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EMPIRICAL STUDY OF THE STRATEGIC IMPACT OF MAJOR MARKETING FACTORS ON FIRMS ACCOUNTING PERFORMANCE IN THE PHARMACEUTICAL INDUSTRY

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ABSTRACT

The purpose of this study is an attempt to explore the impact of various market structure elements (Research and Development/ R&D, Advertising, Capital Intensity, Inventory Turnover, and Firm Size) on the financial accounting performance measurements (Return on Equity (ROE) and Return on Assets (ROA)) in the United States pharmaceutical industry. Firms will be selected and analyzed based on two criteria; those who's major manufacturing operations is pharmaceuticals and those whose manufacturing operations may include pharmaceuticals, but they represent only a section of the firms manufacturing operations. This includes approximately 332 publicly traded United States firms. The study findings indicate that firm size and R & D intensity are associated significantly and positively with ROA and ROE, whereas advertising intensity and capital intensity are significantly and positively associated with ROE only in the pharmaceutical industry. However, Inventory Turnover is not statistically significant for both ROA and ROE and cannot be used to determine the financial performance of US pharmaceutical firms.

I. INTRODUCTION

Numerous empirical studies investigating the variables that affect the financial success of the pharmaceutical industry have been published. These empirical studies have used various financial indices, such as Asset-to-net-worth, return on net profit, sales growth, and ROE. They explained and measured those financial indices in terms of independent variables such as, brand power, sales per sales representative, and percentage of revenues from new products, gross sales, and product success rate. Many of these studies used R&D and Advertising Expense as independent variables.

The reasons for the plethora of studies performed on the pharmaceutical industry are likely due to the sizeable growth of the industry as a whole, its sustained profitability, and the volatility of the industry. A single determinant, such as R&D or Advertising expense can cause drastic swings in profitability and company image. This is perhaps most reminiscent of the volatility in the technology sector in the 1990s, where although an industry may have appeared to be steadily profitable, it was actually quite risky.

The primary intention of this study is an attempt to identify the relative significance of six selected market structure elements: Research and Development, Advertising Expense, Capital

Intensity, Inventory Turnover, Firm Size, and Industry type (Drug Manufacturer-Major vs. Drug Manufacturer-Other). It will describe whether these elements explain the profitability of a United States pharmaceutical company, in terms of Return on Equity and Return on Assets. The analysis will empirically examine whether relationships between these market structure elements, which have been established as traditional measures of the pharmaceutical industry and financial performance, are also specifically applied to our selected United States pharmaceutical industry companies.

II. THEORETICAL FOUNDATION OF STUDY

Some empirical studies in industrial organization have taken various market structure elements as given and other related these elements to various aspects of financial accounting performance. One such study analyzed the vulnerability of pharmaceutical companies, with respect to regulatory requirements (Bowman, Navissi, Burgess, 2000) and concluded that pharmaceutical companies with higher advertising expense experience more negative abnormal returns and those firms with higher R&D expense experience less negative abnormal returns. Our empirical study is not consistent with this finding.

Firm Size: Firm size is one of the most acknowledged determinants of a firm's profits in terms of its effect on competitive market power in a given industry (Beard & Dess, 1981). Economies of scale, raw material costs, and production strategy are a few of the benefits larger firms employ because their structure allows for the minimization of operational costs.

With respect to the research presented above, we propose the following hypothesis:

H_{o1}: Firm Size is significantly associated with accounting performance.

Research & Development: The most important expenditure in the profitability of a pharmaceutical firm is R&D expenditure. The role of R&D in larger firms is usually to expand upon the usefulness or effectiveness of the current market products and not investigate new molecular entities (Austin Kile, and Moore, 2006). Another major focus of R&D studies is cost-reduction initiatives to prevent and detect failures sooner by "finding technologies that can identify toxicity and efficacy problems during the discovery and preclinical stages" (Miller, 2006). One empirical study on the correlation between ROE and R&D in the pharmaceutical industry supports four hypotheses: "Pioneering drug manufacturers have a higher coefficient on ROE and lower coefficient on R&D than generic drug firms;" "firm with larger therapeutic market shares have a higher coefficient on ROE and a lower coefficient on R&D;" "Firms with more patents per dollar R&D investment have a higher valuation multiple on a scaled R&D;" and "higher growth in R&D positively affects the ROE valuation coefficient and does not affect the R&D multiple" (Joos, 2000). These supporting hypotheses explain the differences of the effect of R&D as it related to new products vs. generic, market share, patents, and increased R&D expenditures.

With respect to the research presented above, we propose the following hypothesis:

H_o2: R&D Intensity is significantly associated with accounting performance

Advertising Expense: Our study measured Advertising Intensity in terms of Advertising expense as a percentage of the company's gross sales. Another empirical study of the pharmaceutical industry analyzed whether lobbying efforts by pharmaceutical companies affected their public

image and advertising expense (Abboud, 2005). This study also revealed that advertising drugs on television emphasizing their safety and those pharmaceutical companies must be conscious to strike a balance between risk & benefits of drugs in their advertising.

The perception of the regulatory agencies of the industry is just as important (Prescott, 2006; Walter, 2004). Therefore, pharmaceutical companies are concentrating on the importance of advertising expense. This includes striking a balance between its cost and its benefit.

With respect to the research presented above, we propose the following hypothesis:

H_o3: Advertising Intensity is significantly associated with accounting performance

Capital Intensity: A study of Compustat firms showed that capital intensity was not a strong predictor of future ROE, and negatively affects unrecognized net assets (Joos, 2000). Our empirical study measured capital intensity in terms of capital expenditures as a percentage of the company's gross sales.

With respect to the research presented above, we propose the following hypothesis:

H_o4: Capital Intensity is significantly associated with accounting performance

Inventory Turnover: Inventory Turnover is calculated using Cost of Goods Sold as a percentage of the company's ending or average inventory. A study of the Indian pharmaceutical industry compared its performance with that of selected multinational corporations concluded that inventory turnover of the multinational companies was less than the pharmaceutical industry average due to strong brand equity and distribution network (Sankaran, 2002).

With respect to the research presented above, we propose the following hypothesis:

H_o5: Inventory Turnover is significantly associated with accounting performance.

III. RESEARCH METHODS

Conventional economic theory conclude that key economic indicators of a company, are significantly related with some corresponding performance measurements. This study is predominantly designed to examine the appropriateness of applying various previous studies/ empirical research to the United States pharmaceutical industry. The results of the empirical study will be presented through an analysis of the United States pharmaceutical industry via the relationship of six selected variables to two financial performance indicators.

The Selected Samples and Data: A total of 332 pharmaceutical firms (SIC 2834) were used as the sample for the present study. The initial sample was comprised of 365 firms listed in Compact D-Disclosure US Firms (2006). The data for advertising expenditure was additionally extracted from the Research Insight and matched with the initial data for other variables. Only firms for which complete data were available were included in the study. Each of the variables used in the study were calculated as a simple average of the five-year period 2001-2005.

IV. EMPIRICAL MODEL AND VARIABLES SPECIFICATION

An empirical model that captures the essence of the relationships hypothesized in H1 to H5 can be stated as follows:

Profitability = f (Firm size, R&D intensity, Advertising intensity, Capital Intensity, Inventory Turnover).

Firm Size is an algebraic expression of the natural logarithm of the firm's total sales.
Research and Development Intensity is a ratio of the R&D expense to the total sales.
Advertising Intensity is a ratio Advertising Expense to the total sales volume.
Capital Intensity is the ratio of total sales to the total sales volume.
Inventory Turnover is a ratio of the average Inventory volume to the total sales volume.

V. EMPIRICAL RESULTS AND STATISTICAL ANALYSIS

Correlation analysis was done to illustrate the relationship between all employed independent variables and dependent variables with respect to ROA and ROE. Firm size and R&D intensity are positively correlated with ROA and ROE, but other strategic market factors such as advertising intensity and capital intensity are significantly and negatively correlated with ROE at 0.001 level. One obstacle that presents difficulty in proving the hypotheses above is the existence of multicollinearity. The standard statistical method for testing data for multicollinearity is analyzing the individual Variance Inflation Factors. There is no existence of multicollinearity.

The only variable that influences the profitability of a pharmaceutical firm in the United States based on this data is Firm Size and R&D intensity. Firm Size and R&D intensity are statistically significant at least 0.01 level and positively associated with both ROA and ROE. More importantly, the result shows that two other strategic variables such as Advertising Intensity and Capital Intensity are also highly significant at 0.001 level, but negatively associated with ROE.

In order to consider the impact of each individual independent variable on the dependent variable simultaneously, the technique of multiple regression analysis was utilized. The only variable that influences the profitability of a pharmaceutical firm in the United States based on the data is Firm Size and R & D intensity. Firm Size and R & D Intensity are statistically significant at the 0.01 level and positively associated with both ROA and ROE. More importantly, the result shows that Advertising Intensity and Capital Intensity are also highly significant at the 0.001 level but negatively associated with ROE. Contrary to other strategic variables, Inventory Turnover is not statistically significant with respect to all financial accounting performance.

VI. CONCLUSION AND IMPLICATIONS

Based on selected strategic variables employed in this study, Firm Size and R&D intensity are uniformly and positively associated with all accounting financial performance with respect to ROA and ROE in the U.S. pharmaceutical industry. But Advertising Intensity and Capital Intensity have been shown to significantly contribute to a firm's profitability. However, Inventory Turnover does not show any strategic relations with any of the accounting profitability measures. However, R&D is positively and significantly associated with ROE and ROA.

With respect to Firm Size, our empirical research shows there is a positive relationship between firm size and ROE as well as ROA. This is consistent with the research that previously

explains that larger firms should be more profitable and reap other economic benefits, as they have more employees at their disposal.

One interesting result from the statistical analysis is that Advertising Intensity was found to not be statistically significant with respect to ROA, yet was found to be statistically significant with respect to ROE at 0.01 level. H5 for this study must also be accepted because the analysis has failed to prove the existence of a relationship between Inventory Turnover and either ROE or ROA.

Given the impact of a firm's profitability in this highly competitive industry on its reputation and marketability, further exploration needs to be performed on this regression analysis to determine why relationships were found to be insignificant. The exact measure of a firm's profitability may be better illustrated with another dependent variable.

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