

RELATIONSHIPS BETWEEN INSTITUTIONAL OWNERSHIP, CAPITAL STRUCTURE AND RESEARCH AND DEVELOPMENT INVESTMENT

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ABSTRACT

Research and development (R&D) is vital for an information technology (IT) firm's innovation. This study investigates the relationship among institutional ownership, capital structure, and research and development investment for 336 listed information technology firms from 2006 to 2009. Empirical evidence shows that there is no significant relationship between institutional ownership and research and development investment. The finding suggests that institutional investors may not influence management decision making on research and development investment. This study also finds that capital structure has a negative relationship with research and development investment. The result indicates that information technology firms may use less debt when the investment outcome is uncertain.

JEL: M400, M490

KEYWORDS: Research and Development, Institutional Ownership, Capital Structure, Information Technology

INTRODUCTION

High levels of institutional ownership of publicly held companies have led to concerns about the potential effects such ownership can have on research and development (R&D) investment. Another considerable factor deemed relevant in R&D investment decisions is capital structure. The choice of investments can influence the choice of financing (Williamson, 1988). The evidence for a negative relationship between institutional ownership and R&D is widely evident (Graves, 1988, Dong & Gou, 2010, White, 1987, Zahra, 1996). However, existing empirical work contradicts that thesis (Jarrel and Lehn, 1985, Graves 1990). Overall, the literature regarding capital structure paints the picture suggesting a firm's intensity of investments in R&D will influence capital structure (Simerly and Li, 2000, Long and Malitz, 1985, Vincente-Lorente, 2001).

Extending the work of previous literature, this study investigates the relationship between the institutional ownership, capital structure, and research and development (R&D) investments for 336 listed information technology (IT) companies in Taiwan. Taking an industry specific perspective, as well as international perspective, can provided interesting insights that will add to the current literature. We hypothesize that institutional ownership has a positive relationship with R&D investment. Empirical results find no association between institutional ownership and R&D expenditures, suggesting that institutional investors may not influence management decision making on R&D investment. We also hypothesize that capital structure has a negative relationship with R&D investment. Consistent with our hypothesis, an increase in R&D investment is associated with lower debt. The rest of this paper is structured as follows: We first describe the relevant literature and develop our hypotheses. Next, we discuss the sample data and methodology used in the study. Then we present the results of the tests and the primary conclusions.

LITERATURE REVIEW

For young innovative firms, the most important assets are intangible assets such as research and development (R&D). Efficient R&D investments result in advanced products or services, which enable a firm to generate persistent profits (Chauvin & Hirschey, 1993, Ho, Keh, & Ong, 2005). However, R&D investments are not reported in firms' financial statements under U.S. GAAP and their valuation is more complicated (Hirschey & Weygandt, 1985, Sougiannis, 1994). For example, U.S. GAAP requires the full expensing of R&D expenditures (Cañibano et.al., 2000, Han & Manry, 2004, Lev & Sougiannis, 1996).

R&D investments make significant contributions to information technology (IT) firms (Lee & O'Neill, 2003, Noriyuki, 1985). The development of IT plays a key role in Taiwan economic growth over the last decade. Since 1995, Taiwan has become the world's third-largest supplier in the IT industry after the United States and Japan. The IT industry is a group of companies involved in different industry sections. Depending on the industry section, these companies specialize in different activities from R&D to innovation, manufacturing and assembly.

Ownership structure has been recognized as one important determinant of R&D spending (Baysinger, Kosnik, & Turk, 1991, Lee & O'Neill, 2003). For the influence of ownership on R&D investment, some reports show that institutional investors are risk-averse and would not like to invest in R&D activities (Graves & Waddock, 1990). Others argue that institutional investors have the capability to diversify their investments and encourage the invested companies to pursue the projects with prospects (Bushee, 1998).

Capital structure (i.e., leverage) is also important for a firm to complete innovation and ensure the financial resources required to launch new products. R&D investment generally requires large amounts of capital. However, IT firms may have difficulty accessing debt markets because R&D investment is risky and cannot serve as good collateral (Simerly & Li, 2000, Vicente-Lorente, 2001).

Institutional Ownership and R&D Investment

Information asymmetry exists between investors and managers. Information asymmetry arises from the inability of managers to convey information and from the reluctance of investors to gather information. Institutional investors with large ownership have incentives to gather more information and reduce information asymmetry (Lee & O'Neill, 2003). Managers are hesitant to invest long term R&D because innovative projects have a high failure rate. Institutional ownership can diversify their investment portfolio to reduce R&D risk (Baysinger, Kosnik, & Turk, 1991). Some studies find that the recurrent trading and short-term focus of institutional investors encourage management to engage in prejudiced investment behavior. Others argue that the large stockholdings and sophistication of institutions allow managers to focus on long-term return rather than on short-term earnings.

Jarrell and Lehn (1985) studied the association between institutional ownership and R&D spending in 324 firms for the period 1980-83. They found a significantly positive relationship between the level of institutional ownership and R&D intensity, based on OLS regression equations with dummy variables for the 19 industries. Graves (1988) analyzed the relationship between institutional ownership and R&D spending using 10 years of data from Standard and Poor's Securities Owner's Stock Guide. The analysis showed that institutional ownership is negatively associated with R&D for the period of 1976-1985. Graves (1988) concluded that institutional ownership might continue growth as the decreased spending in R&D could seriously grind down the competitiveness of U.S. firms. Graves (1990) described the effect of institutional ownership on corporate R&D investment for 133 companies in six U.S. industries over the period 1965-1984. The result shows no significant relationship between institutional ownership and R&D investment. This study does not provide support for the hypothesis that higher levels of institutional ownership result in lower levels of R&D expenditure.

Bushee (1998) examined whether institutional investors increase or reduce incentives for managers to reduce investment in R&D expenditures to meet short-term earnings. The results indicated that managers are less likely to decrease R&D to reverse an earnings decline when institutional ownership is high. The study suggests that institutions are sophisticated investors and serve a monitoring role in reducing pressures for prejudiced behavior. Dong and Gou (2010) tested the hypotheses on the relations between R&D intensity and managerial discretion of CEOs, independent directors, and managerial ownership. The results show that the discretion of CEOs has a negative correlation with the firm R&D investment. Moreover, the proportion of independent directors has a positive influence on the R&D investment.

R&D investments are risky and may induce uncertain returns. Institutional investors are diversified and they can spread R&D risk (Baysinger, Kosink, & Turk, 1991). Additionally, Institutional investors provide their opinions on corporations and influence managers' decision-making. Particularly, the high levels of institutional ownership may inhibit long-term R&D investments to increase the competitiveness of IT firms (Chauvin & Hirschev, 1993). This expectation leads to the following hypothesis:

H1: The institutional ownership has a positive relationship with R&D investment.

Capital Structure and R&D Investment

A proper capital structure is a critical decision for any industry because an organization needs to maximize returns and deals with a competitive environment (Simerly & Li, 2000). Myers and Majluf (1984) developed the pecking order theory for financing decisions. Firms finance new investments first with retained earnings, followed by debt, and finally with equity. R&D investments create intangible assets and cannot serve as good collateral (Simerly & Li, 2000, Vincente-Lorente, 2001). Therefore, intense R&D is associated with lower leverage (Bhagat & Welch, 1995). Bhagat and Welch (1995) explored the determinants of R&D investment for U.S., Canadian, British, European, and Japanese firms. Bhagat and Welch suggested that high-technology firms are likely to be financially distressed and prefer not to presume large amounts of debt to maintain their R&D investments. They find that debt ratio is negatively correlated with R&D expenditures for U.S. firms. Nevertheless, the debt ratio is positively associated with R&D for Japanese firms. O'Brien (2003) proposed that financial slack (i.e., lower leverage) provides lagging against cash flow fluctuation and ensures sufficient financial resources. They found that R&D intensity is negatively associated with financial leverage. This finding suggests that firms competing on innovation should choose capital structures with financial slack.

Bougheas (2004) examined the financial decisions of small firms on R&D in the United States, United Kingdom and Canada. The result indicated that high ratio of R&D investments with the high risk nature are unlikely to raise debt in external capital markets. Moreover, financing R&D with bank loans may be possible, if banks are willing to monitor the investment activities. Singh and Faircloth (2005) examined the relationship between financial leverage and R&D expenditure by using a sample of large U.S. manufacturing firms. The results indicated that there is a negative relationship between financial leverage and R&D expenditure. In addition, financial leverage adversely influences future R&D investment and may in turn lead to negative impact on performance and future growth. R&D investment generally requires large amounts of capital. However, investments in R&D create intangible assets that will likely suffer from market failure and they cannot serve as effective collateral to support a high level of debt (O'Brien, 2003, Ou & Haynes, 2006). Therefore, IT firms may use less debt than other firms when innovation outcomes are uncertain. This expectation leads to the following hypothesis:

H2: The capital structure has a negative relationship with R&D investment.

DATA AND METHODOLOGY

The sample consists of IT firms listed on the Taiwan Stock Exchange (TSE) for the period 2006–2009. The IT firms were chosen because of their dependence on R&D for innovation (Tsai & Wang, 2004). Annual data was collected from a database, the Taiwan Economic Journal (TEJ), a leading research database in Taiwan. TEJ provides detailed company profiles and financial data of companies. The initial sample was 353 firms, which were continually listed on the TSE between 2006 and 2009. The final sample consisted of 336 firms by deleting the missing observations and data retrieved.

Model

The empirical model is as follows:

$$RD = \alpha + \beta_1 OWN + \beta_2 LEV + \beta_3 LIQ + \beta_4 FSIZE + \beta_5 CAPI + \beta_6 PFIRM + \varepsilon \tag{1}$$

R&D investment (RD) is measured by R&D expenditures to total sales (Baysinger et al. 1991; O’Brien, 2003). Institutional ownership (OWN) is measured as the percentage of the shares held by institutional investors. Leverage (LEV) represents capital structure and is measured as the ratio of total debt to total assets (Bah & Dumontier, 2001). Several control variables are included in the model. Liquidity (LIQ) is current assets divided by total assets. Firm size (FSIZE) is controlled by using the natural logarithm of the firm’s total assets to avoid the problems of extreme values. Capital intensity (CAPI) is calculated by net fixed assets to total assets. Prior firm performance (PFIRM) is measured by pre-ROA.

EMPIRICAL RESULTS

Table one reports the means, standard deviation, and Pearson correlations among the variables used in the analysis. The average (Std. Deviation) of the R&D ratio (RD) is 4.26 (4.67). The mean percentage of the shares held by institutional investors (OWN) is 0.36. The mean (Std. Deviation) of total debt to total assets (LEV) is approximately 34.31 (14.62). The model also includes control variables related to R&D investment. The average liquidity index (LIQ) is 244.23. Firm size (FSIZE), the natural log of total assets (in millions), has a mean of approximately 15.73 and a standard deviation of 1.32. The mean firm spends about 13 of its assets on capital expenditures (CAPI) is 0.13. Finally, the average prior ROA (PFIRM) is 5.35. The Pearson correlation analysis shows that the correlation coefficients of the independent variables are less than 0.8. The variance inflation factor (VIF) statistics for the independent variables are less than two. These results indicate that multicollinearity does not appear to be an issue.

Table 1: Means, Standard Deviations, and Correlations

Variables	Means	SD	RD	OWN	LEV	LIQ	FSIZE (In Log)	CAPI	PFIRM
RD	4.260	4.670	1	-0.103	-0.374**	0.276**	-0.168**	-0.020	0.033
OWN	0.360	0.220	-0.103	1	0.000	-0.003	0.519**	0.117*	0.299**
LEV	34.310	14.620	-0.374**	0.000	1	-0.466**	0.159**	0.020	-0.381**
LIQ	244.230	203.750	0.276**	-0.003	-0.466**	1	-0.218**	-0.031	0.198**
FSIZE(in log)	15.730	1.320	-0.168**	0.519**	0.159**	-0.218**	1	0.221**	0.152**
CAPI	0.130	0.120	-0.020	0.117*	0.020	-0.031	0.221**	1	-0.123*
PFIRM	5.350	7.730	0.033	0.299**	-0.381**	0.198**	0.152**	-0.123*	1

*This table shows the mean, standard deviation and Pearson correlations of the variables included in the study. ***, **, and * indicate significance at the .01, .05, and .10 levels respectively. RD= the ratio of R&D expenditures to sales, OWN= the percentage of the shares held by Institutional investors, LEV= the ratio of total debt to total assets, LIQ= the ratio of current assets to total assets, FSIZE= the natural logarithm of the total assets, CAPI= the ratio of net fixed assets to total assets, PFIRM= Pre-ROA*

Table 2 reports the statistical results, which examine the effects of institutional ownership and capital structure on R&D investments for IT companies in Taiwan.

Table 2: Regression Results for the Effects of Institutional Ownership and Capital Structure on R&D Investment

Variable	RD
Constant	10.501*** (3.167)
OWN	-1.064 (-0.083)
LEV	-0.111*** (-5.718)
LIQ	0.003** (2.162)
FSIZE	-0.150 (-0.680)
CAPI	-0.251 (-0.125)
PFIRM	-0.063* (-1.778)
Observations	336
Adjusted R Square	0.159
P-value of F-test	0.000

This table presents the statistical results of the regression estimates of the equation: $RD = \alpha + \beta_1 OWN + \beta_2 LEV + \beta_3 LIQ + \beta_4 FSIZE + \beta_5 CAPI + \beta_6 PFIRM$. The first figure is the regression coefficient and then the t statistic is presented in parenthesis. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively. RD= the ratio of R&D expenditures to sales, OWN= the percentage of the shares held by institutional investors, LEV= the ratio of total debt to total assets, LIQ= the ratio of current assets to total assets, FSIZE= the natural logarithm of the total assets, CAPI= the ratio of net fixed assets to total assets, PFIRM= Pre-ROA.

Hypothesis 1 predicts a positive relationship between the institutional ownership and R&D investment. The regression model shows that there is no significant relationship between institutional ownership (OWN) and R&D investment (RD) (t= -0.083, p > 0.1). Therefore, Hypothesis 1 is not supported. The result is similar to Graves (1990), who find no association between institutional ownership and R&D investment. Hypothesis 2 predicts that the capital structure has a negative relationship with R&D investment. In the model, the relationship between capital structure (LEV) and R&D investment (RD) is negatively significant (t =-5.718, p < 0.01). Therefore, Hypothesis 2 is supported. The result is similar to Bougheas (2004) and Singh and Faircloth (2005), who find a negative association between capital structure and R&D investment.

CONCLUSIONS

This study investigates the relationship between institutional ownership, capital structure and R&D for 336 listed IT firms from 2006 to 2009 in Taiwan. The result shows that there is no significant relationship between institutional ownership and R&D investment. This is similar to Graves (1990), who finds no significant relationship between institutional ownership and R&D investment. The result suggests that institutional investors may not influence management decision making on R&D investment.

This study also finds that the capital structure has a negative relationship with R&D investment. This is similar to Bougheas (2004) and Singh and Faircloth (2005), who find a negative association between capital structure and R&D investment. The finding indicates that innovative firms will be less inclined to follow the mechanistic pecking order model and they will use equity capital instead of debt to avoid liquidity pressure. Thus, IT firms may use less debt when investment outcome is unsure.

The increasing number of institutional investors and their dominance as owners has a significant influence on corporate decisions. This study investigates whether institutional ownership as governance mechanics affects R&D activity. Future research may include other governance mechanics.

This study also examines whether firms involved in R&D activity show a specific financial behavior about their capital structures. To provide a better understanding of R&D- intensive firms' financial choices, further investigations may focus R&D and other corporate financial policy. Possible determinants would include dividend policies and cash on hand. While the results of this analysis draw a path toward a more

definitive study of the linkage between R&D investment, institutional ownership and capital structure, this study has its shortcomings. Perhaps extending to other industries over longer periods of time would provide a clearer perspective of the relationship between these three elements and the policy issues of management decision making and control.

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