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Intellectual Capital, Corporate Governance and Firm Performance

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Abstract: This paper aims to exam the connection among intellectual capital, corporate governance and firm performance. Firm performance measured by Tobin's Q is an important indicator. Business function such as R&D, advertising, and human resources, after adjusting for sales, remains important factors. Especially, management team should be aware of using leverage because excessive debt usage leads to poor Tobin's Q. Investors should be cautious of capital structure when forming their investment portfolios. Although the influences of ownership structure on firm performance are not consistent, the effects are significant. Finally, whether there is independent director and the holdings ratio of board of director definitely affect the firm performance.

Key words: *R& D intensity, intellectual capital, Tobin's Q, corporate governance*

I. Introduction

Intellectual capital such as research and development expenditures, advertising and human resources play the major roles for company valuation in R&D intensive industry. In the past two decades, the economic performance for most of countries in the world is driven by the development and invention of technology, and so is in Taiwan. According to the statistics information of National Science Council, the R&D expenditures of firms in Taiwan increased continuously and rapidly since 2001; then gradually slow down from 2008. Therefore, in an attempt to assess the consequence of increasing R&D, we apply both intellectual capital and corporate governance related factors to evaluate the firm performance for firms in Taiwan. Intellectual capital is commonly grouped into the areas of human, structural and relationship or relational capital. Human capital is an organization's combined human capability for solving business problems by using creativity and innovation of people. Structural capital includes organization's image, organization, information system, and proprietary databases. R&D intensity is the relationship capital trademarks, license, franchises, and also the less definable, such as customer interactions and relationships. Lev and Sougiannis (1996) define the R&D expenditures to sales as the R&D intensity. Bah and Dumontier (2001) also determine the company with more than five percent R&D intensity as a firm with the features of R&D policies. Margaritis and Psillaki (2010) discuss about the lag effects of

intellectual capital on firm performance.

There are numerous literatures exploring relationship between the corporate governance and firm performance. Corporate governance is the set of processes, customs, policies, laws, and institutions affecting the way a corporation is directed, administered or controlled. Corporate governance also includes the relationships among stakeholders involved and the goals for which the corporation is managed. Usually, the research focuses on the connection among ownership structure, agency problem, and firm performance. However, the empirical results of the effects of ownership structure on firm performance are not consistent. Jenson and Meckling (1976) address the Convergence-of-Interest-Hypothesis, which tests the relationship among capital structure, ownership structure, and firm performance. The results present significantly positive relationship between the stock ownership of director and firm performance. However, some researchers document different outcomes. Morck, Shleifer, and Vishny (1988) discuss the Entrenchment Hypothesis. Their results show that the ownership structure of director is significantly negative related to firm performance. Andras and Srinivasan (2003) show that both R&D and advertising variables are significantly positive related to the firm's performance. Obviously, it is rational and critical to consider the performance of corporate governance when estimate the firm value.

The rise of R&D expenditure during 2003 to 2004 is the highest in the past ten years in Taiwan. Among all of industries in Taiwan, The R&D expenditure of the manufacturer on computer electronic and optical product is leading. Besides, lots of companies in the industry have higher stock return which implies the effects of R&D intensity. Stakeholders will be interested to learn the costs of developing new products and services to best suit the consumer needs and enhance the value of firms. Managers should allocate the intellectual capital accordingly to implement for great efficiency to stay competitive. The contribution of this study is to investigate how corporate governance as well as structural relationship in affecting business profit. The empirical results includes that Tobin's Q is an important indicator in measuring firm performance. Whether there is independent board director and the stock holdings ratio of board of director do matter as well. The rest of section is organized as follows. Section 2 lists literature reviews; Section 3 describes data and methodology used in this analysis; Section 4 presents results; and Section 5 summarizes.

2. Literature Review

Intellectual capital and firm performance: In a competitive industry such as chemicals, drugs, electric and electronics, and machinery, R&D is an important factor for maintaining a leading position. In addition to R&D intensity, advertising intensity and human resource intensity are also frequently considered as important intellectual capital variables in previous researches. Andras and Srinivasan (2003) find R&D intensity and advertising intensity is positively related to the profit margin of the firm. Chauvin and

Hirschey (1993) present the companies with high R&D and advertising expenditures receive positive respond from the market. Nalbantian and Szostak (2004) discuss how the individual and company achieve better productivity and return rate through the employee education and training. Margaritis and Psillaki (2010) utilize the intangible assets to the firm's equity which indicting future growth opportunities to measure the intangibility. Surroca, Tribo, and Waddock (2010) show high-commitment human resources practices reduce the risk of future performance declines due to employee lawsuits, unionization, and health and safety fines.

Capital structure, corporate governance and firm performance: The corporate governance theory explains that the capital structure might result in agency problem, which influences the firm performance. Jensen (1986) points out that the agency problem between the managers and the stockholders will deteriorate when the available free cash flow for managers increased. If the leverage of company increases, the financial risk will become higher, and managers will be forced to work harder in order to increase the cash flow for interest payment. The Capital Structure Irrelevance Theory addressed by Modigliani and Miller (1958) discuss about the impacts of capital structure on firm performance. They document that the firm value and cost of capital will not be influenced by capital structure if the taxes for company and individual do not exist. Modigliani and Miller (1963) correct the assumptions in previous study, and address that when considers the tax shield, the firm value increases with the rise of company leverage. When the leverage is near one hundred percent, firm value will become the greatest. Jackling and Johl (2009) examine the correlation between internal governance structures and financial performance of Indian and show that the firm performance is significantly and negatively related to the capital structure. Drakos and Bekiris (2010) investigate the relationship between managerial ownership and firm performance by considering the endogenous nature of the ownership variables. They find that the relationship between capital structure and firm performance is negative. According to previous literatures, (Margaritis & Psillaki, 2010; Muhammad & Ismail, 2009) the investment in R&D activity, advertising, and human resources may reflect on the performance of firm. Numerous literatures such as (Belkhir, 2009; Drakos & Bekiris, 2010; Jackling & Johl, 2009) also suggest that performance of corporate governance plays an important role when measuring a company's value.

Ownership structure and firm performance: Jenson and Meckling (1976) suggest that because of the agency cost, the managers with excessive perquisite consumption will influence the firm value and the wealth of managers themselves. Belkhir (2009) examines the interrelations among five ownership and board characteristics in banks and Savings-and-Loan Holding Companies. The author finds significant relationships between performance and insider ownership and blockholders. Cheng (2008) shows that board size is negatively related to the variability of firm performance by using Tobin's Q as performance variable.

3. Methodology

We collect the data for computers manufacturing firms on electronic and optical products from Taiwan Economical Journal (TEJ). The sample period is from 2004 to 2008with quarterly financial information obtained, such as intellectual capital expenditures, debt ratio, and total asset to estimate the firm performance. Follow previous literatures, this study uses pooled least squares regressions model in illustrating the relationship among intellectual capital, ownership structure, and firm performance. The White test is utilized before the multiple regression analysis to test whether the heteroskedasticity exists. Quarterly stock return and accounting variable Tobin's Q are selected to measure the firm performance. Most of previous researches also evaluate the firm performance with Tobin's Q. R&D intensity is defined as R&D expenditures to sales. The substitute variable for advertising is determined as advertising expenditures to sales. The human resources intensity is defined as salaries expenses to sales. Debt ratio is determined as the measure variable for capital structure. We follow Belkhir (2009) by defining percentage of equity owned by the company directors and top executive officers including the CEO, percentage of equity owned by persons and institutions that hold 5% or more of the company's equity, and the number of outside directors divided by the total number of directors. The corporate governance variables include holdings ratio of managers, including board of directors, the total number of the board of directors, and lastly, the dummy variable, 1 if the company assigns the outside independent director, otherwise 0. Tobin's *Q* and stock return are used to measure the firm performance.

The regressions models to evaluate firm value are as follows:

$$Q = \alpha_0+\alpha_1 RD+\alpha_2 AD+\alpha_3 HR+\alpha_4 D+ \alpha_5 MB+\alpha_6 BD+\alpha_7 ID+\varepsilon \quad (1)$$

$$R= \beta_0 +\beta_1 RD+\beta_2 AD+\beta_3 HR+ \beta_4 D+ \beta_5 MB+\beta_6 BD+\beta_7 ID +\varepsilon \quad (2)$$

Q = Tobin's Q ratio
R = quarterly stock return rate

RD = R&D intensity, which is defined as R&D expenditures/sales
AD = advertising intensity, which is defined as advertising expenditures/sales
HR = human resources intensity, which is defined as human resources expenditures/sales
D = debt ratio, which is defined as total debt/total assets
MB = market-to-book ratio
BD = holdings ratio of board of director, which defined as the equity owned byboard of directors/ total equity
ID = 1 if independent director is assigned in the company, others 0

In equation 1 and 2, firm performance measuring variables such as independent variables Tobin's Q and stock returnshould be positively related to dependable variables of R&D, advertising,or human resourcesintensity in R&Dintensive industries (Margaritis & Psillaki, 2010; Muhammad & Ismail, 2009). Corporate governance and capital structure play an important role when estimating a company's value (Jackling & Johl, 2009). Dependent variable debt ratio should be inversely related to performance (Drakos

and Bekiris, 2010). Holding ratio of board directors and whether an independent director is assigned are negatively related to Tobin's Q (Cheng, 2008;Belkhir, 2009).

4. Empirical Results and Analysis

Descriptive statistics and correlation analysis: There are 58 companies and total of 1160 observations in the sample. Table 1 demonstrates the descriptive statistics. Debt ratio and the holdings ratio of board of director show great variations. Therefore, the capital and ownership structure related strategy may be quite different in R&D intensive industries. In contrast, the variation for R&D, advertising, and human resources intensity is much simlar.

Table 1: Descriptive statistics

Variable	Mean	Standard deviation	Maximum	Minimum
R	0.0067	25.1244	155.3199	-65.3333
Q	6.2481	8.3623	65.6336	0.0565
RD	0.1089	0.2136	6.5482	0.0022
AD	0.0729	0.1191	1.0693	6.5482
HR	0.1707	0.3110	6.2130	0.0069
D	29.0695	13.0405	98.2700	2.5700
MB	2.3729	1.8137	16.8400	0.2700
BD	19.3917	10.2770	60.1900	1.2800
ID	0.6379	0.4808	1.0000	0.0000
N = 1160				

Notes: R is the quarterly stock return. Q represents Tobin's Q ratio. RD is R&D expenditures divided by sales. AD is advertising intensity and defined as advertising expenditures divided by sales. HR is defined as human resource expenditures divided by sales. D is defined as total debt to total assets. MB is the market-to-book ratio, BD is the holdings ratio of board of director. ID is the dummy variable equals1 if the independent director is assigned. The stock return is [(1+Jan_ROI))*(1+Feb_ROI)*(1+Mar_ROI)-1]*100%. Jan_ROI represents the return on investment of January. Feb_ROI stands for the return on investment of February, and Mar_ROI represents the return on investment of March.

Table 2 shows the correlation matrix of relevant variables. Tobin's Q has powerful connection with most of variables except advertising intensity ratio. The intensity of intellectual capital may present great impacts on Tobin's Q and stock return. R is the quarterly stock return. Q represents Tobin's Q ratio. RD is R&D expenditures divided by sales. AD is advertising intensity and defined as advertising expenditures divided by sales. HR is defined as human resource expenditures divided by sales. D is defined as total debt to total assets. MB is the market-to-book ratio. BD is the holdings ratio of board of director. ID is the dummy variable equals1 if the independent director is assigned.

Table 2: Covariance analysis-Spearman rank-order

	Q	*R*	*RD*	*AD*	*HR*	*D*	*MB*	*BD*	*ID*
Q	1								
R	0.2034***	1							
RD	0.1491***	-0.0596**	1						
AD	-0.0262	-0.042	***	1					
HR	-0.1947***	-0.0404	0.2625***	0.3858***	1				
D	-0.4640***	-0.0321	-0.2004***	-0.0905***	-0.0503*	1			
MB	0.5721***	0.2640***	-0.0236	- 0.1975***	-0.1608***	-0.1500***	1		
BD	-0.0993***	0.0271	-0.0928***	0.0563*	0.1263***	0.1037***	-0.0190	1	
ID	0.1539***	0.0336	0.0330	-0.0090	-0.0236	-0.1795***	0.1406***	-0.1183***	1

Notes: ***denotes significance at the 1% level; **denotes significance at the 5% level; and *denotes significance at the 10% level.

We apply White test to examine whether the heteroskedasticity exists in the sample or not. The pooled least squares regression method is used to correct the sample if heteroskedasticity exist. Next, we run the random and fixed effects test to determine whether the data belongs to fixed cross-section or random cross-section. Finally, we run the pooled least squares regression model to examine the relationship between dependent and independent variables. Table 3 shows the results of regression analysis for the wholesample. Debt ratio and market to book ratio present great impact on Tobin' Q, which means when firm is worth more than its value based on what it would cost to rebuild it.

Table 3: Regression analysis of whole sample

Independent variables	**Dependent variables**	
	Q whole	***R whole***
RD	-0.5539 (6.51)	-2.4104 (0.59)
AD	1.5645 (1.23)	5.7785 (0.89)
HR	-0.4014 (0.76)	1.5009 (0.55)
D	-0.0799*** (5.88)	0.0307 (0.42)
MB	1.7022*** (19.21)	2.4807*** (4.95)
BD	-0.0104 (0.34)	-0.0475 (0.27)
ID	-0.9270 (1.58)*	0.4310 (0.1453)
Constant	5.3385*** (6.51)	-6.5402* (1.38)
N	1160	1160
R^2	0.77	0.38
F-statistics	63.11	9.58

Notes: R is the quarterly stock return. Q represents Tobin's Q ratio. RD is R&D expenditures divided by sales. AD is advertising intensity and defined as advertising expenditures divided by sales. HR is defined as human resource expenditures divided by sales. D is defined as total debt to total assets. MB is the market-to-book ratio, BD is the holdings ratio of board of director. ID is the dummy variable equals1 if the independent director is assigned. The numbers in brackets are *t*statistics. ***denotes significance at the 1% level; **denotes significance at the 5% level; and *denotes significance at the 10% level.

Multiple regression analysis – classification with stock return: In order to make more profits to keep the firm stay competitive in the industry, borrowing more debt with taking higher risk may incur higher return. From the perspective of assessing stock performance, high growth firms have high returns and profitability. Therefore, the stock return and Tobin's Q are utilized as two different performance variables in the following analysis. Under finer partition, the effects of intellectual capital, capital and ownership structure on performance variables is further investigated . The regression results of top 30%, middle 40% and last 30% sample are presented in Table 4.

Table 4: Comparison of regression results-sample rank according to stock performance

Independent variables	**Dependent variable**					
	Q top 30%	***Q middle 40%***	***Q last 30%***	***R top 30%***	***R middle 40%***	***R last 30%***
RD	14.1273** (1.90)	14.0022*** (2.79)	-0.0961 (0.31)	-9.0096 (0.62)	-17.3876 (1.24)	-5.3855** (2.02)
AD	23.2214*** (4.02)	-10.0965* (1.87)	3.1703* (1.73)	-1.1380 (0.16)	4.3390 (0.32)	15.0030* (1.60)
HR	-34.1293*** (3.24)	-1.7037 (1.24)	-0.5471** (2.31)	-3.8205 (0.25)	0.3666 (0.12)	7.2137*** (3.13)
D	-0.3543*** (6.09)	-0.0859*** (5.61)	-0.0740*** (4.31)	0.2453 (1.60)	-0.1714 (1.15)	-0.0913 (1.28)
MB	2.5420*** (5.47)	1.8158*** (6.31)	1.3146*** (3.45)	5.6166*** (5.54)	3.7748*** (4.48)	3.7097*** (2.58)
BD	-0.0653 (1.26)	0.0487** (1.95)	-0.0639*** (5.18)	0.1596 (0.90)	0.0653 (0.44)	3.7097*** (2.58)
ID	-1.6136* (1.51)	0.5438 (1.39)	-0.9243*** (2.80)	2.4253 (0.77)	-0.1572 (0.05)	0.0566 (0.70)
Constant	16.9825*** (5.02)	1.9820)** (2.14)	5.6275*** (6.33)	-18.8648*** (2.75)	-5.3078 (0.80)	-10.3777*** (2.42)
N	360	440	360	360	440	360
R^2	0.46	0.38	0.26	0.10	0.08	0.07
F-statistics	43.22	37.54	17.96	5.48	5.07	3.94

Notes: Top 30%, defined as Tobin's *Q* ratio of firms whose stock return is ranked in top 30%.*Q middle 40%*, defined as Tobin's *Q* ratio offirms whosestock return is ranked in middle 40% ..*Q last 30%*, defined as Tobin's *Q* ratio of firms whose stock return is ranked in the last 30%.*R top 30%*, defined as the stock return of firms whose stock return is ranked in top 30%.*R middle 40%*, defined as the stock return offirms whose stock return isranked in the middle 40%.*R last 30%*, defined as the stock return of firms whose stock return is ranked in the last30%.Q represents Tobin's Q ratio.RD represents the R&D intensity. AD is the advertising intensity.HR stands for humanresources intensity. D is the debt ratio. Mrepresents market-to-book ratio. MBrepresents market-to-book ratio.BD is the holdings ratio of board of director.ID is the dummy variable that equals to 1 if the independent director is assigned.
The numbersin brackets are *t*statistics. ***denotes significance at the 1% level; **denotes significance at the 5% level; and *denotes significance at the 10% level.

R&D intensity is significantly and positivelyrelated to Tobin's *Q* except for the sample offirms in the rak of last 30% stock return.The advertising intensity is positively and significantly related to Tobin's *Q* in thesample that firms ranked in top 30% and last 30% stock return performance. That is, theincrease in advertising intensity in thesecompanies leads to increase in Tobin's Q. With the firms rankedin top 30% stock returnperformance, theinvestmentin the promotion of their brand ma y lead to higher return. Human resources intensity has significantly and negatively relationship with Tobin's Qexcept in the middle 40% stock return group. The debt ratio in three different portfolios issignificantlyand negatively related to Tobin's Q. Themarket-t o-book ratio shows overwhelmly consistent results with positive relations. The holdings ratio of board of director in firms ranked in the middle and last 30% stock return performance is negatively related to Tobin's Q. The dummy variable of assigned indepedent director is significantly andnegatively related to Tobin's Q in the firms ranked in the top and last 30% stock retur performance. By partion data into finer portfolio, we find firms with extreme Tobin Q are likely to observe larger advertising and smaller human resource intensity. The effects of board director participation is helpful for relatively poor performing companies.

Multiple regression analysis – classification with control type: Table 5 presents regression analysis for different ownership. Different control types may result in divergent strategy about intellectual capital.

Table 5: Comparison of regression results-sample classified according to family ownership

Independent Variables	**Dependent variable**			
	Q family	***Q manager***	***R family***	***R manager***
RD	-0.4285	2.2212*	-1.9225	-4.5535
	(0.17)	(1.6125)	(0.1380)	(1.2455)
AD	30.2499***	1.1932	2.6850	9.0759*
	(3.46)	(0.3570)	(0.3008)	(1.3100)
HR	-2.7200***	-2.9733**	-3.5037	4.9483**
	(2.36)	(2.3022)	(0.9309)	(1.9892)
D	-0.1062***	-0.1673***	-0.1898**	-0.0294
	(4.33)	(7.1250)	(1.8860)	(0.2740)
MB	0.6564***	2.5305***	1.8419***	4.4223***
	(4.54)	(8.0067)	(3.1827)	(6.5261)
BD	-0.0245*	-0.0513***	0.0198	0.0058
	(1.61)	(2.5755)	(0.2194)	(0.0622)
ID	1.3395***	-1.3375**	-1.9126	1.4317
	(3.13)	(2.1143)	(0.7561)	(0.5786)
Constant	4.5104***	7.4291***	2.1815	-11.7988**
	(3.99)	(4.6593)	(0.4364)	(2.2949)
N	500	660	500	660

2	0.38	0.33	0.03	0.08
F-statistics	42.64	45.35	2.51	8.58

*Notes: Q family is the Tobin's Q of family firms. Q manager represents the Tobin's Q of firms of professional managercontrolling type. R family stands for the quarterly stock return of family firms. R manager represents the quarterly stockreturn of firms of professional manager controlling type. RD represents the R&D intensity. AD is the advertising intensity. HR stands for human resources intensity. D is the debt ratio. Mrepresents market-to-book ratio. MBrepresents market-to-book ratio.BD is the holdings ratio of board of director.ID is the dummy variable that equals to 1 if the independent director is assigned. The numbersin brackets are tstatistics. *** denotes significance at the 1% level; ** denotes significance at the 5% level; and * denotes significance at the 10% level.*

Taiwan Economic Journal mainly defines whether thecompanyisoperated and owned by family basedon the family relationshipproclamation in annual report. Firms with the family ownership have to at least meet the following condition. At least twofamilymembers take charge of the board of director or the manager which satisfies the definitionof prospectus or the standard of disclosure of annual report that the manager position ishigher than the executive, andthe family members serve in the companies which areunder the group.The following situations are defined as the firm under family control type. Firstly,theboardchairmanand general manager are taken up by family members.Next,percentage of seat held by controlling director is larger than 50%, and the percentage ofseat held by outside director is less than 33%. Thirdly, the percentage of seat held bycontrolling director is larger than 33%, and at leastthree family members take up board ofdirector and manager. Finally, the percentage of controlling shareholding islargerthancritical control level. Our sample consistsof25 familyfirms and 33 non-family firms.Human resources have affectedTobin's Q in both family firms and manager controlled type firms. Both types of firmslay stress on advertising activity as well.The results are consistent with Zhang et al. (2010). They use data on Chinesefirms'philanthropic response to the 2008 Sichuanearthquake, and find that firm advertisingintensity is positively associated with both the probability and the amount of corporate giving.

Debt ratiois significantly and negatively related to Tobin'sQ ofboth family firms and manager controlled type firms.The holdings ratio of board ofdirector is significantly and negatively related to Tobin's Q in both family firms andmanager controlled type firms.That is, the increase ofholdings ratio of board of director does not simultaneously raise the effectiveness andefficiency of the supervisory function. Instead, the performance variable, Tobin's Q tendsto deteriorate if the holdings ratio of board of director increases in both type offirms. Therelationship between dummyvariable of independent director and Tobin's Q of familyfirms is significantly positive.The assignment of independent director infamily firms strengthens the supervisory effects of corporate governance.

5. Conclusion

In this study we investigate the effects of intellectual capital and corporate governance factors on firm performance. By mainly focusing on current influence of intellectual capital on firmperformance, our results present that that Tobin's Q is an important performance indicator to measure firms'

Intellectual capitals reveals significant connectionin the firms with higher stock return characteristicand with professional manager control. In addition, Tobin's Q is another good option measuring firms' performance next to stock returns. R&D intensity, advertising intensity, and human resources capital intensity tend to be significantly related to Tobin's Q. One important application is the leverage variable does raise red flag for high tech industry with relative heavy R&D cost. Investors should be cautious of capital structure when forming their investment portfolios. That is, the higher the leverage, the worse the firm performance. Manager team needs to recognize that the holdings ratio of board of director and whether there exists independent director do affect firms' performance. Finally, although the influences of ownership structure on firm performance are not consistent in all portfolios, the effects are significant.

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