D expenditures by firm with good investment opportunities are more valuable than those by firms with poor investment opportunities. Most of the other control variables have little explanatory power on the variation of the announcement-period abnormal returns.

Table 6 examines the interaction effect of investment opportunities and internal governance. Firms with better governance and growth opportunities are expected to receive significantly greater market reactions. For each measure of internal governance, we use a dummy variable that equals one for high-q, better-governance and zero otherwise to catch this interaction effect. The definition of high-q, better-governance follows those in Table 4. For example, for the measure of board size, the high-q, better-governance dummy equals one when a firm's pseudo q and board size are greater than the associated sample medians.

[Insert Table 6 here]

Model 1 tests the interaction effect when internal governance is measured by board size. We find that high-q better-governance dummy is significantly positive at the 5% level, suggesting that the joint effect of growth opportunity and internal governance add additional explanatory power to the variation of abnormal returns. Model 2 uses blockholder ownership as the alternative measure of internal governance. The results are very similar to those in model 1. Model 3 test the interaction effect with insider ownership as the measure of internal governance. The result of the interaction dummy is consistent with those in model 1 and 2. In model 4, internal governance is measured by duality, and the high-q, better-governance dummy equals

one when firms have pseudo q above the sample median, and the CEO is not the chairman of the board. We find the interaction effect remains positive and statistically significant. The conclusion under this measure remains unchanged. The empirical results in Table 6 are consistent with those in Table 4. It is interesting to note that when the interaction effect is included in the regression models, the effect of internal governance becomes weaker (Model 1 and 2) or insignificant (Model 3 and 4), and pseudo q lose its explanatory power in all models. The findings suggest the importance of the simultaneous consideration of both internal governance and growth opportunity in assessing the wealth effect of R&D expenditure increases.

IV. Conclusion

Prior studies documented mixed evidence on the announcements effect of R&D expenditure increases. This study reexamines this issue from the perspective of internal governance. Because the information available for R&D investments is very limited, investors may consider the quality of internal control in their value assessment on shareholders wealth. The evidence shows that internal governance has a significant impact on the valuation of R&D investments. We find better internal control is associated with stronger shareholders wealth upon the announcements of R&D expenditure increases. We further show that the growth opportunity positively influences the impacts of internal control on how investors evaluate R&D announcements. Our empirical results suggest that the availability of growth opportunities jointly determines the value creation of R&D expenditure increases. The evidence in this study also suggest that failure to consider the joint effect of internal governance growth potentials may contribute to the mixed evidence on the announcement effect of R&D expenditure increases in prior studies.

References

Abody, D. and B. Lev, 2000, "Information Asymmetry, R&D, and Insider Gains," *The Journal of Finance 55*, 2747-2766.

Agrawal, A. and C.R. Knoeber, 1996. "Firm Performance and Mechanisms to Control Agency Problems between Managers and Shareholders," *Journal of Financial and Quantitative Analysis 31*, 377-397.

Allen, J.W. and G.M. Phillips, 2000, "Corporate Equality Ownership, Strategic Alliances, and Product Market Relationships," *The Journal of Finance 55*, 2791-2815.

Atiase, K., 1985, "Predisclosure Information, Firm Capitalization, and Security Price Behavior around Earnings Announcements," *Journal of Accounting Research 23*, 21-36.

Baber, W.R., P.M. Fairfield, and J.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.

Barclay, M.J. and C.W. Smith Jr, 1995a, "The Maturity Structure of Corporate Debt," *The Journal of Finance 50*, 609-631.

Barclay, M.J. and C.W. Smith Jr, 1995b, "The Priority Structure of Corporate Liabilities," *The Journal of Finance 50*, 899-917.

Baysinger, B. and R.E. Hoskisson, 1989, "Diversification Strategy and R&D Intensity in Multi-Product Firms," *Academy of Management Journal 32*, 310-332.

Beasley, M.S., 1996, "An Empirical Analysis of the Relation between the Board of Director Composition and Financial Statement Fraud," *The Accounting Review 71*, 443-465.

Bhojraj, S. and P. Sengupta, 2003, "Effect of Corporate Governance on Bond Rating and Yields: The Role of Institutional Investors and Outside Directors," *The Journal of Business*, 455-475.

Blose, L.E. and Joseph C.P. Shieh, 1997, "Tobin's q-Ratio and Market Reaction to Capital Investment Announcements," *The Financial Review 32*, 449-476.

Bushee, B.J., 1998, "The Influence of Institutional Investors on Myopic R&D Investment Behavior," *The Accounting Review 73*, 305-333.

Chaganti, R.S., V. Mahajan, and S. Sharma, 1985, "Corporate Board Size,

Composition and Corporate Failures in Retailing Industry," *Journal of Management Studies 22*, 400-416.

Chan, S.H., J.D. Martin, and J.W. Kensinger, 1990, "Corporate Research and Development Expenditures and Share Value," *Journal of Financial Economics 26*, 255-276.

Chen, S.S., K.W. Ho, C.F. Lee, and G.H.H. Yeo, 2000, "Investment Opportunities Free Cash Flow and Market Reaction to International Joint Ventures," *Journal of Banking & Finance 24*, 1747-1765.

Chen, S.S. and K.W. Ho, 1997, "Market Response to Product-Strategy and Capital-Expenditure Announcements in Singapore: Investment Opportunities and Free Cash Flow," *Financial Management 26*, 82-88.

Chen, S.S., T.Y. Chung, and L.I. Chung, 2001, "Investment Opportunities, Free Cash Flow and Stock Valuation Effects of Corporate Investments in China," *Review of Quantitative Finance and Accounting 16*, 299-310.

Cho, M.H., 1998, "Ownership Structure, Investment, and the Corporate Value: An Empirical Analysis," *Journal of Financial Economics 47*, 103-121.

Chung, K.H., P. Wright, and C. Charoenwong, 1998, "Investment Opportunities and Market Reaction to Capital Expenditure Decisions," *Journal of Banking & Finance 22*, 41-60.

Cornett, M.M., G. Hovakimian, D. Palia, and H. Tehranian, 2003, "The Impact of the Manager-Shareholder Conflict on Acquiring Bank Returns," *Journal of Banking and Finance 27*, 103-131.

Denis, D.J., 1994, "Investment Opportunities and the Market Reaction to Equity Offerings," *Journal of Financial and Quantitative Analysis 29*, 159-177.

Doukas, J. and L. Switzer, 1992, "The Stock Market's Valuation of R&D Spending and Market Concentration," *Journal of Economics and Business 44*, 95-114.

Doukas, J., 1995, "Overinvestment, Tobin's *q* and Gains from Foreign Acquisitions," *Journal of Banking and Finance 19*, 1285-1303.

Fama, E.F. and M.C. Jensen, 1983, "Agency Problem and Residual Claims," *Journal of Law and Economics 26*, 327-350.

Hambrick, D.C. and I. MacMillan, 1985, "Efficiency of Product R&D in Business Units: The Role of Strategic Context," *Academy of Management Journal 28*,

527-547.

Healy, P.M., 1985, "The Effect of Bonus Schemes on Accounting Decisions," *Journal of Accounting and Economics 7*, 85-107.

Hertzel, M. and R. Smith, 1993, "Market Discounts and Shareholder Gains for Placing Equity Privately," *The Journal of finance 48*, 459-485.

Holderness, C.G., R.S. Kroszner, and D.P. Sheehan, 1999, "Were the Good Old Days that Good? Changes in Managerial Stock Ownership since the Great Depression," *The Journal of Finance 54*, 435-469.

Howe, K.M., J. He, and G.W. Kao, 1992, "One-Time Cash Flow Announcements and Free Cash-Flow Theory: Share Repurchases and Special Dividends," *The Journal of Finance 47*, 1963-1975.

Jensen, M.C., 1986, "Agency Cost of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review Papers and Proceedings 3*, 323-329.

Jensen, M.C., 1993, "The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems," *The Journal of Finance 48*, 831-880.

Jensen, M.C. and W.H. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *journal of Financial Economics 3*, 305-360.

Kang, J. and R. Stulz, 1996, "How Different is Japanese Corporate Finance? An Investigation of the Information Content of New Security Issues," *Review of Financial studies 9*, 109-139.

Kelm, K., V.K. Narayanan, and G. Pinches, 1995, "Shareholder Value Creation during R&D Innovation and Commercialization Stages," *Academy of Management Journal 38*, 770-786.

Klein, A., 2002, "Audit Committee, Board of Director Characteristics, and Earnings Management," *Journal of Accounting and Economics 33*, 375-400.

Lang, L.H.P. and R.M. Stulz, 1992, "Contagion and Competitive Intra-Industry Effects of Bankruptcy Announcements: An Empirical Analysis," *Journal of Financial Economics 32*, 45-60.

Lang, L.H.P., R.M. Stulz, and R.A. Walkling, 1989, "Managerial Performance Tobin's *q*, and the Gains from Successful Tender Offers," *Journal of Financial Economics 24*, 137-154.

Lang, L.H.P., R.M. Stulz, and R.A. Walkling, 1991, "A Test of the Free Cash Flow Hypothesis: The Case of Bidder Returns," *Journal of Financial Economics 29*, 315-335.

Lehn, K., S. Patro, and M. Zhao, 2005, "Governance Indices and Valuation Multiples: Which Causes Which?" Working Paper.

Lehn, K.M., and M. Zhao, 2006, "CEO Turnover after Acquisitions: Are Bad Bidders Fired," *Forthcoming, The Journal of Finance.*

Leland, H. and D.H. Pyle, 1977, "Information Asymmetric, Financial Structure and Financial Intermediation," *The Journal of Finance 32*, 371-388.

Mehran, H., 1995, "Executive Compensation Structure, Ownership, and Firm Performance," *Journal of Financial Economics 38*, 163-184.

Monks, R.A.G. and N. Minow, 1995, "Corporate Governance," Oxford: Blackwell.

Murphy, K.J. 1985, "Corporate Performance and Managerial Remuneration: An Empirical Analysis," *Journal of Accounting and Economics* 7, 11-42.

Myers, S. and N. Majluf, 1984, "Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not Have," *Journal of Financial Economics* 13, 187-221.

Peasnell, K.V., P.F. Pope, and S. Young, 2005, "Board Monitoring and Earnings Manageement: Do Outside Directors Influence Abnormal Accruals?" *Journal of Business Finance and Accounting 32*, 1311-1346.

Perfect, S.B. and K.W. Wiles, 1994, "Alternative Constructions of Tobin's *q*: An Empirical Comparison," *Journal of Empirical Finance 1*, 313-341.

Shleifer, A. and R.W. Vishny, 1986, "Larger Shareholders and Corporate Control," *The Journal of Political Economy 94*, 461-489.

Shome, D. and S. Singh, 1995, "Firm Value and External Blockholdings," *Financial Management 24*, 3-14.

Sundaram, A.K., T.A. John, and K. 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, S.H., G.P. Tsetsekos, and Z. Zantout, 1996, "The Valuation of Corporate R&D Expenditures: Evidence from Investment Opportunities and Free Cash Flow," *Financial Management 25*, 105-110.

Weir, C., D. Laing, and P.J. McKnight, 2002, "Internal and External Governance Mechanisms: Their Impact on the Performance of Large UK Public Companies," *Journal of Business Finance and Accounting 29*, 579-611.

Yermack, D., 1996, "Higher Market Valuation of Companies with a Small Board of Directors" *Journal of Financial Economics 40*, 185-211.

Zantout, Z.Z. and G.P. Tsetsekos, 1994, "The Wealth Effects of Announcements of R&D Expenditure Increases," *The Journal of Financial Research 17*, 205-216.

Table 1
Sample Distribution of Research and Development Expenditure Increases Announcement

This table summarizes the sample distribution of research and development expenditure increases announcements from 1988 to 2001. The sample is collected from the Dow Jones News Wire, the *Wall Street Journal* and the Barron's. There are 243 announcements by 108 different firms. The sample distribution is reported in Panel A by first two-digit industry code as classified by Compustat, and in Panel B by R&D expenditure increases fiscal year.

SIC	Industry	Number	Percent of Sample
20	Food	1	0.4
28	Chemicals	114	46.9
33-34	Metal and stone work	4	1.6
35	Machinery and computer equipment	12	4.9
36	Electric equipment	50	20.6
37	Transportation equipment	21	8.6
38	Photo equipment	12	4.9
48	Communications	3	1.2
51	Durable and non-durable goods	1	0.4
73	Business Services	23	9.5
78	Motion Pictures	2	0.8
	Total	243	100.0

Panel A: Sample Distribution by Industry (header above SIC table)

Panel B: Sample Distribution by Year

Year	Number	Percent of Sample
1988	4	1.6
1989	2	0.8
1990	10	4.1
1991	13	5.3
1992	16	6.6
1993	17	7.0
1994	14	5.8
1995	13	5.3
1996	13	5.3
1997	14	5.8
1998	28	11.5
1999	37	15.2
2000	41	16.9
2001	21	8.6
Total	243	100.0

Table 2
Firm Characteristic Statistics

The sample consists of 243 R&D expenditure increases announcements from 1988 to 2001. Data are obtained from the Dow Jones News Retrieval database, CRSP, Compustat and Compact D. Two-day (-1,0) announcement period abnormal returns (CAR) are estimated using the standard market model procedure with parameters estimated for the period 200 days to 60 days before the announcement. Board size is number of the board of directors in the fiscal year -1. Blockholder ownership is the total percentage of company's stock held by shareholder owning more 5% or more of the company's stock. Insider ownership is the total percentage of company's stock held by directors and officers owning. Duality is a dummy variable, which the chairman of the board served as chief executive officer equal one and otherwise equal zero. Pseudo q is estimated as the ratio of the market value of the firm's assets to the book value of the firm's assets for the fiscal year before the announcement, where the market value of assets is estimated as the book value of assets minus the book value of common equity plus the market value of common equity. The industry R&D intensity is the ratio of industry R&D expenditures to industry sales in fiscal year -1. Relative firm R&D intensity is the ratio of firm R&D expenditure to sales in fiscal year -1. Market value of common equity is measured as the capitalization of the firm. Industry concentration is measured by the Herfindahl index, which is equal to the sum of squares of the financial market shares of all firms with the same primary four-digit SIC industry code in Compustat.

Variable	N	Mean	Std	Q1	Median	Q3
CAR (%)	243	0.27	5.83	-1.99	0.08	2.06
Board Size	212	11.87	8.87	8.00	11.00	14.00
Blockholder Ownership	206	0.14	0.20	0.00	0.06	0.21
Insider Ownership	193	0.07	0.16	0.00	0.01	0.05
Duality	227	0.67	0.47	0.00	1.00	1.00
Pseudo q	243	4.20	4.38	1.82	2.97	5.03
Industry R&D Intensity	243	0.11	0.08	0.08	0.11	0.13
Relative Firm R&D Intensity	243	3.09	9.32	0.86	1.05	1.30
Market Value of Equity ($Million)	243	45,566	69,793	2,715	19,050	54,538
Industry Concentration	243	0.18	0.23	0.03	0.08	0.25

Table 3
Mean and Median Cumulative Abnormal Returns (CAR) for Subsamples Stratified According to Internal Governance

Two-day (-1,0) announcement period abnormal returns are estimated using the standard market model procedure with parameters estimated for the period 200 days to 60 days before the announcement. Board size is number of the board of directors in the fiscal year -1. Blockholder ownership is the total percentage of company's stock held by shareholder owning more 5% or more of the company's stock. Insider ownership is the total percentage of company's stock held by directors and officers owning. Duality is a dummy variable, which the chairman of the board served as chief executive officer equal one and otherwise equal zero. In Panel A, high internal governance firms indicate board size above median; low internal governance firms are board size below median. In Panel B and C, high internal governance firms are the percentage of blockholder or insider ownership above median; low internal governance firms are the percentage of blockholder or insider ownership below median. In Panel D, high internal governance firms indicate that chairman of the board didn't served as chief executive officer. Low internal governance firms indicate that chairman of the board served as chief executive officer. "***" represents a 1% significance level; "**" represents a 5% significance level; "*" represents a 10% significance level.

	Panel A: Board Size		
	Large	Small	Diff.
Mean	0.98	-0.83	1.81**
T	(2.63)***	(-1.15)	
Median	0.39	-0.25	0.63*
Prob.	1.05%	53.04%	
N	123	89	

	Panel B: Blockholder Ownership		
	High	Low	Diff.
Mean	2.22	-0.44	2.66***
T	(4.23)***	(-1.07)	
Median	1.05	-0.01	1.06***
Prob.	0.01%	25.87%	
N	107	99	

	Panel C: Insider Ownership		
	High	Low	Diff.
Mean	1.31	-0.86	2.17***
T	(3.12)***	(-2.31)**	
Median	0.57	-0.31	0.88***
Prob.	1.47%	4.18%	
N	100	93	

	Panel D: Duality		
	No	Yes	Diff.
Mean	1.07	-0.13	1.20*
T	(2.16)**	(-0.30)	
Median	0.44	-0.42	0.86*
Prob.	4.72%	50.19%	
N	76	151	

Table 4
Mean and Median Cumulative Abnormal Returns (CAR) for Subsamples Stratified According to Pseudo Q and Internal Governance

Two-day (-1,0) announcement period abnormal returns are estimated using the standard market model procedure with parameters estimated for the period 200 days to 60 days before the announcement. Pseudo q is estimated as the ratio of the market value of the firm's assets to the book value of the firm's assets for the fiscal years before the announcement, where the market value of assets is estimated as the book value of assets minus the book value of common equity plus the market value of common equity. Board size is number of the board of directors in the fiscal year -1. Blockholder ownership is the total percentage of company's stock held by shareholder owning more 5% or more of the company's stock. Insider ownership is the total percentage of company's stock held by directors and officers owning. Duality is a dummy variable, which the chairman of the board served as chief executive officer equal one and otherwise equal zero. High-q firms are firms with pseudo q above median; Low-q firms are firms with pseudo q blow median. In Panel A, high internal governance firms indicate board size above median; low internal governance firms are board size below median. In Panel B and C, high internal governance firms are the percentage of blockholder or insider ownership above median; low internal governance firms are the percentage of blockholder or insider ownership below median. In Panel D, high internal governance firms indicate that chairman of the board didn't served as chief executive officer. Low internal governance firms indicate that chairman of the board served as chief executive officer. "***" represents a 1% significance level; "**" represents a 5% significance level; "*" represents a 10% significance level.

Panel A: Board Size			
		Board size	
Pseudo q		Large	Small
High	N	44	56
	Mean	2.46***	0.06
	Median	0.95***	0.85
Low	N	79	33
	Mean	0.16	-2.33**
	Median	0.04	-1.96**
Difference between high-q large board size and low-q small board size	Mean	4.80***	
	Median	2.92***	
Panel B: Blockholder Ownership			
		Blockholder ownership	
Pseudo q		High	Low
High	N	52	51
	Mean	3.69***	0.40
	Median	1.88***	0.04
Low	N	55	48
	Mean	0.83	-1.33*
	Median	-0.18	-0.29
Difference between high-q high blockholder ownership and low-q low blockholder ownership	Mean	5.02***	
	Median	2.17***	

Table 4 (continued)

Panel C: Insider Ownership			
		Insider ownership	
Pseudo q		High	Low
High	N	54	42
	Mean	1.93***	-0.47
	Median	0.95***	0.02
Low	N	46	51
	Mean	0.58	-1.19*
	Median	-0.07	-0.42*
Difference between	Mean	3.12***	
high-q high insider ownership and low-q low insider ownership	Median	1.37***	

Panel D: Duality			
		Duality	
Pseudo q		No	Yes
High	N	40	77
	Mean	2.40***	0.65
	Median	1.30***	0.04
Low	N	36	74
	Mean	-0.41	-0.93
	Median	-0.29	-0.53
Difference between	Mean	3.33***	
high-q & no duality and low-q & duality	Median	1.84***	

Table 5
Cross-Sectional Impact of Internal Governance on Cumulative Abnormal Return (CAR)

The dependent variable is two-day (-1, 0) cumulative abnormal return (CAR). Two-day announcement period abnormal returns are estimated using the standard market model procedure with parameters estimated for the period 200 days to 60 days before the announcement. Board size is nature logarithm of number of the board of directors in the fiscal year -1. Blockholder ownership is the total percentage of company's stock held by shareholder owning more 5% or more of the company's stock. Insider ownership is the total percentage of company's stock held by directors and officers owning. Duality is a dummy variable, which the chairman of the board served as chief executive officer equal one and otherwise equal zero. Size measured by nature logarithm of the market value of equity. The industry R&D intensity (IRI) is the ratio of industry R&D expenditures to industry sales in fiscal year -1. Relative firm R&D Intensity (FRI) is the ratio of firm R&D expenditure to sales in fiscal year -1. Industry concentration (IC) is measured by the Herfindahl index, which is equal to the sum of squares of the financial market shares of all firms with the same primary four-digit SIC industry code in Compustat. Q is pseudo q dummy variable; if firms with pseudo q above median, then Q equal one and otherwise equal zero. Pseudo q is estimated as the ratio of the market value of the firm's assets to the book value of the firm's assets for the fiscal years before the announcement, where the market value of assets is estimated as the book value of assets minus the book value of common equity plus the market value of common equity. The number in the parentheses presents *t-value*. "***" represents a 1% significance level; "**" represents a 5% significance level; "*" represents a 10% significance level.

	Model 1	Model 2	Model 3	Model 4
Intercept	-8.028	0.088	0.873	1.766
	(-3.30)***	(0.04)	(0.52)	(0.93)
Board Size	3.847			
	(4.64)***			
Blockholder Ownership		4.879		
		(2.75)***		
Insider Ownership			4.016	
			(1.93)*	
Duality				-1.559
				(-2.25)**
Size	-0.249	-0.266	-0.175	-0.223
	(-1.12)	(-1.36)	(-1.01)	(-1.19)
IRI	1.694	13.30	-1.484	0.220
	(0.34)	(2.57)**	(-0.34)	(0.05)
FRI	0.055	0.047	0.047	0.084
	(1.28)	(1.29)	(1.35)	(2.24)**
IC	0.193	0.696	0.905	1.170
	(0.11)	(0.42)	(0.60)	(0.73)
Q	2.451	1.841	1.254	2.186
	(2.90)***	(2.34)**	(1.71)*	(2.90)***
N	212	206	193	227
Adjusted R^2	0.097	0.169	0.051	0.073
F-value	4.77***	7.94***	2.71**	3.98***

Table 6
Cross-Sectional Interaction Impact of Pseudo Q and Internal Governance on Cumulative Abnormal Return (CAR)

The dependent variable is two-day (-1, 0) cumulative abnormal return (CAR). Two-day announcement period abnormal returns are estimated using the standard market model procedure with parameters estimated for the period 200 days to 60 days before the announcement. Board size is number of the board of directors in the prior fiscal year. Blockholder ownership is the total percentage of company's stock held by shareholder owning more than 5% or more of the company's stock. Insider ownership is the total percentage of the directors and officers owning. Duality is a dummy variable, which the chairman of the board served as chief executive officer equal one and otherwise equal zero. Q*IGD indicates high-q high internal governance firms. High-q firms are firms with pseudo q above median. In Model 1, high internal governance firms indicate board size above median; In Model 2 and 3, high internal governance firms are the percentage of blockholder or insider ownership above median; In Model 4, high internal governance firms indicate that chairman of the board did not serve as chief executive officer. And then, In Model 1, low internal governance firms are board size below median; In Model 2 and 3, low internal governance firms show that the percentage of blockholder or insider ownership below median; In Model 4, low internal governance firms indicate that chairman of the board served as chief executive officer. Size measured by nature logarithm of the market value of equity. The industry R&D intensity (IRI) is ratio of industry R&D expenditures to industry sales in fiscal year -1. Relative firm R&D Intensity (FRI) is ratio of firm R&D expenditure to sales in fiscal year -1. Industry concentration (IC) is measured by the Herfindahl index, which is equal to the sum of squares of the financial market shares of all firms with the same primary four-digit SIC industry code in Compustat. Q is Pseudo q dummy variable; if firms with pseudo q above median, then Q is 1 and otherwise is 0. Pseudo q is estimated as the ratio of the market value of the firm's assets to the book value of the firm's assets for the fiscal years before the announcement, where the market value of assets is estimated as the book value of assets minus the book value of common equity plus the market value of common equity. The number in the parentheses presents *t-value*. "***" represents a 1% significance level; "**" represents a 5% significance level; "*" represents a 10% significance level.

	Model 1	Model 2	Model 3	Model 4
Intercept	-6.131	-0.168	0.356	0.08
	(-2.32)**	(-0.08)	(0.22)	(0.04)
Q*IGD	2.273	2.357	1.970	3.002
	(2.23)**	(2.75)***	(2.36)**	(2.51)**
Board Size	2.994			
	(3.39)***			
Blockholder Ownership		3.144		
		(1.67)*		
Insider Ownership			2.437	
			(1.09)	
Duality				-0.060
				(-0.06)
Pseudo q	-0.0002	-0.001	0.00003	-0.001
	(-0.16)	(-0.80)	(0.03)	(-1.06)
Size	-0.192	-0.144	-0.083	-0.085
	(-0.84)	(-0.76)	(-0.51)	(-0.46)
IRI	5.698	15.388	-2.205	5.146
	(1.15)	(2.99)***	(-0.50)	(1.17)
FRI	0.061	0.053	0.055	0.095
	(1.41)	(1.44)	(1.58)	(2.52)**

IC	-0.573	-0.495	0.277	0.334
	(-0.33)	(-0.31)	(0.20)	(0.21)
N	212	206	193	227
Adjusted R^2	0.078	0.173	0.063	0.061
F-value	3.56***	7.14***	2.85***	3.11***