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Full Length Research Paper

Does corporate governance matter to technical, commercial and economic success?

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This study examines how corporate governance influences the technical, commercial, and economic success of a firm's R&D activity. We use a sample of Taiwanese electronics firms which made investments in R&D in the study period. We find that in the presence of innovation, corporate governance does not equally influence the technical, commercial and economic success of firms' R&D investments. We affirm that higher levels of corporate governance are positively associated with technical success, but in the presence of technical success innovative activity, higher levels of corporate governance do not impact sales growth that represents commercial success. Overall, our study demonstrates that corporate governance essentially plays a contributory role in enhancing the value for an innovative firm.

Key words: Commercial success, corporate governance, economic success, technical success.

INTRODUCTION

This study is motivated by Mansfield (1981) who noted the importance of research into factors that could potentially make research and development (R&D) activity successful. Mansfield noted that an R&D project's likelihood of economic success is the product of three separate factors: (1) the probability of technical success, (2) the probability of commercialization (given technical success), and (3) the probability of economic success (given commercial success). The purpose of this study is to examine how levels of corporate governance could potentially influence the overall technical, commercial and economic success of a firm's R&D investments.

Many studies have examined the influence of corporate governance on a number of issues critical to the success of a firm. In particular studies have examined the influence and impact of corporate governance on reported earnings management behavior of firms (Duh, Lee and Lin, 2009; Peasnell et al., 2005; Klein, 2002; Agrawal and Knoeber, 1999; Beasley, 1996) on firm value and financial performance (Lins, 2003; Yeh, Lee and Woidtke, 2001; Core, Haulthausen and Larcker, 1999) and on the innovative efforts of companies (Jermias, 2007). In general these studies find that higher corporate governance has a dampening effect on earnings management behavior and a positive impact on firm value and financial performance. In the third stream of research noted above, Jermias (2007) finds that the outcomes of innovative activity are affected by corporate governance as surrogated by level of firms' internal controls and board independence. This study contributes to the extant literature in corporate governance. The results indicate that, in the presence of innovation, corporate governance does not equally influence the technical (as measured by the number of patents received), commercial (as measured by sales growth) and economic (as measured by market valuation of corporate innovation) success of firms' R&D investments.

Prior literature and hypothesis development

Previous studies examining the association between the quality of corporate governance and firms' investment

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decisions and subsequent financial performance yielded mixed results (Gompers et al., 2003; Cremers and Nair, 2005; Coles et al., 2001). In general, there is a high level of uncertainty characterizing innovative activities. Further there is asymmetric information between shareholders and managers. How does corporate governance factor in here? Corporate governance reduces agency problems and aligns the interests of managers and shareholders. Hence we theorize that it should be particularly relevant to contributing to overall success of innovative activities which otherwise could be encumbered by suboptimal behavior on the part of managers. Jensen (1993) argued that poor internal control is the reason for firms' innovative activities not increasing their overall values, where internal control is a component of corporate governance. Absent strong controls, in whatever form, managers, according to Jensen, can make suboptimal investment decisions in order to maximize their own utility at shareholders' expense. Furthermore, Mansfield (1981) indicated that an R&D project's likelihood of economic success is the product of the probability of technical success, the probability of commercialization (given technical success), and the probability of economic success (given commercialization success). Following Mansfield's reasoning about an R&D project's likelihood of economic success, we propose that firms with stronger corporate governance succeed more on their innovations than firms with weaker corporate governance. Hypothesis 1 is stated as follows:

H_1: Firms' technical, commercial and economic success arising from R&D activity will be greater in the presence of higher levels of corporate governance.

METHODOLOGY

Sample selection

All electronics firms listed on the Taiwan Stock Exchange or Taiwan's Over-the-Counter Market with R&D investments every year from 2001 to 2007 are identified to be initial sample for the current study. Chin, Lee, Wang and Kleinman (2007) note that the R&D expenditure is regarded as innovation input while the number of patents is regarded as an innovation outcome. Pegels and Thirumuthy (1996) propose that patents are useful to assess the technological competitiveness of a firm's new products and processes. They indicate that patents are a good indicator of advances in technical knowledge, and their empirical results support the notion that patent counts contribute significantly to improved firm's performance. As suggested by Chin et al. (2007), because the investments in R&D do not always result in immediate product innovation, we took those electronics firms making consecutive R&D investments into our technical success sample. By following this sense, 2,892 firm-year observations were identified for the technical success analyses from 2003 to 2007. Next, as noted by Mansfield (1981), commercial success is mediated by technical success. We required those technically successful firm-year observations with patents granted in support of their commercial success. One thousand three hundred and eighty-three out of 2,892 firm-year observations were then identified for the commercial success analyses. Finally, economic success is expected to be more pronounced after successful patents commercialization. Since 1,064 out of 1,383 firm-year observations from commercial success sample having positive sales growth, they were classified as economic successful firms.

Definition of the dependent and independent variables

Dependent variables

Our overall dependent variable will be a proxy of technical, commercial or economic success. Technical, commercial or economic success, however, is difficult to be measured. Mansfield (1981) has noted that overall success of innovative activity is contingent on what he describes as three mediating measures. These mediating measures are that a firm must enjoy economic success which is contingent on commercial success which in turn is contingent on technical success. Further details are elaborated as follows:

1. Dependent variable measuring technical success: This dependent variable in our study measures the ability of a firm to convert investments in R&D into successful products. We use patent counts as our proxy of innovative successful products, because they have long been used as an indicator of a firm's technological capability (e.g., Pegels and Thirumuthy 1996; Chin, et al. 2007). In particular, we use the natural logarithm of number of patents received (PAT) to avoid skewness. Furthermore, a growing number of studies argue that the more patents a firm possesses, the more intensive the firm's innovative activities are (Acs, Anselin and Varga 2002; Frame and Narin 1990; Patel and Pavitt 1987).
2. Dependent variable measuring commercial success: Firms invest in innovative activities to develop new products and utilize new processes. When innovative products or processes create barriers to entry for rivals or attract new customers, firms will enjoy a quasi-monopoly which enables them to command premium prices and generate long-term profitability (Barney 1991; Golder and Tellis 1993 and Calantone et al., 2002). As suggested by *Jermias* (*2007), we* use sales growth ratio (SG), which is a percentage change in net sales from year t-1 to t as a measure of commercial success.
3. Dependent variable measuring economic success: We use Tobin's Q, calculated by using book value of total debts plus market value of equity minus the book value of equity as the numerator and book value of total assets as the denominator, to be as a measure of economic success. Prior research (e.g. Megna et al. 1993; Chin et al. 2006) explains that Tobin's Q can be used to measure the market value of innovation.

Independent variables

The primary independent variable in the test of technical success is related to the R&D expenditures (RD) invested over the period from the current year to two years before. Then, a three-year average of R&D expenditure is obtained and followed by taking the natural logarithm transformation. As indicated by Mansfield (1981), commercial success is mediated by technical success. To establish a model for commercial success, the natural logarithm of average number of patents granted over the current year and the prior two years (APAT) is the primary independent variable to surrogate for technical success. Since economic success is mediated by commercialization success, to set up a model for economic success, we surrogate patent productivity for commercialization success.

We measure patent productivity as sales growth ratio divided by the APAT, and denote it as SGP. The following independent variables are included as control variables:

1. Corporate governance: We use a surrogate variable that is a

composite measure for a multitude of corporate governance mechanisms. Larcker, Richardson and Tuna (2007) argue that there is no well-developed theory for selecting the relevant governance characteristics that can be viewed as all encompassing. As suggested by Duh, Lee and Lin (2009) we used six variables to capture corporate governance. These variables include board size (Agrawal and Knoeber 1999; Beasley 1996); number of independent directors (Peasnell et al. 2005; Klein 2002); number of independent supervisors (Cho and Rui 2007); number of institutional investors (Koh 2003; Bushee 1998); number of foreign institutional investors (Haat, Rahman and Mahenthiran 2008); and the difference between control rights and cash flow rights (Claessens, Djankov and Lang 2000). These variables are measured as follows:

(i) Board size (B_SIZE), measured as the total number of directors on the board;
(ii)Independent directors (IND_D), an indicator variable which equals one if none of the directors is an insider of the company and holds more than one percent of the firm's stock;
(iii) Independent supervisors (IND_S), an indicator variable which equals one if none of the supervisors is an insider of the company and holds more than one percent of stock;
(iv) Institutional investors' shareholding (%INST);
(v) Foreign institutional investors' shareholding (%FORE), and
(vi) The difference between control rights and cash flow rights (V−C), computed as the percentage of voting rights minus the percentage of cash flow rights.

Higher values for B_SIZE, IND_D and IND_S, %INST, %FORE, and lower values for V−C represent more effective corporate-governance mechanisms. Following Bushman et al. (2004), we first sort B_SIZE, %INST, and %FORE in ascending order and V−C in descending order before computing percentile values so that each variable can be transformed into a 0-1 scale. We then compute a corporate governance composite variable (CG) by adding up the percentile values of B_SIZE, %INST, %FORE, and V−C plus IND_D and IND_S to capture the strength of corporate governance. Hence, a bigger value of CG means more effective corporate-governance mechanisms. We use a dummy variable DUCG measuring 1 if a firm's corporate governance composite score is greater than the sample median and 0 otherwise.
2. Size: Size is an important control variable since it can proxy for many effects. Larger firms may apply for a greater number of patents. Hence, this variable has to be controlled for. We measure size as the natural logarithm of total assets.
3. Debt: Prior research indicates firms' R and D investment decisions are made based on capital structure (Refer Titman and Wessel 1988, Billing and Fried 1999 among others). We measure debt as the proportion of total debt to the total assets of a firm.
4. Efficiency of operating assets: We use return on assets (ROA) as a proxy of efficiency of operating assets. This is measured as the ratio of income before interest and taxes to total assets.
5. Advertising expenditures: We use natural logarithm of advertising expenditures to measure the impact of advertising.
The variable definitions are provided in Table 1. Descriptive statistics are provided in Table 2.

RESULTS AND DISCUSSION

Test of technical success

Electronics firms making at least consecutive three-year R&D investments were regarded as our technical success sample for testing if technical success arising from R&D activity will be greater in the presence of higher levels of corporate governance. We develop three regression models to test this proposition. The dependent variable namely, natural logarithm of number of patents received as a measure of innovative activity, that is. PAT, is the same across all models. In model 1, as shown below, debt (leverage) and firm size as control variable are included. Also included are year dummy variables.

$$PAT_{i,t} = \beta_0 + \beta_1 DEBT_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 RD_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (1)$$

In model 2, corporate governance is taken into account. While in model 3, an interaction term of corporate governance with R&D investments (RD) is included. In this study, corporate governance is represented by a dummy variable representing 1 if corporate governance composite score is higher than the median score and 0 otherwise. The model 2 and 3 are presented below:

$$PAT_{i,t} = \beta_0 + \beta_1 DEBT_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 RD_{i,t} + \beta_4 DUCG_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (2)$$

$$PAT_{i,t} = \beta_0 + \beta_1 DEBT_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 RD_{i,t} + \beta_4 DUCG_{i,t} + \beta_5 RD_{i,t} \times DUCG_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (3)$$

Here in model 3, $\beta_5 > 0$ represents that firms' technical success arising from R&D investment will be greater in the presence of higher levels of corporate governance after controlling other predictors. Results of these models are presented in Table 3.

The results of model 1 are shown in the first panel of Table 3. Here the coefficients of size are significant at the one percent level. The coefficient of R&D investments (β_3) is significant at the one percent level indicating that investment in R&D projects is positively associated with technical success as measured by number of patents, given other predictors being fixed. In model 2, the coefficient of corporate governance (β_4) is positive and significant at the one percent level. This indicates that better corporate governance is associated with higher granted patents, given other predictors being held constant. In model 3, the coefficient of interaction term between R&D investments and corporate governance (β_5) is positive and significant at the one percent level. This indicates that, for the firms in our sample, firms' technical success arising from R&D investment will be greater in the presence of higher levels of corporate governance, when all other predictors are held constant. This finding supports Hypothesis 1.

Test of commercial success

Among the observations constituting the technical

Table 1. Variable definition.

Symbol	Variable	Measure
PAT	Number of patents received	Natural logarithm of number of patents received
RD	R&D expenditures	Natural logarithm of average R&D expenditures (in thousand NT dollars) over current year and the prior two years.
DEBT	Leverage	The ratio of total debts to total assets.
SIZE	Size	Natural logarithm of total assets
DUCG	A dummy variable of corporate-governance quality	DUCG = 1 if a firm's corporate-governance composite score (CG) is greater than the sample median, and 0 otherwise.
SG	Sales growth ratio	The percentage change in net sales from year t-1 to t.
APAT	Average number of patents received	Natural logarithm of average number of patents received over the current year and the prior two years
ROA	Return on assets	Ratio of income before interests and taxes to total assets
AE	Advertising expenditures	Natural logarithm of advertising expenditures
TQ	Tobin's Q measures the market valuation of corporate innovation	Tobin's Q is calculated by using book value of total debts plus market value of equity minus the book value of equity as the numerator and book value of total assets as the denominator
SGP	SGP measures the patent productivity	Sales growth ratio divided by the natural logarithm of average number of patents that the firm received in the current year and the prior two years
$Year_y$, y=2004,…,2007	Year dummies	Year 2004 to 2007 are included in the regression models

success sample, only those receiving patents were included in the sample for testing if commercial success arising from patenting activity will be greater in the presence of higher levels of corporate governance. We also develop three regression models to test this proposition. In model 4, as shown below, we include natural logarithm of average number of patents received over the current year and the prior two years (APAT) and two other control variables that could account for sales growth, namely, a performance ratio, return on assets (ROA) and level of advertising expenditure (AE) and year dummy variables. The dependent variable, namely the sales growth ratio (SG), is the same across three regression models. Model 4 is presented as:

$$SG_{i,t} = \beta_0+\beta_1 ROA_{i,t} +\beta_2 AE_{i,t} +\beta_3 APAT_{i,t} +\sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (4)$$

Moreover, corporate governance in terms of DUCG is incorporated into model 5 and an interaction of corporate governance (in terms of DUCG) and average patents granted (in terms of APAT) is added into model 6. The model 5 and 6 are shown as:

$$SG_{i,t} = \beta_0+\beta_1 ROA_{i,t} +\beta_2 AE_{i,t} +\beta_3 APAT_{i,t} +\beta_4 DUCG_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (5)$$

$$SG_{i,t} = \beta_0+\beta_1 ROA_{i,t} +\beta_2 AE_{i,t} +\beta_3 APAT_{i,t} +\beta_4 DUCG_{i,t} + \beta_5 APAT_{i,t} \times DUCG_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (6)$$

In model 6, if β_5 is significantly greater than 0, firms' commercial success arising from given successful technical innovation will be greater in the presence of higher levels of corporate governance. The results are shown in Table 4.

The results of model 4 are shown in the first panel of Table 4. The coefficient of APAT variable is significant indicating that overall, increased technical success in converting R&D investment to patents granted results in increased sales growth after controlling for the performance of utilizing assets, investment in advertising, and year effect. The results of model 5 show that the coefficient of average granted patents (β_3) is positive and significant at the one percent level, but the coefficient of corporate governance (β_4) is not significant. Moreover, the results of model 6 report that the coefficient of interaction term of average granted patents with corporate governance (β_5) is not significant either. These results indicate that higher levels of corporate governance do not significantly influence firm's commercial success in converting invention into growing revenues

Table 2. Descriptive statistics.

Variable	Mean	Std Dev.	Min.	Median	Max.
			Panel A: Technical Success n=2,892		
PAT	0.995	1.404	0.000	0.000	7.273
RD	17.959	1.556	9.616	17.865	23.490
DEBT	42.514	17.360	2.260	43.330	162.640
SIZE	21.744	1.348	18.623	21.535	27.155
CG	3.059	1.190	0.080	3.210	5.580
			Panel B: Commercial Success n=1,383		
SG (%)	14.343	22.341	-55.270	12.657	170.713
APAT	2.231	1.289	0.693	1.946	7.927
ROA (%)	8.352	11.252	-93.340	8.620	50.230
AE	12.307	1.508	8.478	12.084	17.304
CG	3.265	1.128	0.150	3.410	5.580
			Panel C: Economic Success n=1,064		
TQ	1.747	1.032	0.641	1.428	11.527
SGP	14.191	16.996	0.023	8.757	174.436
ROA (%)	10.387	9.491	-31.870	9.810	50.230
DEBT	41.597	15.502	4.580	42.940	80.720
CG	3.308	1.137	0.150	3.455	5.580

Table 3. A regression analysis of technical success based on the number of patents received as the dependent variable.

	Model 1		Model 2		Model 3	
	Std. Coef.	**t-value**	**Std. Coef.**	**t-value**	**Std. Coef.**	**t-value**
Intercept	-13.564	-46.431***	-14.472	-48.464***	-14.562	-49.025***
DEBT	0.014	1.028	-0.022	-1.479	-0.017	-1.136
SIZE	0.331	17.368***	0.742	17.759***	0.748	17.396***
RD	0.469	24.766***	0.204	24.463***	0.147	25.210***
DUCG			0.072	5.120***	0.013	0.746
RD×DUCG					0.116	5.835***
YEAR2004	-0.005	-0.294	-0.009	-0.472	-0.008	-0.463
YEAR2005	0.034	1.931*	0.021	1.166	0.021	1.189
YEAR2006	-0.006	-0.333	-0.014	-0.777	-0.015	-0.855
YEAR2007	-0.036	-2.052**	-0.040	-2.202**	-0.040	-2.195**
AdjR2	0.542		0.545		0.548	
F value	436.126		414.765		373.372	

***, ** and * denote significance at <1, <5 and <10% levels, respectively.
For Variable definitions see Table 1.

probably, after controlling for other predictors. The findings imply that corporate governance seemingly has no direct impact on patenting commercialization.

Test of economic success

Among the observations contained in the commercial success sample, those with positive sales growth were including in the sample for testing if economic success arising from innovative activity will be greater in the presence of higher levels of corporate governance. We also develop three regression models to test this proposition. In model 7, 8 and 9, in addition to positive sales growth due to patenting activities (surrogate for commercial success), we include an asset operational efficiency ratio (return on assets) and leverage as independent variables. The dependent variable for three regression models

Table 4. A regression analysis of commercial success based on sales growth as the dependent variable.

	Model 4		Model 5		Model 6	
	Std. Coef.	**t-value**	**Std. Coef.**	**t-value**	**Std. Coef.**	**t-value**
Intercept	17.736	3.979***	13.449	3.214***	11.709	2.746***
ROA	0.427	17.685***	0.440	18.254***	0.440	18.279***
AE	-0.042	-1.394	-0.013	-0.429	-0.012	-0.418
APAT	0.087	2.924***	0.089	2.976***	0.140	3.607***
DUCG			-0.026	-1.053	0.060	1.239
APAT×DUCG					0.110	1.057
YEAR2004	-0.035	-1.124	-0.026	-0.814	-0.028	-0.887
YEAR2005	-0.107	-3.337***	-0.116	-3.567***	-0.115	-3.556***
YEAR2006	-0.247	-7.761***	-0.255	-7.923***	-0.255	-7.907***
YEAR2007	-0.324	-10.109***	-0.352	-10.913***	-0.349	-10.843***
AdjR2	0.265		0.271		0.293	
F value	66.326		64.323		57.797	

***, ** and * denote significance at <1, <5 and <10% levels, respectively.
For Variable definitions see Table 1.

Table 5. A regression analysis of economic success based on Tobin's Q as the dependent variable.

	Model 7		Model 8		Model 9	
	Std. Coef.	**t-value**	**Std. Coef.**	**t-value**	**Std. Coef.**	**t-value**
Intercept	1.348	23.004***	1.317	21.207***	1.361	20.861***
ROA	0.640	25.559***	0.629	24.895***	0.629	24.905***
DEBT	-0.176	-7.166***	-0.174	-7.028***	-0.177	-7.144***
SGP	0.059	2.586**	0.083	3.616***	0.011	0.273
DUCG			0.038	1.670*	-0.007	-0.218
SGP×DUCG					0.098	3.162***
YEAR2004	-0.027	-0.944	-0.017	-0.572	-0.017	-0.573
YEAR2005	0.109	3.738***	0.112	3.781***	0.111	3.768***
YEAR2006	-0.041	-1.436	-0.041	-1.417	-0.040	-1.386
YEAR2007	-0.139	-4.813***	-0.124	-4.255***	-0.125	-4.312***
AdjR2	0.543		0.545		0.546	
F value	157.786		137.164		122.927	

***, ** and * denote significance at <1, <5 and <10% levels, respectively.
Variable definitions see Table 1.

is Tobin's Q. The model 7 is presented as:

$$TQ_{i,t} = \beta_0+\beta_1 ROA_{i,t} +\beta_2 DEBT_{i,t} +\beta_3 SGP_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (7)$$

Moreover, corporate governance in terms of DUCG is incorporated into model 8 and an interaction of corporate governance (in terms of DUCG) and sales growth deflated by granted patents (in terms of SGP) is added into model 9. Model 8 and 9 are shown as follows:

$$TQ_{i,t} = \beta_0+\beta_1 ROA_{i,t} +\beta_2 DEBT_{i,t} +\beta_3 SGP_{i,t} +\beta_4 DUCG_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (8)$$

$$TQ_{i,t} = \beta_0+\beta_1 ROA_{i,t} +\beta_2 DEBT_{i,t} +\beta_3 SGP_{i,t} +\beta_4 DUCG_{i,t} + \beta_5 SGP_{i,t} \times DUCG_{i,t} + \sum_{y=2004}^{2007} \theta_y YEAR_y + \varepsilon_{i,t} \quad (9)$$

In model 9, if β_5 is significantly greater than 0, firms' economic success arising from given commercial success of innovative activity will be greater in the presence of higher levels of corporate governance. The results are shown in Table 5.

In model 7, coefficient of sales growth deflated by granted patents (SGP) is positive and significant indicating that sales growth of patent granted firms significantly influences a firm's value as measured by Tobin's Q, given other predictors being fixed. In model 8, the coefficient of sales growth deflated by granted patents (SGP) variable is positive and significant at one percent level, but the coefficient of corporate governance (DUCG) variable is positive and significant at ten percent level, given other predictors being held constant. In model 9, the coefficients of both SGP and DUCG variable are insignificant, but the coefficient of an interaction term of sales growth deflated by granted patents with corporate governance (β_5) is positive and significant. These results show that higher corporate governance with higher commercial success of innovation has a positive impact on the probability of firms' economic success, after controlling for other predictors.

Conclusion

Mansfield (1981) indicated that a firm must experience and be successful in three stages to ensure the success of innovation. First, the firm must be technically successful. Second, given technical success, the firm must be commercially successful. Third, given commercial success, the firm must be economically successful. In this study we focus on how the level of corporate governance affects technical, commercialization and economic success of a firm. In this study technical success depends on the number of patents received, commercialization success relies on sales growth and economic success is valued by Tobin's Q. The current study demonstrates that the level of investment in R&D does contribute to technical success as measured by the number of patents received. In other words, while much research has been conducted on the importance, influence and implications of corporate governance, we affirm that higher levels of corporate governance are positively associated with technical success, even after controlling other predictors in the model.

Mansfield (1981) noted that, to be completely "successful" a firm must be able to convert technical success into commercial success. We find that, in the presence of technical success innovative activity, higher levels of corporate governance do not impact sales growth that represents commercial success.

This result implies higher levels of corporate governance do not significantly influence firm's commercial success.

Mansfield noted that the final stage of importance is the ability to convert commercial success to economic success. While technical success sends a signal of innovative ability, commercial success conveys a signal that innovative skills is being translated to sales. Economic success is concerned with, "has the technical and commercial success been recognized by investors?" If so, this should be incorporated in the market's valuation of the firm. Our findings indicate that economic success is recognized by the market and does enhance firm value. Our findings support that higher corporate governance is associated with enhancing technical and economic success of a firm. This echoes "insider economics" a term developed by Leuz, Nanda and Wysocki (2003). By insider economics they meant that firms must place an important role in internal factors such as setting high standards of corporate governance.

Earlier the theoretical paradigm was that corporate governance curtailed earnings management behavior and fraud. Our study demonstrates corporate governance essentially plays a contributory role in enhancing the value for an innovative firm. Our finding has important implications for nations around the globe since as globalization continues, the need to intensify investment in new products and ideas become of paramount importance. Finally, innovation has increasingly played an important role in enhancing industrial technology levels and has also emerged as the key to national competitiveness in the knowledge economy. We note that the innovation activities in Taiwan are similar to that of industrialized nations. Hence, our findings are not merely limited to Taiwan, but have external validity in that they can be generalized to other countries as well.

REFERENCES

Acs ZJ, Anselin L, Varga A (2002). Patents and innovation counts as measures of regional production of new knowledge. Res. Pol., 31(7): 1069-1085.

Agrawal A, Knoeber C (1999). Outside directors, politics, and firm performance. Working Paper. North Carolina State University.

Barney JB (1991). Firm resources and sustained competitive advantage. J. Manage., 17(1): 99–120.

Beasley M (1996). An empirical analysis of the relation between the board of director composition and finan. statement fraud. Account. Rev., 71(2): 443-465.

Billings AB, Fried Y (1999). The effects of taxes on organizational variables on research and development intensity. RD Manag., 29(3): 289-301.

Bushee BJ (1998). The influence of institutional investors on myopic R and D investment behavior. Account. Rev., 73(3): 305-333.

Bushman R, Chen Q, Engel E, Smith A (2004). Financial accounting information, organizational complexity and corporate governance systems. J. Account. Econ., 37(2): 167-201.

Calantone RJ, Cavusgil ST, Zhao Y (2002). Learning orientation, firm innovation capability, and firm performance. Ind. Mark. Manag., 31(6): 515–524.

Claessens S, Djankov S, Lang L (2000). The separation of ownership and control in East Asian Corporations. J. Finan. Econ. ,58(1-2): 81-112.

Chin C, Lee P, Chi H, Asokan A (2006). Patent citation, R and D spillover, and Tobin's Q: evidence from Taiwan semiconductor industry. Rev. Quant. Finan. Account., 26(1): p67-84.

Chin C, Lee P, Wang P, Kleinman G (2007). Does Innovation Matter to Conference Calls? IEEE Trans. Eng. Manag., 54(4): 699-715.

Cho S, Rui OM (2007). Exploring the effects of China's two-tier board system on firm performance and earnings informativeness. Working paper. Social Science Research Network.

Coles JW, McWilliams VB, Sen N (2001). An examination of the relationship of governance mechanisms to performance. J. Manag., 27(1): 23-50.

Core JE, Holthausen RW, Larcker DF (1999). Corporate governance, chief executive officer compensation and firm performance. J. Finan. Econ., 51(3): 371-406.

Cremers M, Nair V (2005). Governance mechanisms and equity prices. J. Finan., 60(6): 2859-2894.

Duh R, Lee W, Lin C (2009). Reversing an impairment loss and

earnings management: The role of corporate governance. Int. J. Account., 44(2): 113-117.
Frame D, Narin F (1990). The United States, Japan and the changing technological balance. Res. Pol., 19(5): 447-455.
Golder PN, Tellis GJ (1993). Pioneer advantage: Marketing logic or marketing legend?. J. Mark. Res., 30(2): 158–170.
Gompers PA, Ishii JL, Metrick A (2003). Corporate governance and equity prices. Quart. J. Econ., 118(1): 107-155.
Haat M, Rahman R, Mahenthiran S (2008). Corporate governance, transparency and performance of Malaysian companies. Manag. Audit. J., 23(8): 744-778.
Jensen MC (1993). The modern industrial revolution, exit, and the failure of internal control systems. J. Finan., 48(3): 831-880.
Jermias J (2007). The effects of corporate governance on the relationship between innovative efforts and performance. Eur. Account. Rev., 16(4): 827-854.
Koh PS (2003). On the association between institutional ownership and aggressive corporate earnings management in Australia. Br. Account. Rev., 35(2): 105-128.
Klein A (2002). Audit committee, board of director characteristics, and earnings management. J. Account. Econ., 33(3): 375-400.
Larcker DF, Richardson SA, Tuna I (2007). Corporate governance, accounting outcomes and organizational performance. Account. Rev., 82(1): 963-1008.
Leuz C, Nanda D, Wysocki P (2003). Earnings manage and institutional protection: An int. comparison. J. Finan. Econ., 69(3): 505-527.
Lins KV (2003). Equity ownership and firm value in emerging markets. J. Finan. Quant. Anal., 38(1): 159-184.
Mansfield E (1981). How economists see R and D. Harv. Bus. Rev., Nov/Dec: pp. 98-106.
Megna, Pamela, Klock M (1993), The impact of intangible capital on Tobin's Q in the semiconductor industry. Am. Econ. Rev., 83 (2): 265-269.
Patel P, Pavitt K (1987). Is Western Europe losing the technological race? Res. Pol., 16(2-4): 59-85.
Peasnell KV, Pope P, Young S (2005). Board monitoring and earnings management: Do outside directors influence abnormal accruals? J. Bus. Finan. Account., 32(7-8): 1311-1346.
Pegels CC, Thirumurthy MV (1996). The impact of technology strategy on firm performance. IEEE Transact. Eng. Manag., 43(3): 246–249.
Titman S, Wessels R (1988). The Determinants of Capital Structure Choice. J. Finan., 43(1): 1-19.
Yeh Y, Lee TS, Woidtke T (2001). Family control and corporate governance: Evidence from Taiwan. Int. Rev. Finan., 2(1-2): 21-48.