Financial Performance of Healthcare Firms: The Case of Korea

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ABSTRACT

The purpose of this study is to analyze the financial performance and financial characteristics of healthcare companies. Healthcare firms are statistically significantly higher than non-healthcare companies in terms of several ratios such as research and development (R and D) cost ratio, selling general and administrative expenses ratio, Tobin's Q, return on equity, return on sales, total capital growth and sales growth. The cost of sales ratio is statistically lower than that of non-healthcare companies, which implies that healthcare companies spend much R and D costs for technological innovation, and as a result, they increase corporate value by lowering the cost of sales ratio and improving profitability. The profitability, growth, and leverage of healthcare companies were found to influence more on corporate value for the healthcare firms than those of non-healthcare companies. This result can be interpreted as reflecting the expectation that future cash flow will be more influenced by profitability, growth, and leverage of healthcare companies.

Keywords: Healthcare, Healthcare Firms, Financial Performance
JEL Classifications: 30, 32

1. INTRODUCTION

The range of healthcare industry is relatively wide to encompass pharmaceuticals, medical devices and medical service. The industry is forecasted to grow with high speed, driven by increases of the middle class, and life expectancy, and rapid technological advances. Medical expenditure of Korea is the fastest growing among OECD countries and thus demand for healthcare is expected to surge (Samsung Economic Research Institute, 2011). Among the healthcare industry, Korea's pharmaceutical and medical equipment industries are relatively weak in global competitiveness because they are small in scale and lack of technical capability. However, it is necessary to utilize the medical service industry of Korea because it has competent manpower and advanced medical treatment system.

There are differences in competitiveness among various sectors of the healthcare industry. Therefore, specific strategy for securing competitiveness of each sector will be needed in the future. Because IT industry of Korea is competitive, some people insist on fostering the healthcare industry utilizing IT. It is essential for a firm to have strategies and policies and to understand characteristics of the firm accurately to maintain growth. Future

strategies and policies need to be established by thorough analyses of the past and present of a firm.

It is expected that the healthcare industry as a high-tech industry might be different in financial performance and characteristics compared to non-tech industries. This study analyzes differences I financial performance and financial characteristics between the healthcare industry and the non-health industry. With the rapid growth of the healthcare market, many healthcare companies and related industries have been attracting attentions of many people all over the world. Technology of healthcare industry keeps developing continuously. Nevertheless, research and literature related to the industry are relatively in short supply and insufficient.

The purpose of this study is to examine financial performance and financial characteristics of healthcare companies. We compare financial details of healthcare companies with those of non-healthcare companies. This paper tries to suggest strategic implications and ideas for development of healthcare industry by comparing financial performances. In addition, we try to find implications by comparing and analyzing financial factors affecting financial performance. Also, the results of this paper

will provide implications for various stakeholders related to the healthcare companies.

2. HYPOTHESES

Investigating financial performances and financial characteristics of a particular industry is very important task because they are valuable basic data for establishing future strategies and policies. Nonetheless there have been no prior studies examined the financial performances of healthcare companies in Korea. However, there have been many researches on various topics which investigated financial performance and characteristics of other firms except healthcare companies. Based on these previous studies, we are going to explain variables and set up hypotheses by categorizing the variables into research and development (R and D) expenditures and costs, corporate value and profitability, growth potential, activity and productivity in this study.

2.1. R and D and Costs

Investments on R and D of a firm increase the value of the firm because they increase the sales and the profit of the company (Branch, 1974; Park, 2009). This is because investments on R and D lead to technological innovation, which leads to cost reduction and productivity enhancement resulting in profit increases of the company. Many scholars have shown that the relationship between R and D investment and technological innovation is positive (Pakes and Grilliches, 1984; Kleinknecht and Reijnen, 1992; Kondo, 1999; Shefer and Frenkel, 2005). High-tech firms might need consistent innovation to survive in their highly advanced market technologically (D'Aveni, 1994; Hamel and Prahalad, 1994).

Healthcare firms have very similar characteristics with high-tech companies which are expected to have higher R and D investment ratio than non-healthcare companies. Higher R and D investment ratio is expected to lead to technological innovation, which reduces various costs of a firm. This study considers and compares R and D investments treated as intangible assets and treated as costs of current period, separately.

H_1: R and D investment ratios of healthcare companies will be larger than those of non-healthcare companies.

H_2: Healthcare companies will have smaller cost of sales than non-healthcare companies.

2.2. Firm Value and Profitability

Researches have shown positive (+) relationship between technological innovation and firm performance. Park et al. (2006) found that patent intensity and R and D intensity as proxy variables for the technological innovation have positive correlation with the firm performance. Kim at al. (2009) found that the higher the technology rating, the better the financial performance of Korean small and medium enterprises.

Kim and Kwon (2015) examined the changes in corporate value of the KOSDAQ firms because of disclosure of supply contracts and found suppliers had higher excess returns in case of high-tech firms. Also, the operating profits of high-tech companies

were higher than those of non-high-tech companies. Financial characteristics of fin-tech firms were superior to those of non-fin-tech firms in value and profitability (Park, 2016). In this study, we use Tobin's Q ratio as a measure of firm value and return on asset (ROA), return on equity (ROE), and return on sales (ROS) as measure of profitability.

H_3: Healthcare companies will have larger firm value than non-healthcare companies.

H_4: Healthcare companies will be more profitable than non-healthcare companies.

2.3. Growth, Activity and Productivity

As mentioned earlier, healthcare industry is considered to be growing and the characteristics of growing firms are to be reflected in financial indicators. Because healthcare firms are based more on high technologies than non-healthcare companies and because of the advantages of growth industry, it is highly probable that the healthcare firms to show superiority in the aspects of growth, activity and productivity of financial indicators. The study of Kim (2014) evidenced the paths that innovation activities resulted in innovation performances which resulted in firm's operation performances which resulted in sales growth rate using path analyses. Raquel et al. (2015) found that knowledge stock had significantly positive (+) effects on firm productivity and that the coefficients of the effects were larger for high-tech firms than for non-high-tech firms.

Thus, we set following hypotheses;
H_5: Healthcare companies will have higher growth than that of non-healthcare companies.

H_6: Healthcare companies will have higher activity than that of non-healthcare companies.

H_7: Healthcare companies will have higher productivity than that of non-healthcare companies.

3. METHODOLOGY

3.1. Sample

Since 2006, the Korea Exchange has developed stock price indices by classifying Korea's representative industries into five categories of automobile, semiconductor, healthcare, IT and banking industry.

Korea's healthcare index is composed of 20 companies which are mainly health-related such as pharmaceutical companies and biotechnology firms. The Korea Exchange has updated the constituents of the index annually considering market capitalization, sales, R and D, research personnel, financial situation and volume of transactions.

The indices of Korean healthcare industry from 2006 to 2015 were selected for the sample of this study. The sample were consisted of the firms in KOSPI and KOSDAQ. The data used in the analyses of this study were extracted from TS2000 database of Korea Listed Companies Association and KIS Value database of Korea

Credit Evaluation Information. The final sample was consisted of 46 firms as shown in Table 1. 27 companies were listed on the KOSPI market and 19 firms were from the KOSDAQ market. The healthcare industry was classified into five sectors and most of the sample, 35 of 46 firms, were in the sector of "manufacture of medical materials and pharmaceuticals."

We collected matching and corresponding sample to compare and analyze financial performance of healthcare companies of KOSPI and KOSDAQ markets. The selection of matching counterparts is based on the method used by McLaughlin et al. (1996), Bae et al. (2002) and Jang and Kim (2013). The corresponding company is selected with non-healthcare firms that is classified within ±30% range of market value of common shares of healthcare counterpart and that is similar market-to-book value of the healthcare company.

3.2. Measuring Performance

The measurement of financial performance in related studies usually involves financial ratio analyses and stock price indicators. However, in this study, we analyze efficiency of healthcare company by measuring technological innovation activity and cost of a company and using ratio of R and D cost, cost of sales ratio, and ratio of selling, general and administrative expenses.

Table 1: Sample

Sector of healthcare industry	Number of companies
Wholesale and commodity brokerage	1
Medical, precision, optics and watch manufacturing	5
Manufacture of medical materials and pharmaceuticals	34
Services	5
Etc.	1
Total	46

We use the Q ratio of Tobin as a measure of corporate value, ROA, ROE, and ROS as measures of profitability, and total capital growth rate and sales growth rate as measures of growth. The value added per employee and the net income per employee are used for the measure of productivity. The detailed methods of calculating the variables are shown in Table 2.

4. EMPIRICAL ANALYSES

4.1. Basic Statistics

Table 3 shows basic statistics of each variable for healthcare companies and non-healthcare companies such as range, minimum value, maximum value, mean, and standard deviation. The mean value of the ratio of total R and D cost to sales (T_RND/S) of healthcare firms is larger than that of non-healthcare companies. However, the ratio of R and D cost treated as assets to sales (A_RNDA/S) of non-healthcare firm is slightly larger than that of healthcare companies.

The profitability indicators such as ROA, ROE, and ROS, and the growth indicators such as total capital growth rate (TC_G) and sales growth rate (SALE_G) also are larger for healthcare companies than non-healthcare firms. The debt ratio and total capital turnover rate are smaller for healthcare companies, and value added per employee (1_EVA) and net profit per employee (1_PRO) as productivity indicators are found not to be different significantly between healthcare and non-healthcare firms.

4.2. Comparison of Financial Performance

Table 4 compares financial performances of healthcare companies and non-healthcare companies, which are the core of this research. The R and D expenditure ratio invested for technological innovation is divided into two ratios, the ratio of R and D cost treated as intangible assets to sales (A_RNDA/S) and the ratio of R and D cost treated as cost to sales (E_RNDE/S).

Table 2: Variables

Financial characteristic	Variable※	Calculation
R and D	A_RNDA/S (%)	R and D cost treated as assets/sales
	E_RNDE/S (%)	R and D cost treated as costs/sales
	T_RND/S (%)	Total R and D cost/sales
Firm efficiency, cost	S_COST/S	Cost of sales/sales
	EX/S	Selling, general and administrative expenses/sales
Firm value	TOBIN_Q	(Total market capitalization of common stock+total market capitalization of preferred stock+total liabilities)/total assets
Profitability	ROA (%)	Net profit/total assets
	ROE (%)	Net profit/equity
	ROS (%)	Net profit/sales
Growth	TC_G (%)	(Total capital at the end of period−total capital at the end of previous year)/Total capital at the end of the year
	SALE_G (%)	(Sales at the end of the year-sales at the end of the previous year)/sales at the end of the year
Leverage	DEBT (%)	Debt/equity
Activity	TURNOVER	Sales/total capital
Productivity	1_EVA (million Won)	Value added/number of employees
	1_PRO (million Won)	Net profit/number of employees

※A_RNDA/S is ratio of R and D cost treated as assets to sales, E_RNDE/S is ratio of R and D cost treated as cost to sales, T_RND/S is the ratio of total R and D cost to sales. S_COST is ratio of cost of sales to sales, EX/S is ratio of selling, general and administrative expenses to sales, TOBIN_Q is Tobin's Q value, ROA is return on assets, ROE is return on equity, ROS is return on sales, TC_G is total capital growth rate, SALE_G is sales growth rate, DEBT is debt ratio, TURNOVER is total capital turnover rate, 1_EVA is value added per person, and 1_PRO is net profit per employee. R and D: Research and development

Table 3: Statistics

Variables※	Healthcare or non-healthcareψ	N	Mean±Standard deviation	Min	Max
A_RNDA/S (%)	1	171	2.037±6.233	0.000	63.380
	2	121	2.667±14.921	0.000	121.160
E_RNDE/S (%)	1	171	7.209±5.565	0.280	34.650
	2	121	3.385±4.107	0.000	33.080
T_RND/S (%)	1	171	9.300±8.507	0.400	74.680
	2	121	5.811±16.444	0.000	135.500
S_COST/S (%)	1	184	0.502±0.204	0.000	0.907
	2	184	0.695±0.251	0.000	1.165
EX/S (%)	1	184	0.365±0.139	0.075	0.771
	2	184	0.211±0.202	0.034	1.229
TOBIN_Q	1	184	2.159±2.438	0.000	15.843
	2	184	1.563±2.969	0.000	37.018
ROA (%)	1	184	6.130±10.274	−19.210	109.660
	2	184	4.712±10.641	−71.880	31.010
ROE (%)	1	184	8.513±15.101	−30.850	163.870
	2	184	4.813±18.611	−95.160	37.580
ROS (%)	1	184	14.066±34.338	−28.760	390.260
	2	184	6.590±28.553	−119.230	262.190
TC_G (%)	1	184	9.344±17.115	−76.100	114.710
	2	184	6.583±14.939	−51.940	80.400
SALE_G (%)	1	184	12.890±54.650	−99.300	663.290
	2	184	6.567±29.248	−54.220	196.090
DEBT (%)	1	184	56.366±42.613	0.930	271.400
	2	184	71.080±153.791	0.000	1240.360
TURNOVER	1	184	0.638±0.309	0.010	1.390
	2	184	0.773±0.442	0.060	2.290
1_EVA (million Won)	1	184	130.046±272.766	−5.100	3086.210
	2	184	194.628±678.300	−402.930	5326.870
1_PRO (million Won)	1	184	115.583±841.300	−50.840	11152.700
	2	184	112.972±538.803	−473.950	4251.250

※A_RNDA/S is ratio of R and D cost treated as assets to sales, E_RNDE/S is ratio of R and D cost to sales, T_RND/S is ratio of total R and D cost to sales. S_COST is ratio of cost of sales to sales, EX/S is ratio of selling, general and administrative expenses to sales, TOBIN_Q is Tobin's Q value, ROA is return on assets, ROE is return on equity, ROS is return on sales, TC_G is total capital growth rate, SALE_G is sales growth rate, DEBT is debt ratio, TURNOVER is total capital turnover rate, 1_EVA is value added per person, and 1_PRO is net profit per employee. ψ1 means healthcare firm, 2 means non-healthcare firm. R and D: Research and development

The ratio of R and D cost treated as intangible assets to sales (A_RNDA/S) of healthcare companies is slightly smaller than that of non-healthcare companies without statistical significance. It is shown that healthcare companies have significantly larger ratio of R and D cost treated as cost to sales (E_RNDE/S) and ratio of total R and D cost to sales (T_RND/S) than non-health care companies. This means that healthcare companies spent more R and D costs than non-healthcare companies for ongoing technological innovation.

Healthcare companies have significantly smaller value of cost of sales ratio (S_COST/S) than non-healthcare companies, which can be interpreted as a result of reducing manufacturing cost and cost of sales through improvement of management efficiency by strengthening the intensity of technology innovation by increasing R and D spending more than non-healthcare companies.

The ratio of selling, general and administrative expenses to sales (EX/S) of healthcare companies is higher than that of non-healthcare firms, which can be explained that healthcare companies have the characteristics of growth industry relatively more than non-healthcare companies spend more expenses.

Mean value of Tobin's Q ratio is 2.159 for healthcare companies and 1.563 for non-healthcare firms with statistically significance.

High Tobin's Q means that stock price of a firm is highly valued in the market, reflecting investors' expectation that future cash flows will increase. In other words, healthcare companies in growth industry are more valued in the market due to steady growth and high profitability than non-healthcare companies.

ROA, ROE and ROS as profitability indicators of healthcare companies are larger than those of non-healthcare companies with statistically significance except for ROA, which implies that healthcare companies produce and sell high value-added products with bigger margin rates through continuous technological innovation than non-healthcare companies.

Both total assets growth rate and sales growth rate of healthcare firms are larger than those of non-healthcare companies with statistically significance for total assets growth rate only. These results indicate that healthcare companies have more growth potential than non-healthcare industries. As for debt ratio, healthcare companies have smaller value of 56.36% than non-healthcare companies' value of 71.08% without statistically significance.

The total capital turnover ratios of the two groups of firms are interpreted not to be different. Value added per employee of non-healthcare companies is slightly bigger than that of healthcare

Table 4: Financial performances of healthcare and non-healthcare companies

Variables[※]	Healthcare or non-healthcare[ψ]	N	Mean	Mean difference	t-value	Hypothesis
A_RNDA/S (%)	1	171	2.037	−0.630	−0.495	Accepted
	2	121	2.667			
E_RNDE/S (%)	1	171	7.209	3.824	6.421***	
	2	121	3.385			
T_RND/S (%)	1	171	9.300	3.488	2.364**	
	2	121	5.811			
S_COST/S (%)	1	184	0.502	−0.193	−8.088***	Accepted
	2	184	0.695			
EX/S (%)	1	184	0.365	0.154	8.515***	
	2	184	0.211			
TOBIN_Q	1	184	2.159	0.596	2.104**	Accepted
	2	184	1.563			
ROA (%)	1	184	6.130	1.417	1.300	Accepted
	2	184	4.712			
ROE (%)	1	184	8.513	3.701	2.094**	
	2	184	4.813			
ROS (%)	1	184	14.066	7.476	2.264**	
	2	184	6.590			
TC_G (%)	1	184	9.344	2.761	1.649*	Accepted
	2	184	6.583			
SALE_G (%)	1	184	12.890	6.324	1.384	
	2	184	6.567			
DEBT (%)	1	184	56.366	−14.714	−1.251	Not accepted
	2	184	71.080			
TURNOVER	1	184	0.638	−0.135	−3.393***	
	2	184	0.773			
1_EVA (million Won)	1	184	130.046	−64.582	−1.198	Not accepted
	2	184	194.628			
1_PRO (million Won)	1	184	115.583	2.611	0.035	
	2	184	112.972			

[※]A_RNDA/S is ratio of R and D cost treated as assets to sales, E_RNDE/S is ratio of R and D cost treated as cost to sales, T_RND/S is ratio of total R and D cost to sales. S_COST is ratio of cost of sales to sales, EX/S is ratio of selling, general and administrative expenses to sales, TOBIN_Q is Tobin's Q value, ROA is return on assets, ROE is return on equity, ROS is return on sales, TC_G is total capital growth rate, SALE_G is sales growth rate, DEBT is debt ratio, TURNOVER is total capital turnover rate, 1_EVA is value added per person, and 1_PRO is net profit per employee. [ψ]1 means healthcare firm, 2 means non-healthcare firm. ***,**,*Significant at 1%, 5% and 10% level, respectively. R and D: Research and development

companies, but net profit per employee of healthcare companies is slightly bigger with no statistical significance.

In summary, healthcare companies spend more R and D expenditures than non-healthcare companies for technology innovation and they seem to improve efficiency of management by reducing cost of sales ratio. In addition, since the healthcare industry was in a growing phase during the sample period, healthcare companies grew faster than non-healthcare companies.

The empirical results of the hypotheses tested are summarized as follows; First, hypotheses 1, 2, 3, 4 and 5 are accepted that healthcare companies have higher R and D ratios, cost of sales ratios, firm value ratios, profitability ratios, and growth rate than non-healthcare companies. However, hypotheses 6 and 7 that healthcare company will have a bigger productivity ratio than non-healthcare company are rejected.

4.3. Correlation Analysis
Next we perform correlation before regression analyses with the variables found to be significantly different between two groups of healthcare and non-healthcare companies in the preceding analyses. Table 5 shows correlation coefficients between variables.

R and D ratio has significantly negative (−) relationship with cost of sales ratio and significantly positive (+) relationship with ratio of selling, general management cost to sales ratio, significantly positive (+) relations with Tobin's Q ratio and negative (−) with total capital turnover ratio. Cost of sales ratio shows significantly negative (−) correlation with selling, general and management cost to sales ratio, Tobin's Q ratio, ROA, ROS, total assets growth rate, sales growth rate, value added per employee and net profit per employee.

Ratio of selling, general and management expenses to sales shows positive (+) relationship with Tobin's Q ratio, ROS, total capital turnover rate, net profit per employee and total assets. We also find that selling, general management expenses to sales ratio has significantly negative (−) relation with debt ratio and total capital turnover ratio.

Tobin's Q ratio shows positive (+) relation with ROA, ROE, total assets growth rate, and sales growth rate, and statistically significant negative (−) relationship with total assets. ROA has significant positive relationship with ROE, ROS, total assets growth, sales growth, total capital turnover, value added per employee, and net profit per employee, and negative (−) relationship with debt ratio.

Table 5: Correlation coefficients

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Coefficient	1													
P value														
Coefficient	−0.408	1												
P value	0.000													
Coefficient	0.426	−0.768	1											
P value	0.000	0.000												
Coefficient	0.576	−0.348	0.234	1										
P value	0.000	0.000	0.000											
Coefficient	−0.088	−0.319	0.050	0.149	1									
P value	0.132	0.000	0.336	0.004										
Coefficient	−0.090	−0.327	0.003	0.160	0.803	1								
P value	0.127	0.000	0.956	0.002	0.000									
Coefficient	0.013	−0.144	0.121	−0.006	0.500	0.544	1							
P value	0.823	0.006	0.020	0.913	0.000	0.000								
Coefficient	−0.039	−0.168	−0.053	0.187	0.263	0.263	−0.254	1						
P value	0.510	0.001	0.312	0.000	0.000	0.000	0.000							
Coefficient	-0.040	−0.209	−0.049	0.249	0.127	0.138	−0.121	0.312	1					
P value	0.497	0.000	0.345	0.000	0.015	0.008	0.020	0.000						
Coefficient	−0.053	0.272	−0.179	−0.101	−0.606	−0.237	−0.034	−0.165	−0.098	1				
P value	0.367	0.000	0.001	0.053	0.000	0.000	0.520	0.002	0.061					
Coefficient	-0.340	0.406	-0.372	−0.167	0.142	0.130	−0.103	0.126	−0.001	0.106	1			
P value	0.000	0.000	0.000	0.001	0.006	0.013	0.049	0.016	0.981	0.041				
Coefficient	−0.036	−0.378	0.016	0.028	0.109	0.151	0.041	0.110	0.160	−0.101	−0.217	1		
P value	0.539	0.000	0.761	0.595	0.036	0.004	0.429	0.035	0.002	0.052	0.000			
Coefficient	−0.034	−0.308	0.098	0.008	0.462	0.521	0.831	−0.149	−0.026	−0.084	−0.195	0.587	1	
P value	0.565	0.000	0.061	0.881	0.000	0.000	0.000	0.004	0.619	0.109	0.000	0.000		
Coefficient	−0.056	−0.035	−0.090	−0.169	0.024	−0.042	−0.017	−0.014	−0.031	0.047	0.057	0.314	0.148	1
P value	0.340	0.498	0.084	0.001	0.651	0.423	0.740	0.786	0.558	0.368	0.276	0.000	0.004	

1: T_RND/S (ratio of total R and D cost to sales), 2: S_COST (ratio of cost of sales to sales), 3: EX/S (ratio of selling, general and administrative expenses to sales), 4: TOBIN_Q (Tobin's Q value), 5: ROA (return on assets), 6: ROE (return on equity), 7: ROS (return on sales), 8: TC_G (total asset growth rate), 9: SALE_G (sales growth rate), 10: DEBT (debt ratio), 11: TURNOVER (total capital turnover rate), 12: 1_EVA (value added per person), 13: 1_PRO (net profit per employee), 14: Log AT (log value of total asset)

ROE has statistically significant negative (−) relationship with ROS, sales growth, total capital turnover, value added per employee, and net profit per employee. ROS has positive (+) relationship with net profit per employee, but significant negative (−) relationship with total assets growth, sales growth rate, and total capital turnover rate.

Total assets growth rate has positive (−) relationship with sales growth rate, total capital turnover ratio, and value added per employee, and has negative (−) relationship with debt ratio and net profit per employee. Sales growth rate is positively correlated with value added per employee and negatively correlated with debt ratio. Debt ratio shows positive (+) relationship with total capital turnover ratio and negative (−) relationship with value added per employee.

Total capital turnover ratio is negatively related with value added per employee and net profit per employee. Value added per employee has positive relation with net profit per employee and total assets, and net profit per employee has positive (+) relationship with total assets.

4.4. Regression
As further investigation of this study, regression analyses are performed with R and D cost, Tobin's Q ratio, and net capital ratio as dependent variables which were found to be different significantly in financial performance indicators between healthcare firms and non-healthcare companies. We exclude variables in regression analyses with high correlation coefficients because of the multicollinearity problem.

Table 6 is the results of regression models with dependent variable of R and D cost for samples of total companies, healthcare companies, and non-healthcare companies respectively. The coefficient of selling, general and administrative expenses to sales ratio (EX/S) for the sample of healthcare companies is significantly positive while that of non-healthcare firms is not significant, which means the larger the selling, general and administrative expenses, healthcare company invests more in R and D expenditure. In addition, the coefficient of firm size (Log AT) of the healthcare subsample is significantly positive while that of non-healthcare firms is not significant, which means as the size of healthcare company increases the company invests in more R and D expenditure compared to non-healthcare firms.

Table 7 is the results of regression with Tobin's Q ratio as dependent variable. R and D ratio, ROE, and total capital growth rate affect Tobin' Q ratio positively in all of the three models. R and D ratio of healthcare company has less impact on Tobin's Q ratio than non-healthcare firms. ROE, total capital growth rate, and debt ratio have greater impact for healthcare firms than non-healthcare firms.

These results indicate that profitability, growth, and leverage of healthcare companies are reflected in corporate value more

Table 6: Regression analyses of R and D cost

Independent variables	Total firms		Healthcare firms		Non-healthcare firms	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
EX/S	0.291	6.052***	0.430	5.961***	0.097	1.546
TOBIN_Q	0.558	11.802***	0.282	3.630***	0.768	12.948***
ROE	−0.140	−2.872***	−0.008	−0.103	−0.150	−2.516**
DEBT	−0.030	−0.602	0.072	0.987	−0.033	−0.529
Log AT	0.139	2.882***	0.362	4.863***	0.028	0.477
N	291		170		120	
F value	47.086		11.698		47.678	
Adjusted-R^2	0.442		0.239		0.660	

EX/S means ratio of selling, general and administrative expenses to sales, TOBIN_Q means Q ratio of Tobin, DEBT means debt ratio, and Log AT means log of total asset.
***,**Significant at 1% and 5% level, respectively. R and D: Research and development, ROE: Return on equity

Table 7: Regression analysis of Tobin's Q

Independent variables	Total firms		Healthcare firms		Non-healthcare firms	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
T_RND/S	0.587	13.107***	0.211	3.271***	0.810	14.645***
ROE	0.175	3.244***	0.272	3.613***	0.141	2.089**
TC_G	0.133	2.603***	0.214	2.899***	0.002	0.026**
DEBT	−0.004	−0.076	0.032	0.471	−0.009	−0.136
Log AT	−0.168	−3.538***	−0.355	−5.295***	−0.051	−0.860
N	291		170		120	
F-value	44.259***		17.102***		45.770***	
Adjusted-R^2	0.426		0.321		0.651	

T_RND/S is ratio of total R and D cost to sales, S_COST/S is ratio of cost of sales to sales, EX/S is ratio of selling, general and administrative expenses to sales, ROE is return on equity, TC_G is total asset growth rate, DEBT is debt ratio, and Log AT is log of total asset. ***,**Significant at 1% and 5% level, respectively. R and D: Research and development, ROE: Return on equity

Table 8: Regression analysis of ROE

Independent variables	Total firms		Healthcare firms		Non-healthcare firms	
	Coefficient	t-value	coefficient	t-value	coefficient	t-value
S_COST/S	−0.188	−3.437***	−0.245	−3.479***	−0.109	−1.272
TOBIN_Q	0.175	2.820***	0.222	3.101***	0.215	1.670*
TC_G	0.389	7.845***	0.348	5.266***	0.424	5.703***
DEBT	−0.310	−6.117***	−0.145	−2.235**	−0.407	−5.070**
Log AT	0.133	2.592***	0.202	2.966***	0.124	1.540
N	291		170		120	
F-value	27.976		19.432		12.243	
Adjusted-R^2	0.357		0.394		0.360	

S_COST/S is ratio of cost of sale to sales, TOBIN_Q is Tobin's Q ratio, TC_G is total asset growth rate, DEBT is debt ratio, and Log AT is log of total asset. ***,**,*Significant at 1%, 5% and 10%, respectively. ROE: Return on equity

than non-healthcare firms. In other words, investors' expectation that future cash flow of a healthcare firm will increase due to profitability, growth, and leverage is reflected in corporate value.

Table 8 shows the results of regression model with ROE as dependent variable. In all three models, the cost of sales ratio and the debt ratio have negative effect on ROE, but the Tobin's Q ratio and the total capital growth ratio have positive effect on ROE. Cost of sales ratio affects ROE more for healthcare firm than non-healthcare company. Tobin's Q ratio is interpreted to be closely related to ROE that represents shareholder's return on investment.

5. CONCLUSION

Healthcare industry has unlimited growth potential because global population is aging rapidly and life expectancy is increasing. With this trend the results of this study will provide implications for investors and policy makers who are much interested in the industry. The purpose of this study is to analyze financial performance and characteristics of healthcare companies. The results of the study are as following:

- First, healthcare companies are found to have significantly high values compared to non-healthcare companies in R and D cost ratio, selling general management expenses, Tobin's Q ratio, ROE, ROS, total capital growth rate, and sales growth rate. Cost of sales ratio of healthcare firm is significantly lower than that of non-healthcare company. These results show that healthcare companies spend much R and D expenditure in their efforts for technological innovation and accordingly the firms are found to increase the firm value by lowering cost of sales ratio and improving profitability. The high ratio of selling, general and administrative expenses of healthcare companies is attributable to higher R and D expenditure treated as costs than non-healthcare firms and increased costs of healthcare firms growing.

- Second, the results of the study show that profitability, growth, and leverage of healthcare companies are found to affect firm value more than those of non-healthcare companies. This result can be interpreted as the result of reflection of investors' expectation that cash inflows in the future will be increasing.

The results of this study are expected to provide investment information to the investors in healthcare companies and to be used as analyses data related to the development of healthcare industry for policy makers.

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