

Empirical Analyses on the Financial Profile of Korean Chaebols in Corporate Research & Development Intensity

Hanjoon Kim

Division of Business Administration, Hoseo University

국내 자본시장에서의 재벌 계열사들의 연구개발비 비중에 대한 재무적 실증분석

김한준

호서대학교 사회과학대학 경영학부

Abstract This study examines one of the conventional and controversial issues in modern finance. Specifically, this study identifies financial determinants of corporate R&D intensity for firms belonging to Korean Chaebols. Empirical estimation procedures are applied to derive more robust results of each hypothesis test. Static panel data, Tobit regression and stepwise regression models are employed to obtain significant financial factors of R&D expenditures, while logit, probit and complementary log-log regression models are used to detect financial differences between Chaebol firms and their counterparts not classified as Chaebols. Study results found the level of R&D intensity in the prior fiscal year, market-value based leverage ratio and firm size empirically showed their significance to account for corporate R&D intensity in the first hypothesis test, whereas the majority of explanatory variables had important power on a relative basis. Assuming that the current circumstances in the domestic capital market may necessitate gradual changes of Korean Chaebols in terms of their socio-economic function, the results of this study are expected to contribute to identifying financial antecedents that can be beneficial to attain optimal level of corporate R&D expenditures for Chaebol firms on a virtuous cycle.

요 약 본 연구는 현대 재무관리 이론 상 전형적인 주제로서 현재까지도 지속적인 논의의 대상이 되는 국내 재벌그룹 소속 계열사들의 연구개발비 비중에 대한 재무적 결정요인들에 대한 분석이다. 실증 연구를 통한 분석 결과의 강건성 제고를 위하여 본 연구에서는 다양한 실증적 모형들이 응용되었다. 절대적 추정방법으로서 정적인 패널자료 모형, 토빗 모형 그리고 단계적 회귀 모형 등이 활용되었고, 상대적인 추정방법으로서 로짓, 프로빗 그리고 보완적 로그-로그 모형 등이 재벌소속 계열사와 그에 대한 상대 표본인 비재벌소속 계열사들의 재무적 결정요인의 차별성 규명을 위하여 응용되었다. 실증 분석 결과와 관련, 전년도 연구개발비 비중, 시장가치 기준의 부채비율 그리고 기업규모 등이 첫 번째 가설에서 표본기업들의 연구개발비 비중에 대하여 통계적으로 유의한 재무적 결정요인으로서 판명되었으며, 후자의 상대적 추정모형 분석에서는 총 11개의 설명변수들 중, 대다수의 변수들이 통계적으로 유의한 것으로 검정되었다. 최근 국내 자본시장에서 요구하는 재벌기업들의 사회-경제적 기능면에서의 점진적 변화 가능성을 전제하여, 본 연구 결과는 재벌소속 계열사들의 적정 연구개발비 수준을 결정하기 위한 선행요인들의 재무적 분석에 기여할 수 있다고 판단된다.

Keywords : Chaebol Firms, Financial Determinants, Logit Model, Panel Data Model, Research & Development

*Corresponding Author: Hanjoon Kim(Hoseo Univ.)

Tel: Tel:+82-41-560-8369 email: khj723@hoseo.edu

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1. Introduction

The study conducts academic research in association with analyses of “corporate research and development” (hereafter, R&D) activities for firms with headquarters in the Korean capital market. Firms in the domestic market recently seems to make larger R&D investments in their corporate operating activities. It was officially announced by Ministry of Science and ITC (Information, Communication and Technology) of the Korean government that the total amount of R&D spending was reached to KRW69.4055 trillion (US\$ 59.8billion) in 2016, which was the top 5th rank among the OECD (Organization for Cooperation and Development) member countries. [1] Interestingly, the ratio of R&D expenditures scaled by national GDP (Growth Domestic Product) was recorded as 4.24%, which ranked the 2nd position on a global basis.

Even if there have been relatively voluminous researches conducted on the subject of corporate R&D expenditures on a global or domestic viewpoint, the study may be differentiated with previous studies in the following primary aspects: First, Korean firms classified into a “large enterprise group”, called as “Chaebol” in the domestic capital markets are investigated in terms of the financial issue of R&D expenditures and then relevant financial characteristics are compared with their counterparts that are not classified into Chaebols on a relative basis. Little attention seems to be paid to the financial analyses of R&D expenses for “firms belonging to the Korean Chaebols” (hereafter, Chaebol firms), so far, even if the level of R&D activities of Chaebol firms seems to be gradually extended on a global perspective. For instance, it was reported that Samsung Electronics, Co. as one of the subsidiaries of Samsung Group in Korea, ranked 1st in the amounts of R&D expenditures in 2017, which was followed by Intel Co. and Apple Co. in the U.S. ranked top 6th and 7th in the world, respectively, as presented in [2]. In terms of the concept of a “conglomerate” entity in the U.S. capital market, it is overall organized by similar levels of

investments made by a parent firm in the entity on her subsidiaries which belong to each different industry.[17] In contrast, formation of Korean Chaebol groups are historically involved in the domestic government policy with subsidy, which may have focused on only a few firms in each corresponding industry in the anticipation of boosting economic conditions in a speedy manner.

Second, the present study is an extension of the preceding one, [3], which examined financial disparities between firms with headquarters in the U.S. and their counterparts in Korea as an inter-country analysis. In other words, when compared to those of several preceding studies in terms of the analogous subjects such as [3] and [4] that is for firms listed on the KOSPI stock market, the present study is conducted to empirically detect financial differences between Chaebol firms and their counterparts in the domestic capital markets on R&D expenses.

Finally, given the recent demand on possible transitional changes in the role of Korean Chaebol firms from a domestic socio-economic perspective, it seem to be important in time to conduct more researches on the financial subjects of the firms inclusive of R&D expenditures. As notice, their role has been traditionally regarded to have ambivalent aspects in the development of the domestic economy since the 1960s. Recently, more weight seems to be given to one of the aspects in association with fair distribution of wealth accumulated in the national level, which has been brought about by Chaebol firms in large part. Therefore, it will be worthwhile to identify financial factors to determine R&D intensity only for Chaebol firms in the study, which is different from the preceding studies employing other sets of sample data. Corporate restructuring process seems to have been reformulated or reset after going through the unstable financial conditions in relation to the global financial turmoil occurred in 2008. Therefore, a specific time frame between the year 2010 and 2015 is used for the study to test for two relevant hypotheses below.

Moreover, empirical estimations to test for the hypothetical topics are performed on both absolute and relative bases as described later.

2. Previous Literature

This section reviews the previous literature on the subject of corporate R&D spending in the international or domestic context in a chronological order. A majority of the studies reviewed in the section were also presented in the preceding studies such as [3] and [4].

The study of [5] empirically tested benefit or cost of a firm's R&D investments in relation to stock price by utilizing the U.S. sample data during the period from 1979 to 1985. In the study, systematic and statistically significant factors which may affect a change of share price were examined, based on the type of R&D expenses. Empirical procedure of "event-study" was also methodologically applied and the results showed that announcements on the increase of R&D expenditures are, overall, evaluated as positive information to increase a firm's market capitalization. The study conducted by [6] tested the hypotheses that corporate earnings may be adjusted (or manipulated) by incumbent management in the short-run if projected earnings appears to be deviated from its original target level. They tested a hypothesis that changes in R&D expenses are statistically related to those in corporate earnings, assuming that management adjusts R&D costs to attain its original goal for earnings. The study provided evidence that there was an linear relationship between a firm's unexpected R&D costs and corporate earnings. On the other hand, [7] examined a relationship between stock return and corporate R&D outlay. The sample data were selected from 1975 to 1995, which consisted of all U.S. firms across those listed on NYSE, AMEX, and NASDAQ. Both measures for corporate R&D intensity such as the ratio of R&D expenditures over sales and over market value of equity, were separately tested to find a relationship between a degree of market valuation and R&D

investments. For instance, when using the former ratio, there was no statistically significant difference between the firms with and without making R&D investments in terms of market reaction.

In the meantime, market reaction in relation to both long-term stock rate of return and operating performance were tested after the announcement of corporate R&D activities.[8] On the results of the test to examine a statistically significant abnormal rate of return for the sample groups, the alphas for abnormal return in the estimated models revealed their importance across models across the sample groups. Moreover, on the test results of each subsample groups such as high-tech, low-tech, high-growth, and low-growth firms, there were overall statistically significant abnormal rates of returns across all defined sub-samples, based on the equally weighted method. [9] also tested an interesting issue on corporate R&D outlay, which was classified by two type of firms such as high-tech and low-tech types. It was hypothesized that U.S. investors favorably respond to positive prospects of a high-tech firm's R&D expenditures in relation to stock returns before it announces a SEO (Seasoned Equity Offerings) issue. On the outcome, overinvestors in high tech firms outperformed low-tech overinvestors in terms of CARs (Cumulative Abnormal Returns). Capital market may respond more favorably to positive discretionary R&D expenditures by the high-tech issuers and may penalize the stock returns of the low-tech issuers, if they made overinvestments in the R&D outlays. The study conducted by [3] empirically tests financial determinants of the R&D outlays for the NYSE-listed in the U.S. and the KOSPI-listed firms in Korea. In the first hypothesis, explanatory variables such as one-year lagged R&D expenditures, market-value based leverage ratio, profitability and corporate cash holdings revealed their significant impacts on the R&D costs across the two sample firms. Financial elements such as squared one-year lagged R&D expenses, interaction term between one-lagged R&D expenses and high-growth

firm, non-debt tax shield, Tobin's q and a dummy variable for accounting differences between the U.S. and Korea, showed their significance to discriminate between two sample groups in the second hypothesis. Meanwhile, it was revealed that the NYSE-listed firms showed their statistically significant relationship between growth rate and one-year lagged R&D expenses only in the lower quantiles.

3. Empirical Procedures

3.1 Data Collection and Variables Employed

To perform an empirical procedure of the study, the data sampling criteria and variables employed in each relevant model are defined in [Table1] and [Table2], respectively.

Table 1. Data Selection Criteria for Chaebol Firms

1. Data for each sample firm are available for at least six years from 2010 to 2015 which are the post-period of the global financial crisis.
2. The sample firms are listed on the KOSPI stock exchange during the sample period.
3. They are included in the population of the database of KisValue provided by the NICE.
4. Criteria to classify a firm into being Chaebol group, are set in accordance with the guidelines by the Fair Trade Commission (FTC) of the Korean Government, such that it is the one classified into a "Large Business Group", subject to the ceiling limits on cross shareholding mechanism.
5. Financial and regulated industries are excluded in the final data screening process.

Based on the criteria above, total number of the sample observations during the studied period was finalized as 127 firms in 24 domestic industries. (Descriptive statistics for the sample data are described in the next section.) In particular, the time reference of the empirical research is selected to comprehend the period from the year, 2010 to 2015 five years (a base year, 2010) by taking into account a tendency of financial ratios reverting to industry means over a five-year or ten-year interval period, as presented in [10]. Moreover, the specific period is chosen to

mitigate or reduce possible spillover effect in association with the global financial turmoil, as also described in [3]. [15]. In the following table, [Table2], a dependent variable representing corporate R&D intensity and explanatory variables as regressors are listed, where the same variables defined in [3] were also adopted. Primary purpose utilizing the same variables in majority between the two studies is to check for comparability and validity of the empirical results, given that the present study is academically related to the preceding one of [3], as described. In sum, total original nine (9) independent variables (IDVs) as regressors are entered in the models as described later.

Table 2. List of variable employed in the models

Definition	Symbol	Measurement
R&D Intensity:	RD (Dependent Variable)	(R&D Expenses) / Sales
Market-value Based Leverage:	MLEVER	Book Value of Liabilities / (Book Value of Liabilities + Book Value of Preferred Equity + Market Value of Common Equity)
Firm Size:	SIZE	Natural Logarithm of Sales Amount
Profitability:	PFT	Net income / Equity
Non-debt Tax Shield	NDTS	(Depreciation + Amortization) / Total Assets
Tobin's q :	GROWTH	(Market Value of Common Equity + Book Value of Preferred Equity + Book Value of Liabilities) / Total Assets
Change in Cash Liquidity	CASHHOLD	$[(\text{Cash \& Cash Equivalents})_t - (\text{Cash \& Cash Equivalents})_{t-1}] / \text{Total Assets}_t$
Business Risk	VOLATILITY	$3.3 \times (\text{EBIT} / \text{Total Assets}) + 1.0 \times (\text{Sales} / \text{Total Assets}) + 1.4 \times (\text{Net Income} / \text{Total Assets}) + 0.6 \times (\text{Market Value of Equity} / \text{Book Value of Equity})$
Tangible Assets	TANASSET	Tangible Assets / Total Assets
Change in Net Investment	NETINVEST	$(\text{Tangible Assets}_t - \text{Tangible Assets}_{t-1}) / \text{Total Assets}_{t-1}$

Besides the aforementioned variables, one-year lagged variable of the dependent variable (RD) is also adopted as an additional predicted variable (i.e., Lag_RD) to be entered into each model. As presented in [Table 2], dependent variable was defined as the ratio of R&D expenses over sales, as also adopted in [3] and [4].

3.2 Hypothesis Postulation and Methodologies

In the section, two hypothesized financial issues of concern are postulated to be statistically tested. First hypothesis is to identify financial characteristics of R&D intensity of Chaebol firms on an absolute basis, whereas two sub-samples between the one consisting of Chaebol firms and its counterpart of the non-Chaebol firms are compared on a relative basis. The null hypothesis of the first hypothesis is as follows:

H1: During the post-period of the global financial turmoil (i.e., from 2010 to 2015), there may not exist any statistically significant components to determine corporate R&D intensity for Chaebol firms listed on the KOSPI stock market.

As for the econometric methodologies to test for the hypothesis, several robust estimation methods are applied like (static) panel data, Tobit, robust and stepwise regression models. With being estimated by the stepwise model at the 5% level of significance, which may be one of the effective methods to reduce the issues of heteroscedasticity and autocorrelation as described by [11]. Tobit regression model is also employed for estimation by taking into account a binary attribute of the dependent variable (i.e., RD in the study) that is bounded from "0" to a positive direction. The followings are the general outline of the model as also presented in [3] and [12]: It assumes that observations are asymmetrically distributed in terms of values. Function of the model is described as:

$$Y_t = a + bX_t + U_t \text{ if } Y_t > 0, \text{ or } Y_t = 0 \text{ if } Y_t < 0$$

With respect to the estimation procedures for the model, an index function, $It = a + bX_t + U_t$ is set to zero if $It < 0$; otherwise, the value of a dependent variable is set

to It. The joint probability density function is given by the following expression:

$$P1 = P(1/\sigma) f[(Y_t - a - bX_t) / \sigma], \text{ if } Y_t > 0$$

$$P2 = P F[(-a - bX_t) / \sigma], \text{ if } Y_t < 0$$

Based on the likelihood function for the entire sample observations being $L = P1 \times P2$, each coefficient in the model (i.e., a and b) can be estimated by applying the maximum likelihood estimation such that L_t is maximized with respect to the aforementioned parameters in the model.

H2: On a relative basis, firms belonging to Korean Chaebols in the domestic market, may not be differentiated from their counterparts of the non-Chaebol firms in terms of financial aspects in the post-era of the global credit crisis.

As for the postulation of the second hypothesis, it may be interesting to detect any financial differences between firms in Chaebols and their counterparts listed on the KOSPI stock market since there seems to be few empirical studies to conduct the issue yet. For the purpose of comparability and robustness, a majority of the explanatory variables and the estimation techniques which had been utilized in [3], are also reemployed in the study to identify possible differences in the financial aspects. In the hypothesis test, a squared term of Lag_RD (SQlag_RD) is added in the relevant binary models to possibly account for a non-linear effect of R&D spendings in the previous fiscal year, as in [3]. In methodologies, with being accompanied by the logit and probit regression models, another model of complementary log-log (CLOG) model is also utilized. The method may be more useful to estimate the coefficients of the model, if the disturbance term is distributed with its extreme-values, as presented in [13]. A squared term of Lag_RD (i.e., SQlag_RD) is entered in the models to test for an possible effect of a non-linearity of R&D intensity in the previous fiscal year, as also presented in [3] and [5].

4. Analyses and Discussion

4.1 Analyses of the Results

As a legitimate procedure of an empirical study, descriptive statistics for the sample data are described in [Table 3].

Table 3. Descriptive Statistics for the Sample Data

IDV	Mean	Median	Standard Deviation	Max.	Min.
RD	0.008	0.001	0.020	0.180	0.0
MLEVER	0.578	0.616	0.234	0.989	0.039
SIZE	28.767	28.767	1.660	33.063	23.628
PFT	-0.115	0.048	2.423	19.760	-50.130
NDTS	0.007	0.002	0.015	0.120	0.0
GROWTH	1.082	0.959	0.468	4.527	0.425
CASHHOLD	-0.008	0.0003	0.125	0.282	-2.115
VOALTILITY	1.934	1.629	1.492	19.277	-7.149
TANASSEET	0.337	0.357	0.190	0.844	0.002
NETINVEST	0.040	0.005	0.473	9.017	-0.684

As for the corporate R&D intensity (RD) as a dependent variable of the study, the probability distribution of the variable appears to be right-skewed due to a larger value of mean (=0.008) than its median of 0.001. This phenomenon may imply that higher levels of R&D investments are maintained by a few Chaebol firms among total sample firms, which are located in the extreme right position of the distribution. Moreover, the coefficient of variation (CV) of PFT that is measured by the ratio of standard deviation over mean, is estimated at -21.07 as the largest value among the nine independent variables (IDVs), while the CV of SIZE is estimated at 0.058 as the smallest one. It may thus suggest that corporate profitability is most widely dispersed among Chaebol sample firms during the studies period. Regarding the test of the first hypothesis, results are listed in the following table, [Table 4].

Table 4. Results of financial determinants to determine corporate R&D spending for Chaebol firms

IDV	Estimated coefficient (Fixed effects model)	Estimated coefficient (Tobit reg. model)	Estimated coefficient (robust reg. model)
Constant	-0.023	-0.024*	-0.0003
Lag_RD	0.447*	0.986*	0.975*
MLEVER	0.001	-0.005*	-0.0001*
SIZE	0.001	0.001*	0.00001**
PFT	-0.00002	-0.0001	-0.00001
NDTS	-0.158**	-0.029	-0.001
GROWTH	-0.002	0.0003	0.0001*
CASHHOLD	-0.003	-0.003	0.00001
VOALTILITY	-0.0001	-0.0004**	-0.00001*
TANASSEET	0.002	0.002**	0.00001
NETINVEST	-0.0004	0.0004	0.00001

<Note> * and ** indicate a statistical significance at the 5% and 10% level, respectively. The value of R-square of the fixed effects model is estimated at 0.968.

On the results of the static panel data analysis, null hypothesis was not accepted by the *a priori* test of Wald (F) test at the 5% level, while it was accepted by Breusch-Pagan test with a m-value of 0.18 (p-value>0.6753). Therefore, the "fixed effect" model is selected to be the most appropriate one among fixed effect, random effect and pooled OLS models, as described in [14]. Regarding the issue of multicollinearity among all (10) explanatory variables in the fixed effects model, no significant relationship are found when measured by the variance inflation factor (VIF). For instance, the VIFs are 1.02507 for CASHHOLD as the smallest value and 2.21697 for GROWTH as the largest one, all of which are less than 10 as a criterion for insignificance of multicollinearity. Moreover, by applying a stepwise regression model, only three IDVs such as Lag_RD, MLEVER and SIZE revealed their statistically significant effects on the RD at the 5% level. The coefficients are estimated at 0.953, -0.002 and 0.0003, respectively, which also account for 95.04% of variations in terms of an adjusted R-squared value. In consequence, across the models listed in [Table 4], Lag_RD, MLEVER, and SIZE seems to show their importance to determine R&D intensity for

Chaebol firms in a statistical viewpoint. Concerning the results obtained from the second hypothesis tests, estimated coefficients with their p-values are reported in [Table 5].

Table 5. Results of limited dependent variable models to identify financial factors discriminating between Chaebol and the non-Chaebol firms on the R&D outlay

	Logit	Probit	CLOG
Constant	-34.961*	-18.727*	15.655*
Lag_RD	-14.230**	-7.338**	6.859**
SQlag_RD	184.0*	95.510*	-82.411*
MLEVER	0.005	-0.036	0.098
SIZE	1.258*	0.672*	-0.572*
PFT	-0.038**	-0.021**	0.023
NDTS	16.416*	9.000*	-6.873**
GROWTH	0.056	0.027	-0.077
CASHHOLD	-3.155*	-1.746*	1.425*
VOLATILITY	-0.189*	-0.085	0.077*
TANASSET	-1.598*	-0.971*	0.561*
NETINVEST	-0.092	-0.043	0.037
Goodness of Fit	1239.56*	1210.88*	1129.57*

<Note 1> * and **: Significant at the 5% and 10% level in terms of the chi-square value.

<Note 2> Coefficients were estimated by the method of maximum likelihood (ML). The test for overall goodness of fit was performed by the likelihood ratio (LR) test, while the Wald test was used to test for the significance of each individual estimated coefficient.

Based on the outcome obtained from each test for a relative comparison purpose, a majority of the IDVs shows their significant role to differentiate Chaebol firms from their counterparts in terms of financial aspects. As reported in [Table 5], the results from the CLOG are almost all consistent with those of the former tests such as logit and probit, considering the signs of the estimated coefficient in the test with ascending order are opposite to their counterparts in the former tests. All explanatory variables other than MLEVER, GROWTH and NETINVEST reveal their financial importance to separate two sample groups of the firms in the econometric context. For instance, the probability to be included in the Korean Chaebol firms is higher, if firm size (SIZE) becomes larger, given that the probability modeled in “1” for Chaebol firms in the

logic and probit models.

4.2 Discussion

It is interesting to empirically detect that only a few predicted variables demonstrated their pronounced effect to determine the R&D intensity in the test of the first hypothesis. In other words, amongst nine IDVs, Lag_RD and SIZE showed their positive impact on the dependent variable, whereas MLEVER to represent the market-value based debt ratio for Chaebol firms had a negative influence on the R&D intensity. Foremost, the variable of Lag_RD provides evidence of statistically significant role to account for RD across all the models, as reported in [Table 4]. The results are consistent with the findings of the preceding studies such as [6] and [15]. Therefore, it is empirically confirmed that the sample firms belonging to Chaebols are overall reluctant to change or tend to still maintain their levels of R&D intensity relative to those of the previous fiscal year. The phenomenon was also found to be prevalent in the previous study of [3], which had examined financial factors of corporate R&D expenditures in the international context (i.e., for NYSE and KOSPI firms). Regarding the positive and significant effect of SIZE on the R&D outlay found in the majority of the tests in [Table 4], it seems to be noteworthy that, firm size is more important to determine the level of the R&D expenditures for Chaebol firms, when compared to the findings of the preceding study such as [4], in which had sampled the data among the entire KOSPI listed firms. This phenomenon may, in part, arise from the fact that most Chaebol firms that are engaged in multinational businesses, may face higher or more serious competition with other overseas firms in the same industry, which may, in turn, makes necessary to extend their R&D expenditures for developing a wide diversity of new or updated products. The market-value based leverage ratio (MLEVER) was detected as another important variable to determine corporate R&D intensity in the majority of the models tested. The

consequences are compatible with those found in the preceding studies as in [3] and [4]. The negative association between MLEVER and RD as a dependent variable may imply that firms in the Chaebol groups appear to reduce their investments or spending in R&D activities by considering a increasing burden of financial distress in terms of the conventional “trade-off” theory of the capital structure. However, coupled with the outcome aforementioned association, corporate profitability (PFT) did show its insignificant relationship with the dependent variable of RD as in [Table 4]. In contrast, PFT revealed a negatively significant effect on the R&D expenses (RD) in terms of the inter-country analysis between the NYSE- and the KOSPI-listed firms, given the negative linkage between RD and MLEVER as in [3]. Therefore, it may suggest that financial burden of non-operating expenses inclusive of interest expenses seems to be larger for the Korean chaebol firms than those of other sample groups inclusive of non-Chaebol firms or NYSE-listed firms in the U.S. capital market.

With respect to the consequences of the second hypothesis test reported in [Table 5], it is of interest to identify that most of the variables were found to be significant to explain the R&D ratio of Chaebol firms during the sample period, as discussed in the followings: First, given the probability modeled is “1” for Chaebol firms in the models, the variable of Lag_RD with a negative sign (-) shows its pronounced power to separate two sub-samples. It suggests that probability to be classified into Chaebol firms will be lower if the R&D investments in the prior year increased. Moreover, there is a statistically strong non-linear relationship (i.e., SQlag_RD) between Chaebol and the non-Chaebol firms in terms of R&D expenditures spent in the last fiscal year. To illustrate, the probability categorized into the non-Chaebol group will be lower as the amount of Lag_RD becomes larger, in that the coefficient of the SQlag_RD is estimated as a positive and statistically significant one which seems to explain a non-linear relationship

between the probability modeled and the variable of Lag_RD. As Lag_RD continues to become larger, the probability to be in a financial type of Chaebol firms will be higher after reaching a certain level of the R&D intensity. Second, Chaebol firms seems to be larger in size (SIZE) than their counterparts of the non-chaebol ones in the domestic capital markets. As discussed, most Chaebol firms are heavily engaged in overseas businesses and attempt to maintain their positions as market leaders in their corresponding industries on a relative basis. Accordingly, accompanied by easier access to credit market, they may be more concerned with increasing their size (SIZE) in sales amount to take advantage of the economies of scale or scope in economic theory. Third, it was detected that Chaebol firms may use more benefit in association with corporate non-debt shield (NTDS) than their counterparts, which is defined as the sum of depreciation and amortization over total assets as in [Table 2]. The phenomenon is consistent with the findings of the study, [3], that is applicable to the NYSE-listed firms in the U.S. capital market. On the contrary, the proportion of total assets (TANASSET) maintained by the non-Chaebol firms in the study, are, on average, identified to be higher than that of Chaebol firms. Based on the financial information, it is plausible that the proportion of amortization (on intangible assets) over total assets may be larger for Chaebol firms, when compared to their counterparts in the post-era of the global financial turmoil. The results to a large extent, arise from the fact that active business activities or strategies operated by Chaebol firms may cause the proportion of amortization in TANASSET to be higher than their counterparts by purchasing intangible assets such as patents or licenses in more diverse business areas. Finally, it was also interesting to identify that the ratio of a change in corporate cash holdings from the prior fiscal year (CASHHOLD) is larger for the non-Chaebol firms. In the theory of modern finance, primary motives for excess cash holdings are classified into the

precautionary, transactional and speculative ones, as also outlined in [16]. Going through the experiences of the unprecedented global financial crisis occurred in 2008, it appears that relatively conservative policies on cash holdings are maintained or preserved by the non-Chaebol firms in accordance with the precautionary motive.

5. Concluding Remarks

The study addresses one of the financial issues still in debate on the subject of corporate R&D expenditures. As presented earlier, the empirical settings of the study are formed to include the criteria of the sample observations and the time reference to conduct the study. That is, the sample data consists of firms belonging to Chaebols listed on the KOSPI stock market. As an extension of the preceding study of [3] and [4], the sample period are also set to be in the post-era of the global financial turmoil to mitigate a spillover effect associated with the financial crisis.

Two primary hypotheses are tested to derive the following results: First, it is detected that Lag_RD and SIZE are positively significant to determine corporate R&D intensity (RD) on an absolute basis, whereas MLEVER shows its negative impact on the dependent variable. Concerning the test of the second hypothesis, a majority of the explanatory variables amongst total eleven variables revealed their statistical importance to differentiate between Chaebol firms and their non-Chaebol counterparts. Even if the study may suffer from legitimate weaknesses in association with empirical procedures, it may suggest a new vision which may warrant a future research as an extended one. In other words, by identifying differences between Chaebol firms and their counterparts in financial aspects, the results of the present study may contribute to being antecedents, when new policies are implemented to accommodate new socio-economic environments for Korean Chaebols at the government or corporate level.

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Hanjoon Kim

[regular member]



- Feb., 1985 : Yonsei Univ., Seoul.
- Sept., 1987 : The George Washington Univ., MBA, U.S.A.
- Jan., 1999 : Boston University DBA (Major: Finance), U.S.A.
- Mar. 2010 ~ Present : Hoseo Univ. Dept. of Business Administration. Professor

<Research Interests>

Corporate Finance, M&A, Valuation, Int'l Finance