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雙軌效果存在嗎?檢驗成本構型對不同績效軌跡群組之影響

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中 文 摘 要 ： 管理相關研究常使用行管費用(含研究發展)衡量企業運用策略或資源帶來之成本優勢，另一方面，此項目也常被用來衡量投入資源以累積無形資產以利未來發展。前述兩個行管費用的角色是相互對立的：前者與企業績效之關係為負，而後者則為正。本研究將行管費區分成行管費(不含研發)及研發費用，採用資源管理觀點，分析行管與績效及研發與績效間之關係，在長期成長軌跡相異的兩個企業群體是否有差異，並以生技產業廠商為研究對象。本研究使用潛在群組分析法找出高績效軌跡及低績效軌跡兩個群體，繼而進行時間序列橫斷面資料分析，檢測不含研發之行管費與研發費之成本構型，對兩個績效軌跡群組之影響。結果發現行管費與研發費用對兩個群體之績效影響有顯著差異。再對個別群體分析的結果顯示，行管費對高績效軌跡群體之績效有正U效果，而對低績效軌跡群體之績效則為倒U效果；研發費用對兩個群體之績效均為正U效果，而研發費用提高對高績效軌跡群體之影響大於低績效軌跡群體。

中 文 關 鍵 詞 ： 成本構型、報酬遞減法則、報酬遞增法則、潛在群組成長分析、時間序列橫斷面資料分析

英 文 摘 要 ： Selling, general, and administrative expense (SG&A), including research and development expenditures (R&D), have been commonly used in management studies to examine the cost advantages generated from corporate strategy or the efficiency of resource employment. They also have been used to indicate the intangible assets that accumulate from the resources employed for future prospects. These two roles of SG&A tell different stories: the former signifies a negative, while the latter presents a positive relation with firm performance. This adopts a resource management viewpoint to examine the differences of the relations of cost configuration between SG&A(excluding R&D) and R&D with performance between groups with heterogeneous performance trajectories, using the pharmaceutical industry as the case. The utilized latent class growth analysis (LCGA) grouped and mapped firms into upper-performance trajectory and lower-performance trajectory subpopulations. Panel data analysis showed that the effects of an increase in SG&A and R&D (both were measured as the percentage to sales) on performance were significantly different between subpopulations of performance trajectory. Furthermore, the SG&A-performance relationship presented a U-shape within the upper-performance trajectory group but showed an inverted U-shape within the lower-performance trajectory group. Both the R&D-performance relationship within the upper-performance trajectory group and the lower-performance trajectory group presented a U-shape, providing that the effect of R&D increase on performance was higher within the former than within the latter.

英文關鍵詞：cost configuration, law of diminishing returns, law of increasing returns, latent class growth analysis, panel data analysis

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管理相關研究常使用行管費用(含研究發展)衡量企業運用策略或資源帶來之成本優勢，另一方面，此項目也常被用來衡量投入資源以累積無形資產以利未來發展。前述兩個行管費用的角色是相互對立的：前者與企業績效之關係為負，而後者則為正。本研究將行管費區分成行管費(不含研發)及研發費用，採用資源管理觀點，分析行管與績效及研發與績效間之關係,在長期成長軌跡相異的兩個企業群體是否有差異,並以生技產業廠商為研究對象。本研究使用潛在群組分析法找出高績效軌跡及低績效軌跡兩個群體，繼而進行時間序列橫斷面資料分析,檢測不含研發之行管費與研發費之成本構型,對兩個績效軌跡群組之影響。結果發現行管費與研發費用對兩個群體之績效影響有顯著差異。再對個別群體分析的結果顯示，行管費對高績效軌跡群體之績效有正 U 效果，而對低績效軌跡群體之績效則為倒 U 效果；研發費用對兩個群體之績效均為正 U 效果，而研發費用提高對高績效軌跡群體之影響大於低績效軌跡群體。

關鍵詞：成本構型、報酬遞減法則、報酬遞增法則、潛在群組成長分析、時間序列橫斷面資料分析

A tale of two paths? the effects of cost configuration on performance trajectories of different groups

Abstract

Selling, general, and administrative expense (SG&A), including research and development expenditures (R&D), have been commonly used in management studies to examine the cost advantages generated from corporate strategy or the efficiency of resource employment. They also have been used to indicate the intangible assets that accumulate from the resources employed for future prospects. These two roles of SG&A tell different stories: the former signifies a negative, while the latter presents a positive relation with firm performance. This adopts a resource management viewpoint to examine the differences of the relations of cost configuration between SG&A(excluding R&D) and R&D with performance between groups with heterogeneous performance trajectories, using the pharmaceutical industry as the case. The utilized latent class growth analysis (LCGA) grouped and mapped firms into upper-performance trajectory and lower-performance trajectory subpopulations. Panel data analysis showed that the effects of an increase in SG&A and R&D (both were measured as the percentage to sales) on performance were significantly different between subpopulations of performance trajectory. Furthermore, the SG&A-performance relationship presented a U-shape within the upper-performance trajectory group but showed an inverted U-shape within the lower-performance trajectory group. Both the R&D-performance relationship within the upper-performance trajectory group and the lower-performance trajectory group presented a U-shape, providing that the effect of R&D increase on performance was higher within the former than within the latter.

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1. Introduction

Prior studies have presented that corporate strategy perspectives complement traditional financial paradigms, such as capital structure choices (Barton and Gordon 1987; 1988; Kochhar and Hitt 1998; O'Brien 2003; Simerly and Li 2000) and cash holdings (Kim and Bettis 2014). On the other hand, financial statements provide useful information for researchers to measure the efficiency and effectiveness of corporate strategy or resource employment (Tang and Liou 2010; Lévesque, Joglekar, and Davies 2012). Among others, selling, general, and administrative (SG&A) costs or expenses are commonly used to serve this purpose. For example, it was used to evaluate the performance of vertical integration (D'Aveni and Ravenscraft 1994), to measure market efficiency (Morgan and Rego 2009), and to identify the sources of cost advantage (Boulding and Christen 2008). These studies took SG&A as costs for generating expected outcomes from corporate strategy or resource employment, so the smaller percentage of SG&A to sales represents higher efficiency and in turn, better performance.

Contrarily, despite that SG&A are recorded as expenses which reduces the current profits on accounting statements, accounting research has been trying to explore the expected rewards from SG&A spending; that is, the creation of intangible assets and improving operating profits in the future (Baumgarten, Bonenkamp, and Homburg 2010; Lev and Sougiannis 1996). SG&A was also used as the measurement of productivity or capabilities (e.g., Chen 2014; Duta, Narasimhan, and Rajiv 1999; Lee and Rugman 2012; Lev and Sougiannis 1996; Wuyts, Stremersch, and Dutta 2004), and the input resource expenditure that generate future value (Banker, Huang, and

Natarajan 2011). These studies have presented that high SG&A expenses may not necessarily result in a lower return.

The above-mentioned two research streams tell different stories about the roles of SG&A in firm performance. Both of the two streams, the conventional methodologies used in most studies presented an underlying assumption that individuals come from a single population of performance. The identical single-population assumption ignores the heterogeneity of strategic choices that lead to long-term firm performance in the industry. However, firms in an industry are heterogeneous in unique resources as the inputs and the performance as the outcomes. Considering that firms are competing on two different axes, the competitive advantage axis and the error axis (Powell and Arrangel, 2007), this paper aims to examine the effects of SG&A and R&D on the persistence of performance, which has not been touched on in prior studies whichever took a cross-section or autoregression analysis perspective. A number of strategic management studies use SG&A and R&D respectively as the proxy variables of marketing and innovation (or knowledge management). Separating R&D from SG&A to test their relations with performance individually allows us to examine the effectiveness of the resource allocation between these functional activities, which are essential for management decisions.

This paper first reviewed the positive and negative perspectives on the function of SG&A and R&D in firm operations and performance in literature and subsequently proposed research hypotheses. The empirical study includes two parts with two methodologies applied to the pharmaceutical industry to test the hypotheses. In the first part, LCGA grouped sample firms into different subpopulations according to their patterns of performance trajectory. The grouping of persistent performance is a two-way blinded task because which objects follow which path and the patterns of those paths are both unknown. LCGA is a longitudinal, multinomial model that is particularly useful in identifying and modeling the probability of membership in distinct

trajectory groups where grouping variables are unobservable or unknown (Jung and Wickrama 2008; Nagin 2001, 2005; Nagin and Tremblay 2001). The performance of firms classified in the subpopulation of the upper trajectory is superior to those in the lower trajectory. The effects of SG&A and R&D (measured as the percentage to sales) in different trajectory subpopulations could be examined.

The second part used panel data regression to examine the effects of SG&A and R&D on firm performance in different subpopulations. The first model used a dummy variable to distinguish the heterogeneous subpopulations and test the difference between the two groups in the effects SG&A and R&D had on their performance. This pooled model assumes that the intercept and slope variances and the functional form of the performance trajectory are invariant across subpopulations. The second model, the intra-subpopulation model, relaxes the restrictions to regresses the SG&A items on performance for each of the subpopulations. Quadratic regressions for both groups were taken for better model fits. The panel data analysis results showed that the effects of SG&A and R&D (measured as the percentage to sales) on performance were significantly different within trajectory subpopulations. The SG&A-performance relationship presented a U-shape within the upper-performance trajectory group but showed an inverted U-shape within the lower-performance trajectory group. In addition, both the R&D-performance relationship within the upper-performance trajectory group and within the inferior-performance group presented a U-shape, providing that the effect of R&D on performance was higher in the former than the latter.

The rest of the paper is organized as follows. The second section reviews different perspectives of SG&A on performance and the research hypotheses are proposed. The third section introduces the LCGA approach. The fourth section describes the empirical study and the results. The final section summarizes the findings and the managerial implications. Suggestions

for future research are also given.

2. Literature review and hypotheses development

SG&A and R&D are expensed as incurred in accordance with general accounting rules and they decrease the annual net profit accordingly. The increase in SG&A is expected to negatively relate to future earnings with respect to its expense natural (Lev and Thiagarajan 1993). Likewise, SG&A was found to be negatively associated with the contemporaneous stock prices, reflecting that the capital market does not recognize the benefits of SG&A on long-term value (Banker et al. 2015). Contrarily, a number of studies presented the positive relationship between SG&A and R&D with firm performance from various aspects. For example, the accounting research stream explores the "sticky" nature of resource employments of a firm. That is, the variation of SG&A costs with revenue increases is greater than the variation for revenue decreases given the managers' expectations of future earnings (Anderson, Banker, and Janakiraman 2003; Brüggen and Zehnder 2014). The SG&A to sales ratio (SG&A ratio, hereafter) was found to be positively correlated with future earnings in the declining period given the stickiness of SG&A ratio. With an alternative aspect, the management perspectives attribute the positive SG&A/R&D-performance relations to intangible assets (Hirschey and Weygandt 1985; Megna and Klock 1993), market-based assets (Srivastava, Shervani, and Fahey 1998; Luo 2008), or knowledge assets (Decarolis and Deeds 1999) created by the resource employments from SG&A expenses and R&D expenditures.

2.1 The "high SG&A to sales ratio is bad" perspective

SG&A expenses are realized on the accounting book as a deduction from the profits in the period

incurred. From the viewpoint of fundamental information the SG&A ratio reveals the management's ability to control costs. Further, an increase in the percentage of SG&A costs to sales represents deteriorating operating cost efficiency (Abarbanell and Bushee 1997; Lev and Thiagarajan 1993). High SG&A expenses can be a serious problem for businesses so good management often attempts to keep their SG&A ratio to a specific ceiling. For many businesses in financial difficulty, cost-cutting initiatives and employee lay-offs are common measures to achieve this goal.

SG&A ratio was taken as a negative factor to firm performance in many studies. For example, D'Aveni1 and Ravenscraft (1994) used SG&A (including advertising and R&D) savings as the economic benefit of a vertical integration strategy. Another article, Boulding and Christen (2008) signified SG&A as one of the cost disadvantages. Morgan and Rego (2009) examined brand portfolio strategy and firm performance providing that marketing efficiency was measured by SG&A to sales ratio, with the position of the smaller, the better. Furthermore, the negative relations between SG&A and performance might come from the underestimation of the benefits of SG&A by the market analysts so that the stock value of firms with large SG&A is underestimated (Banker et al. 2015).

2.2 The "high SG&A to sales ratio is good" perspective

The accounting research streams attribute the positive relations between the increase in SG&A and future earnings to the "stickiness" nature of costs; that is, they increase more with an activity increase than they decrease with an equivalent activity decrease. Stickiness refers to an asymmetric change of costs, where its decline is smaller when a decrease occurs than the rise for increasing activity levels, when accounting for the same amount of change. Anderson, Banker,

and Janakiraman (2007) suggested that SG&A cost is a “sticky” perspective on attribute changes of SG&A ratio in management decisions. They observed that as demand increases, managers tend to increase committed resources to accommodate additional sales, resulting in an increase of SG&A costs during sales-increasing periods. In periods of declining demand, managers may decide not to remove resources if an increase in future revenues is expected. With the earning prediction model, they found that future earnings positively correlated with changes in the SG&A ratio in periods when revenue declined. In addition, a less than proportionate decrease in SG&A costs during sales-decline periods implies that the managerial perspective for the future is positive and vice versa.

The stickiness of operation costs was found to vary with different firm-specific factors. It was greater for functions that relate to an organization's core competency (Balakrishnan and Gruca 2008), for firms with weak corporate governance (Chen and Sougiznnis 2012), and manager’s incentives on earnings target (Kama and Weiss 2013). Thus the positive relationship between an increase in SG&A and performance is conditional to management factors and the feature of firms. Baumgarten, Bonenkamp, and Homburg (2010) distinguished an intentional increase in SG&A from un-intentional increases and concluded that an intentional increase in the SG&A ratio leads to increased future operating earnings for the SG&A-efficient firms. Anderson, Banker, and Janakiraman (2007) identified three factors that may result in an increasing SG&A ratio when revenue declines: (1) fixity of costs, (2) managers’ economic decisions to maintain resources during a downturn, and (3) managers’ failure to control costs. Since firms with higher proportions of fixed SG&A ratio are more likely to have positive future earnings changes when the distribution of revenue over time has a positive drift, a higher SG&A ratio caused by fixity of costs in a revenue-decreasing period would be associated with expectations of increase in future earnings (Janakiraman, 2010).

According to Baumgarten, Bonenkamp, and Homburg (2010), increases in the SG&A ratio caused by managers intentionally retaining slack resources does not indicate operating inefficiency but merely reveals managers' future prospects for the firm. Therefore, increases in the SG&A ratio attributable to cost fixity and the stickiness of SG&A costs in sales-decreasing periods indicate future earnings increases. Likewise, SG&A ratio as evidence of inefficiency and loss of cost control is not necessarily applicable for revenue-decreasing periods since during these periods, cost fixity leads to a reduction in the SG&A ratio.

Except for managers' intentions, the positive relationship between SG&A stickiness and firm performance are also conditional to the firm features. Brüggen and Zehnder (2014) found positive relationships between the level of SG&A stickiness and the sales increase given equity-based executive compensation. In another study, based on the real options theory, Kim et al. (2016) presented that SG&A costs were stickier for firms with internal control weakness (ICW) than for others. The real options theory implies that ICW firms prefer the option to wait for more information about future business prospects and postpone downward adjustments of slack resources.

2.3 The Strategic Viewpoint and Research Hypotheses

Strategy theories attribute the status of business performance to corporate strategy (Porter 1980; 1985) or idiosyncratic and immobile resources (Barney 1991), knowledge management (Grant 1996), capabilities (Teece, Pisano, and Shuen 1997), or other intangible assets/factors. There is always a cost for resource generation and capacity building as well as to keep and continuously accumulate these intangible assets. Various firm expenditures generating the intangibles often are accounted for as operating expenses and are incorporated into the SG&A expenses on the income statement. Resource allocation decision is essential to managing daily operations especially in

rapidly changing environments. Management needs to have the ability to reconfigure a firm's asset structure so as to accomplish the internal and external transformation (Amit and Schoemaker 1993).

R&D expenditure has been a common proxy variable of innovation or knowledge and SG&A minus R&D has been used to measure marketing inputs. Numerous studies provide evidences that intangible assets created by SG&A expenses/R&D expenditure are associated with future profitability. Lev and Sougiannis (1996) showed that R&D and advertising expenses create intangible assets and are positively related to future operating earnings. Chen (2014) presented that financial statements underestimate the intangible assets since SG&A expense has long-term impacts on firm performance and market value. From the perspective of resource-based theory, Lévesque, Joglekar, and Davies (2012) suggested that the allocation among SG&A, R&D, and cost of goods sold (COGS) accumulated resources and formed production function, which were positively related to a firm’s revenue. Similarly, from a knowledge-based view, Decarolis and Deeds (1999) found that R&D spending accumulated stocks and flows of organizational knowledge, which was positively related to performance in the biotechnology industry. Weiss, Naik and Weiss (2009) also found positive effects of R&D investment on stock prices. Yao and Goo (2005) found that intellectual capital (partly measured by R&D expenditure) showed an increasing return on firm value for the top 500 listed companies.

From a marketing aspect, Luo (2008) investigated the role of marketing in the initial public offerings (IPOs) from a large-scale, cross-industry study and concluded that firms’ pre-IPO marketing spending helped reduce IPO underpricing and boost IPO trading in the stock market. Furthermore, a number of studies took SG&A expenses or “stock” (Dutta et al. 1999) as an effective measure of marketing capabilities (e.g., Dutta, Narasimhan, and Rajiv 1999; Lee and Rugman 2012; Wuyts, Stremersch, and Dutta 2004).

The research hypotheses

To trace the sources of competitive advantage, Tang and Liou (2010) presented that firm performance can reveal its own causes by decomposing financial performance. They destructed the return on invested capital (ROIC) to find the possible causes of performance from financial items. The present paper follows a similar approach but replaces ROIC with ROA to depict the resource efficiency of total assets. The DuPont equation deposes ROA into two items: total assets turnover (TAT) and profit margin (PM). While TAT is a non-negative multiplier to enlarge profits, ROA is positive only if PM is positive. PM is calculated as EBIT (earnings before interest and tax) divided by sales. Divide the denominator and the numerator by quantity sold, and we receive the formula of PM per sales quantity as follows:

$$PM = \frac{EBIT}{Sales} = \frac{(Sales - costs)/Q}{Sales/Q} = \frac{p-c}{p} \tag{1}$$

where p denotes unit price, c denotes unit cost of goods, and Q is sales quantity.

Equation (1) reveals that a firm can generate profits via either a higher price from differentiation of products or a lower cost from efficacy management (Porter 1980; 1985). Firms that enjoy higher $p - c$ have a stronger ability to retain slack resources in sales decreasing periods. Managers may tend to decide on a less proportionate change in SG&A. On the other hand, firms that have small difference in $p - c$ may have large pressure to decrease SG&A so as to retain a target return. Any firms that fail to make a quick response to environmental changes will suffer from low profits. This research takes the strategic perspective that SG&A ratio is positively influence performance but the traversing ways for groups with heterogeneous performance trajectories are different. We propose the hypotheses as follows:

HYPOTHESIS 1*: There are two subpopulations operating along different patterns of*

performance trajectory, the upper-performance trajectory and the lower-performance trajectory, in the specific industry.

HYPOTHESIS 2*: The effects of SG&A excluding R&D on performance for the upper-performance trajectory subpopulation are different from those for the lower-performance trajectory subpopulation.*

HYPOTHESIS 3*: The effects of R&D on performance for the upper-performance trajectory subpopulation are different from those for the lower-performance trajectory subpopulation.*

2.4 Diminishing vs. increasing returns of R&D and marketing

Other than the hypotheses described above, we also test whether there is law of diminishing return or increasing return associated with the R&D and SG&A resource inputs. The assumption of diminishing returns suggests that after some level, adding more of one resource of production, providing all others constant, will not result in additional increase in the output. Diminishing returns usually present when increase the use of variable inputs and maintain the same levels of fixed inputs. For example, Saad and Zantout (2014) found that R&D was negatively correlated with performance when it was over-invested. This finding implies an inverted U-shape relationship between R&D and performance. Opposite the diminishing returns, the assumption of increasing returns is defined as the reduction in cost per unit resulting from increased production, realized through operational efficiencies or economies of scale or scope.

R&D

R&D and salesforce expenditures have indirect and direct effects, respectively, on sustained competitive advantage of the US pharmaceutical industry (Ywoh and Roth 1999). The

pharmaceutical industry has higher R&D[1] to sales ratio than other industries in the United States. PhRMA's (2016) study on its members in the biopharmaceutical sector presented that total R&D has grown 50% for the last decade. The report highlights other findings include: the average R&D expenditure to total sales is around 20%; the average time to develop a drug is around 10 to 15 years; less than 12% of drugs that enter clinical trials can receive approval for marketing; and only 2 of 10 marketed drugs can recover the corresponding R&D costs. These facts show that R&D in the pharmaceutical industry is lengthy, costly and highly risky. Congressional Budget Office's report (2006) signifies that R&D costs vary widely from one new product to the other depending on the type of drug, the probability of success, and whether the drug is a new molecular entity not being used before or an incremental modification of an existing drug. The average cost of modifying existing drugs is only about one-fourth of the cost of new drugs. The wide differences in average R&D costs and the coverage patterns reflect firms' heterogeneous research strategies and the choices on product development, all of which together result in the final performance.

The high R&D spending results in a cost structure of high fixed costs and low variable costs. Previous studies have examined the economies of scale in R&D and the conclusions were diverse. Several studies found evidence that the pharmaceutical industry experiences decreasing returns to scale in R&D as the level of R&D expenditures rises (Comanor 1965; Graves and Langowitz 1993; Vernon and Gusen 1974). Alternatively, Schwartzman (1976) suggested that there were significant economies of scale in pharmaceutical research. Further, Henderson and Cockburn (1996) found that larger pharmaceutical firms enjoyed higher benefits from research programs from economies of scale, economies of scope, and spillovers of knowledge.

[1] PhRMA's total R&D includes all R&D spending in the United States by its members and expenditures abroad by U.S. firms and U.S. divisions of foreign firms.

Marketing

Pharmaceutical industry spends on marketing in the form of samples, direct mailing and pharmaceutical representative consultations. According to the information provided by Cegedim Strategic Data (2013), pharmaceutical industry spends more than 90 percent of marketing on physicians and the rest on advertising to consumers (mainly through television commercials). As median percentage of sales, SG&A spending has been higher than R&D for decades (Weiss, Naik, and Weiss 2009). Other than the debates on the ethics problem of marketing through physicians, a few studies signified the benefits of pharmaceutical marketing to the firms. For example, pharmaceutical marketing increases incentives for R&D investment and provides guidance to R&D to comply with consumer preferences (Calfee 2002). In addition, it reduces the price elasticity of demand and allows firms to charge higher prices (Windmeijer et al. 2005).

3. METHODOLOGY

Latent class growth analysis (LCGA)

Conventional multivariate methods are useful in identifying unknown groups among objects with known similar characteristics (e.g., cluster analysis) or to explore unknown common features among known groups (e.g., discriminant analysis). However, many times the exploration is double-blinded so that the groups among objects and the characteristics distinguishing the groups are both unknown. Identification of the groups of firms with heterogeneous performance patterns is also double-blinded because the heterogeneous groups of performance trajectories and the patterns of those trajectories are both latent. LCGA is a statistical methodology originally developed by Nagin and Land (1993) in criminology, and was later adopted by other social science researchers for longitudinal data analysis (Bushway and Weisburd 2006). It is a

semi-parametric group-based trajectory analysis (Jones, Nagin, and Roeder 2001) that combines cluster analysis and latent trajectory analysis. This approach groups individuals in a way that the individual response trajectories within groups are homogeneous but those of different groups are heterogeneous (Berlin, Para, and Williams 2014; Jung and Wickrama 2008; Sturgis and Sullivan 2008). LCGA fits each group with a different model and assigns different parameter values across unobservable subpopulations (Jung and Wickrama 2008).

Rather than grouping by observed outcomes, the LCGA groups firms with similar but unobserved individual growth parameters (Jones, Nagin, and Roeder 2001). It identifies *K* latent classes (the latent trajectory groups) with distinct developmental trajectories depicted by different growth parameters, including intercept and slopes. The growth trajectory identified for each group is based on the vector $Y_i = (y_{i1}, y_{i2}, \cdots, y_{iT}), i = 1, \ldots, n,$ describing the longitudinal sequence of firm *i*'s performance over *T* points in time for *n* firms. The LCGA assumes that there are *K* unobserved trajectory subpopulations of firms within an industry, differing in parameter values, λ_{ik}. Assuming that parameters of the LCGA model are $f(\boldsymbol{y}, \lambda)$, the marginal density function for the time series $\boldsymbol{y}$ can be written as:

$$f(\boldsymbol{y}) = \sum_{k=1}^{K} Pr(\boldsymbol{Y} = \boldsymbol{y} | c = k) Pr(c = k) = \sum_{k=1}^{K} Pr \; f(y, \lambda_{ik}) \tag{2}$$

The form of the likelihood function can be selected to conform to three types of data: count data, psychometric scale data, or binary data. For binary data, which will be used in this research, the likelihood function is based on the Bernoulli distribution.

A binary logit model was used to fit the dichotomous data (superior performance or otherwise) resulting from the "above the industry average" criterion. More specifically, letting Y_{ijk} be the binary performance response (1 = superior; 0 otherwise) for firm *i* at time *t* in group *k*, we have:

$$Pr(Y_{itk}=1)=p_{itk}=\frac{\exp\left(\beta_{0k}+\beta_{1k}Time+\beta_{2k}Time^{2}+\ldots\right)}{1+\exp\left(\beta_{0k}+\beta_{1k}Time+\beta_{2k}Time^{2}+\ldots\right)} \tag{4}$$

$$Pr(Y_{itk}=1)=Pr(Y=y|c=k)$$

where β_{0k} , β_{1k} and β_{2k} denote the latent intercept, latent linear trajectory and latent quadratic trajectory for group *k* respectively. The degree of the polynomial logit model is determined by trying different models and choosing the degree that best fits the data. The ellipsis in the formula represents these higher-order terms.

The grouping is based on the adjusted latent trajectories (reflecting the categorical latent variables) of the firms. Moreover, the entry status, a time-invariant variable, was included to examine and delineate its effect on the groups formed by using the multinomial logit model given by:

$$\Pr(C_i=k|ENTRY_i=entry_i)=\frac{\exp\left(\theta_k+\lambda_k entry_i\right)}{\sum_{k=1}^{K}\exp\left(\theta_k+\lambda_k entry_i\right)} \tag{5}$$

where $C_i = k$ means that firm *i* belongs to group *k*. θ_1 and λ_1 are taken to be zero for identifiability (Jones, Nagin, and Roeder 2001). Figure 1 illustrates the LCGA framework for the grouping membership of the performance trajectories in the present paper.

The maximum likelihood method is used to estimate these unknown parameter vectors that determine the shapes of the trajectories (Jones, Nagin, and Roeder 2001; Jones and Nagin 2007; Haviland, Jones, and Nagin 2011). The marginal density function for the time series ***y*** can be estimated.

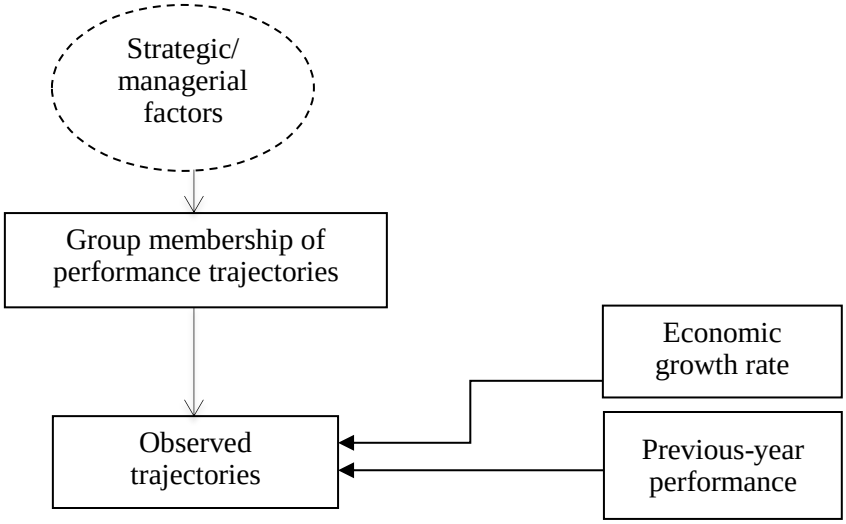


FIGURE 1. Framework for identifying subpopulations of performance trajectory

Liou and Tsai (2016) have successfully used LCGA to identify long-term superior performers in the computer-based services industry. We carried out the LCGA analysis following Liou and Tsai's procedure. In the LCGA, all periods with missing performance values are retained, with the missing data being regarded as random. Economists refer to this approach as exogenous selection (Little and Rubin 1987). It is reasonable to include subjects with missing longitudinal data in the analysis of superior performers, because these firms account for a significant portion of activity in the industry and ought not to be ignored (McGahan and Porter 2003).

To conduct the LCGA, we need to determine the number of trajectory groups and the shapes of the trajectories. SAS Proc Traj software allows for estimating up to a fourth-order polynomial (Jones 2012). As for the number of trajectory groups, no 'correct' solution is available. However, the number of groups can be determined by statistical and/or theoretical criteria (Muthén 2004; Nagin 2005). The trajectory procedure in SAS (Jones, Nagin, and Roeder 2001) uses the Bayesian information criterion (BIC) to determine the model. By using BIC, the risk of overfitting the model to a single sample can be reduced, so as to improve the possibility of

replicating the model findings with future samples (Feldman, Masyn, and Conger 2009). The model with the smallest BIC is the one that best fits the data and is therefore considered the best model.

Panel regression model

This research regressed the ratio of expenditures to sales on ROA for the performance-trajectory groups in three models. The first model formed a panel model with one population. For the first model, all samples will be pooled into one regression equation, controlling for differences in subpopulations by including a dummy variable for each subgroup. This approach assumes that the intercept and slope variances and the functional form of the performance trajectory are invariant across subpopulations (Bollen and Curran 2006). These restrictions were relaxed by an intra-subpopulation model thereafter. For the intra-subpopulation model, this research will divide the subpopulations of business according to the results of the LCGA, computing a separate equation for each population using only the lines of business within that subpopulation. All models consist of control variables including world economic growth rate, firm scale (Logarithm of total assets), and the Herfindahl-Hirschman index (HDF). The respective equations for the panel and intra-subpopulation models are:

$$Y_{it} = INT_i + a_1 \times Y_{i,t-1} + \sum_{k=1}^{K} a_{2k} \times POP_{ik} + \beta_1 \times SG\,\&\,A_{it} + \beta_2 \times R\,\&\,D_{it} + \beta_3 ECO_t + \beta_4 SCALE_t + \beta_5 HDF_t + \varepsilon_{it} \quad (6)$$

$$Y_{ikt} = INT_k + a_{k1} \times Y_{i,t-1} + + \beta_{k1} \times SG\,\&\,A_{ikt} + \beta_{k2} \times R\,\&\,D_{ikt} + \beta_{k3} ECO_t + \beta_{k4} SCALE_t + \beta_{k5} HDF_t + \varepsilon_{ikt} \quad (7)$$

Y_{it} represents performance of firm i at time t while Y_{ikt} represent that of firm i in subpopulation k at time t. POP represents the subpopulation dummy variables. EXP denotes the

item of expenses. HHL is a measure of market concentration, which is the sum of the squares of individual firm's market share. The subscript *k* represents a subpopulation.

The major difference between the Equations (6) and (7) is the way the coefficients for the independent variables were estimated for each group. For each independent variable, the regression using the dummy variable (Equation 6) estimated a single coefficient. For each independent variable, the intra-subpopulation regression (Equation 2) estimated a coefficient for each subpopulation. We then averaged the within-subpopulation coefficients and tested this average for the significance of its difference from zero.

Performance indicator and the percentage of sales method

Several financial indicators have been used to measure the long-term performance of firms. This research uses return on total equity (ROA) because this indicator better fits the goal of this research. ROA measures a company's efficiency and productivity in using the visible assets. Unlike the return on equity that is directly affected by financial leverage, ROA excludes the direct leverage effects driven by capital structure choices. In addition, this indicator is the most popular performance indicator in prior literature studying sustained superior performance. The denominator of ROA is total assets, while the numerator can be earnings before interest and tax, gross/net- tax-of earnings plus interest, or net income after tax. In this research, ROA is calculated as EBIT divided by total assets to exclude the effects of financial burden on performance.

Percentages of sales are common indicators for measuring the efficiency or effectiveness of resource employed by the business. Since advertising expenses were missing for many firms in the Compustat database the study only used the percentage of SG&A excluding R&D (denoted simply SG&A), and R&D expenses over sales.

4. Empirical study

Data and variables

This research focused on the US pharmaceutical industry, in which effective management of R&D and marketing are crucial denominates of competitiveness of each of the firms in the industry. According to European Foundation of Pharmaceutica Industries and Association (efpia 2013) North America accounted for 41.0% of world pharmaceutical sales in 2012 while six out of the top eleven companies were U.S.-based. Sample firms in this research are collected from the Compustat North American Database by standard industrial classification (SIC) code 283x, which includes 2833 ("Medicinal chemicals and botanical products"), 2834 ("Pharmaceutical preparation"), 2835 ("In vitro and in vivo diagnostic substances"), and 2836 ("Biological products, except diagnostic substances"). The pharmaceutical industry is an industry with plentiful innovations that has enjoyed high growth over the last decade, with a great many firms both entering the market and disappearing from the market (died or acquired by other firms) in the space of a few years. There are 1093 such companies from 2000 to 2014 in the Compustat database in total. This period also covers at least two phases of the industry business cycle, if the five-year period depicted by McGahan and Porter (1999) and Rumelt (1991) is accurate. This period also covers the economic turmoil caused by the supreme financial crisis in 2007-08.

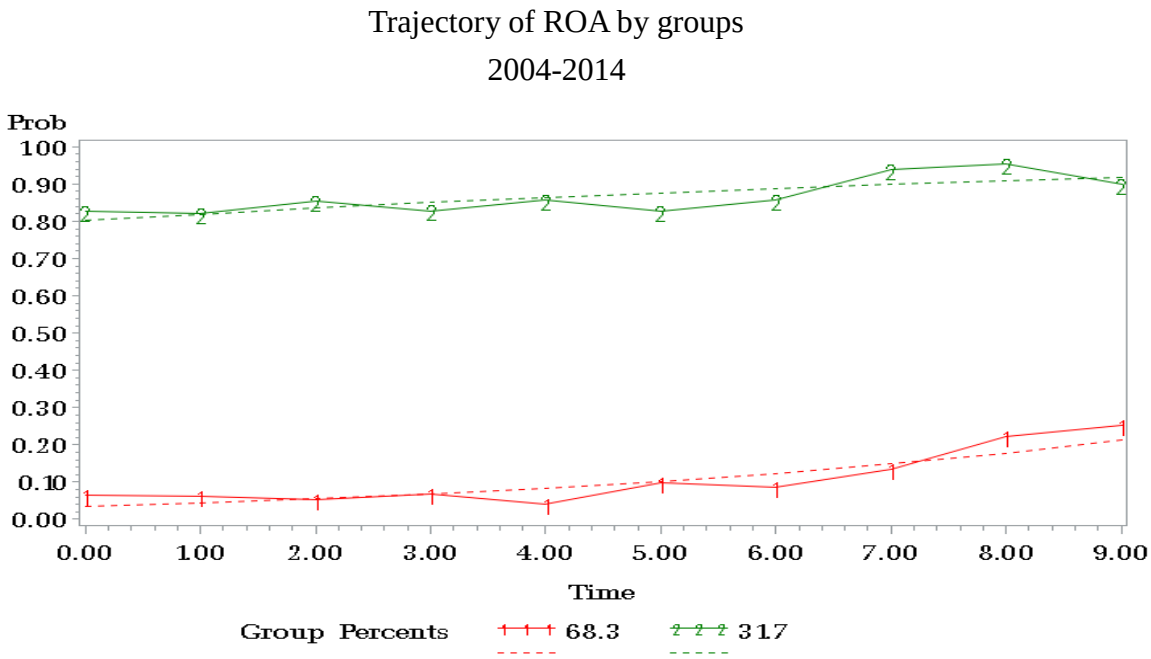
SG&A costs consist of expenditures on R&D, advertising, and the combined payroll costs a company incurs, including salaries and executive compensations, commissions, legal expenses, and travel expenses of executives, sales people and employees. In the empirical study, the SG&A included all expenses except R&D. Both SG&A and R&D were normalized as the percentage of sales. ROA was calculated as EBIT divided by total assets. HFD was estimated as the sum square of the market share of each firm and scale was the natural logarithm of sales.

Identify subpopulations with different patterns of performance trajectory

This section used LCGA to identify subpopulations of performance trajectory in the pharmaceutical industry. ROA was used as the variable to find the latent variables of performance trajectories, including the intercept, the shape, and the associated slopes. ROA was turned into a binary yearly time series. A firm was defined as superior (which was given value of '1') if the performance indicator was above the industry average in that specific year; otherwise its value is '0'.

Only 516 out of the 1093 samples were grouped by the LCGA approach because of missing data. The LCGA approach identified two subpopulations of performance trajectories, the upper-performance trajectory group (31.7%, 164 firms) and the lower-performance trajectory group (68.3%, 352 firms), both of which followed linear growth patterns (Figure 2). High profile companies such as USANA Health Sciences (multi-level marketing company producing various nutritional products and nutraceuticals), Gilead Sciences (research-based biopharmaceutical company), United Gene (predecessor of Innovative Pharmaceutical Biotech), China Biotech (original equipment manufacturing company, Gamma irradiation), Roche (research-based healthcare), and top pharmaceutical companies, Johnson & Johnson, AbbVie, Merck, Pfizer, Eli Lilly (pharmaceutical) etc. were clustered in the upper-performance trajectory group. We further examined the number of years they outperformed the industrial average ROA and found that firms included in the upper-performance trajectory group outperformed nine times among an average of ten operating years while those included in the lower-performance trajectory group only outperformed once among an average of eight operating years. These results confirmed the first hypothesis that there are two subpopulations operating along different performance

trajectory patterns in the pharmaceutical preparation industry.



	Parameter	Estimate	Error	Parameter=0	*p*
Group 1	Intercept	–3.29	0.23	–14.14	0.0000
	Linear	0.22	0.03	7.33	0.0000
Group 2	Intercept	1.40	0.19	7.50	0.0000
	Linear	0.11	0.03	3.43	0.0006
Group membership					
Group 1	(%)	68.31	2.51	27.26	0.0000
Group 2	(%)	31.69	2.51	12.64	0.0000

Note: We have fit three models: 2 groups with linear terms only, 2 groups with a quadratic term; and 3 groups with linear terms. The results showed that BIC (2 groups)= –1755.87 < BIC (3 groups) =–1578; BIC(2,1) =–1750. Linear model was selected for parsimony principle since the BIC of quadratic model was only improved slightly from that of linear model.

FIGURE 2. The Performance Classes identified by LCGA

The descriptive statistics (Table 1) showed that the variation of performance and the SG&A to sales ratio and the R&D to sales ratio were much larger for the lower-performance trajectory

group than the upper-performance trajectory group. In addition, the average scale of the upper-performance trajectory group was bigger than the lower-performance trajectory group.

TABLE 1. Descriptive Statistics

Variable	Median	Mean	Standard deviation
Upper-performance trajectory group			
ROA	0.001	–0.177	0.207
SG&A to sales ratio	0.323	8.235	0.998
R&D to sales ratio	0.177	1.069	3.674
Log(Scale)	4.293	4.759	2.552
Lower-performance trajectory group			
ROA	–0.560	-2.766	2.584
SG&A to sales ratio	0.969	59.284	77.252
R&D to sales ratio	2.064	13.161	191.869
Log(Scale)	1.656	1.705	2.755

Period: 2000-2014, with 1804 in high-performance trajectory group and 3872 data points in low-performance trajectory group.

Test the effects of cost configuration of SG&A and R&D

Table 2 shows the results of panel data regression analysis, which was fitted using pooled estimated general least squares (EGLS) with cross-section weights, for the whole population. A deferential AR(1) model was used to eliminate the autoregressive problem. The Durbin-Watson tests showed that there were no serious autoregressive problems with the final models.

The all sample model showed that SG&A ratio was significantly and positively (0.018^{***}) related and R&D ratio was negatively (-0.006^{***}) related to ROA. The second model used the dummy variable to divide firms into high-level and low-level performance firms (0-superior and 1-inferior). Model 2 showed that the average ROA (increase) of the lower-performance trajectory group was significantly lower (-0.019^{***}) than the upper-performance trajectory group.

Furthermore, the effect of SG&A ratio on ROA was lower (-0.026***) for the lower-performance trajectory group than for the upper-performance trajectory group (0.011***). On the contrary, the effect of R&D ratio on ROA was higher (0.01***) for the lower-performance trajectory group than for the upper-performance trajectory group (-0.003***). Moreover, the SG&A-performance relationship for the upper-performance trajectory group was positive (0.011) but was negative for the lower-performance trajectory group (0.011–0.226=–0.215). While the R&D-performance relationship was negative (–0.003) for the upper-performance trajectory group, it was positive (–0.003+0.01=0.987) for the lower-performance trajectory group. These results supported Hypotheses 2 and 3 that SG&A and R&D affect performance differently between heterogeneous subpopulations of performance trajectory. We further examined the within group effects for each of these two groups.

TABLE 2. Panel data regression analysis: Testing inter-group effects
Model: Pooled EGLS (Cross-section weights)

	Model 1: All firms	Model 2: Grouping firms with dummy
Constant (C)	–0.059***	–0.019***
d(SG&A) (*dm*)	0.018***	0.011***
d(R&D) (*drd*)	–0.006***	–0.003***
d(Scale) (*dsca*)	0.142***	1.457***
d(Growth) (*dg*)	3.342***	0.256***
d(Herfindhle index) (*dhdf*)	–4.312***	–0.145***
Group		–0.022***
Group**dm*		–0.026***
Group**drd*		0.010***
AR(1)		–0.258***
R^2	48.6%	47.6%
Durbin-Watson test	1.99	1.87

Group: 0-superior; 1-inferior; $^{***}p<0.001$, $^{**}p<0.01$, $^{*}p<0.05$.

The linear differential models in Table 3 for the upper and the lower-performance trajectory groups were fitted individually with AR(2) or AR(1) terms. The results show that the linear relationship between SG&A ratio and R&D ratio were insignificant within either group. Scale was the key factor that influenced the ROA within each of the two groups. We further fit quadratic models to test if there were increasing or decreasing return effects within each group. Comparative to the linear model, the R square of the quadratic model (32.6%) was slightly higher for the upper-performance trajectory group but was much improved for the lower-performance trajectory group (from 27.7% to 51.8%). The improved R squares signified that quadratic models had a better fit than the linear model. The results showed that the effects of an increase in SG&A and an increase in R&D on performance growth differed for heterogeneous groups of performance trajectory. The effect of an increase in R&D on performance for both groups showed a U-shape; that is, the effect of R&D on performance was negative at first and then turned positive as SG&A increased up to a turning point. The effect of an increase in SG&A on performance also presented a U-shape for the upper-performance trajectory group but showed an inverted U-shape for the inferior performing group. The U-shape presented an economies of scale associated with the employment of R&D resources for the entire pharmaceutical industry. The inverted U-shape revealed a diminishing return from the employment of marketing resources for the lower-performance trajectory group.

5. Discussion and conclusions

Since SG&A constitute a large portion of a business's cost, practitioners pay close attention to controlling and configuring SG&A spending to generate profits. Controlling SG&A may increase current profits since they are accounted for as expenses. The resources purchased/recruited are

used to generate current profits, however. Further, these resources can probably continue contributing to profits for cross periods. Hence, configuring various resource inputs is essential for long-term superior performance. From the perspective of resource management, this research examined the traverse of SG&A and R&D to the performance of the subpopulations with heterogeneous performance trajectories. Focusing on one industry, the US pharmaceutical industry, we identified the high- and lower-level performance groups, which significantly varied in the long-term performance trajectory. We found that the R&D inputs benefit more to the low-performance trajectory group than to the upper-performance trajectory group. Contrarily, SG&A inputs contribute more to the upper-performance trajectory group than the lower-performance trajectory group.

TABLE 3. Panel data regression analysis: Testing within-group effects

Model: Pooled EGLS (Cross-section weights)

Model type	Linear model		Quadratic model	
Group	Upper-performance trajectory group	Lower-performance trajectory group	Upper-performance trajectory group	Lower-performance trajectory group
Constant (C)	–0.013***	–0.021*	–0.013***	–0.016*
d(SG&A) (*dm*)	–0.009	–0.007	–0.018†	0.016*
d(R&D) (*drd*)	0.004	0.004	–0.018**	–0.008*
$dm \times dm$			0.0004**	–0.0005**
$drd \times drd$			0.00005**	0.00001**
d(Scale) (*dsca*)	0.164***	0.229***	0.156***	0.276***
d(Growth) (*dg*)	–0.076	3.922***	–0.077	3.818***
d(Herfindhle index) (*dhdf)*	0.019	0.828	0.020	1.762*
AR(1)	[a]–0.004***	–0.374***	[a]–0.0004***	–0.387***
R^2	31.8%	27.7%	32.6%	51.8%
Durbin-Watson test	1.99	2.10	2.03	2.09

[a]AR(2); ***p<0.001, **p<0.01, *p<0.05; †p<0.1.

We also distinguished the different effects of SG&A and R&D on performance within the two performance trajectory group. While both groups showed a U-shape relationship between R&D and performance, the relations between SG&A and performance differed. The U-shape relationship between SG&A and performance presents increasing returns to scale (Arthur 1996) after a turning point in the employments of marketing resources for the high-level performance firms. Contrarily, the inverted U-shape relationship between SG&A and performance denotes a diminishing return after a turning point associated with the employments of marketing resources for the low-level performance firms.

These findings contribute to management's knowledge regarding resource management to achieve persist superior performance. The relationship between SG&A and yearly performance depends on the long-term performance and the effectiveness resource utilization of the firm. For the low-level performance firms, the inverse U-shape relationship between marketing resources and performance implies the existence of an optimal allocation of marketing resources. Therefore, up to the turning point, a radical innovation will be necessary for further performance growth since performance cannot be improved by merely employing more marketing resources. For the high-level performance firms, effective management to enhance the economies of scale to increase payoffs from the employments of marketing resources is essential for performance growth. Finally, R&D provides increasing returns to scale after a turning point for the entire pharmaceutical industry. Bhagwat and DeBruine (2011) showed that the pharmaceutical industry enjoys increasing returns to scale from the employments of R&D and advertising. Our study presents similar findings for the high-level performance firms. However, for the low-level performance firms, the increasing returns to scale is mainly from the employment of R&D resources. This paper examined the traverse of SG&A and R&D in search of performance of different groups for a long-term performance trajectory. More industries can be examined to test

the difference of the effects of SG&A and R&D on long-term performance for those specific industries. Similar results might be found in the industry that has big sunk cost (such as computer software industry) as pharmaceutical industry.

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Certificate of Best Paper

This is to certify that the paper titled

"The Effects of Cost Configuration on Performance of Heterogeneous Subpopulations"

Presented by

Fen-May Liou

(SGS-276-105)

Was declared as the **BEST PAPER** of the **Business, Economic, Social Science & Humanities**

In the Singapore 16th International Conference on

"Business, Economic, Social Science & Humanities (BESSH-2016)"

Held at Grand Pacific Hotel Singapore – Singapore

11 – 12 July, 2016

Dr. Malika Ait Nasser (Ph.D.)
Conference Chair
BESSH Secretariat
Academic Fora 2016

企業倫理、企業社會責任與永續發展研討會
優秀論文獎

中華民國 105 年 05 月 14 日
致財字第 1040017 號

劉芬美、蔡淵輝、涂資芬等合著之「雙元能力與永續成長：行銷與研發資源之配置對企業績效之影響」論文乙篇，經本會評獎委員會評為優秀論文。

特頒此狀

致理科技大學財務金融系

中 華 民 國 105 年 5 月 14 日

附件五

科技部補助專題研究計畫出席國際學術會議心得報告

日期：106 年 7 月 18 日

計畫編號	MOST 104－ 2410 － H－ 263 － 005 －		
計畫名稱	雙軌效果存在嗎?檢驗成本構型對不同績效軌跡群組之影響		
出國人員姓名	劉芬美	服務機構及職稱	致理科技大學財務金融系教授
會議時間	106 年 7 月 10 日 至 106 年 7 月 17 日	會議地點	新加坡
會議名稱 1	(中文) (英文)Singapore 16th International Conference on Business, Economics, Social Science & Humanities, July11-12, 2016 Singapore		
發表題目 1	(中文) (英文)The Effects of Cost Configuration on Performance of Heterogeneous Subpopulations		
會議名稱 2	(中文) (英文)International Conference on Engineering, Technology and Management, 15-16 July, 2016, Singapore		
發表題目 2	(中文) (英文)**T**he mediating role of ambidexterity between R&D and marketing with performance		

一、 參加會議經過

本次於新加坡參加兩場研討會，先個別投稿文章獲得接受(附件 1，附件 2)後，簽獲致理科大同意參加研討會。經大會安排於管理類場次進行口頭發表。

(一) Singapore 16th International Conference on Business, Economics, Social Science & Humanities

Venue: Hotel Grand Pacific Singapore

July 11, 2016

08.00am – 09.00am Registration
09:00am – 10: 30am Parallel Session I (Allocated rooms)
10.30am– 11.00am Morning Tea Break
11.00am– 12.30pm Parallel Session II (Allocated rooms)
12.30pm– 02.00pm Lunch
02.00pm– 03.30pm Parallel Session III (Allocated rooms)
03.30pm– 04.00pm Evening Tea Break
04.00pm– 05.30pm Parallel Session IV (Allocated rooms)

July 12, 2016 學者交流活動

獲得最佳論文(附件三)。

(二)International Conference on Engineering, Technology and Management

Venue: Holiday Inn Singapore Atrium

July 15, 2016

08:30 am - 09:00 am	Registration
09:00 am - 09:30 am	Inaugural Ceremony by the Guests
9:30 am - 10:15 am	Session - I: Invited talk by Dr. Seow Ta Wee, Malaysia & Dr. M Muralidhara Rao, India
10:15 am - 10:45 am	TEA BREAK
10:45 am - 01:00 pm	Session - II Presentations (Chair: Dr. Jen-Chia Chang, Taiwan)
01:00 am - 02:00 pm	LUNCH BREAK
02:00 pm - 03:30 pm	Session - III Presentations (Chair: Prof. A V N L Sharma, India)
03:30 pm - 03:45 pm	TEA BREAK
03:45 pm - 05:00 pm	Session - IV Presentations (Prof. Devaki Pendlimarri, India)

July 16, 2016 學者交流活動

二、 與會心得

本次參加兩場研討會，與來自各國之學者交流，包括印度、韓國、馬來西亞、喀麥隆、香港、新加坡，泰國等均有學者參加。

三、發表論文全文或摘要

第一篇 附件四

第二篇 附件五

四、建議

本次參加之第二場研討會有許多南韓之年輕學子發表論文，年輕學子在國際會議中發表研究成果，令人驚艷，建議多給年輕學子出國參加研討會之機會。

五、攜回資料名稱及內容

1. Conference Proceedings, International Conference on “Business Economic, Social Science & Humanities” (BESSH-2016), Singapore
2. Conference Proceedings, International Conference on Engineering, Technology and Management, 15-16 July, 2016, Singapore

六、其他

Certificate of Best Paper

Singapore 16th International Conference on Business, Economics, Social Science & Humanities, July11-12, 2016 Singapore

與同場次學者合照

獲頒 Certificate of Best Paper

（大會提供之照片）

International Conference on Engineering, Technology and Management, 15-16 July, 2016, Singapore

大會未提供照片

附件一　接受函(Singapore 16th International Conference on Business, Economics, Social Science & Humanities, July11-12, 2016)

Office Address: Academic Fora
125 Jalan Setia 5, Jinjang Utara 52000
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April 19, 2016

Fen-May Liou
Department of Finance, Chihlee University of Technology
Contact Email: mayliou@mail.chihlee.edu.tw
Submission Reference Number: SGS-276-105
Submission Title: The Effects of Cost Configuration on Performance of Heterogeneous Subpopulations
Co-author(s): Shih-Yu Yang

Dear Fen-May Liou

On behalf of the conference organizers, I am pleased to write that your proposal **"The Effects of Cost Configuration on Performance of Heterogeneous Subpopulations"** having met the accepted international academic standards of blind peer review, has been accepted for oral Presentation at BESSH-2016. The Conference will be held in Singapore Hotel Grand Pacific on July 11-12, 2016. Your paper will be included in the conference proceeding in a USB and online publication on the website.

You are requested to improve your research in view of reviewers feedback provided with this acceptance letter. As a presenter you are requested to bring your Power Point Presentation Slides with you on the day of conference. You are advised to submit your improved / proof edited version of full paper to us at least one week before the conference so that it can be included in full paper conference proceeding. Please make sure to pay the registration fee and send us the payment proof as soon as possible. Your registration will only be confirmed after receiving the fee payment proof from your side. For details of registration please visit at: http://academicfora.com/bessh-singapore-11-12-july-2016/. In case your paper is multi-authored, each attending author have to register separately and pay the registration fee for the conference.

Please note that securing visa is the responsibility of the individual author (s). Upon registration we can provide you invitation /guarantee letter however It is solely based on discretion of the respective embassy to grant your visa. We can only request the embassy to facilitate your application for this purpose.

Looking forward to welcome you in Singapore on conference day. Thank you for participating in the International Conference on "Business, Economics, and Social Science & Humanities"- BESSH-2016. Should you require any further assistance, please contact the conference secretariat at: SGS276@academicfora.com.

Kind regards

Ms. Grace Ooi
Conference coordinator
BESSH-2016, Secretariat
Email: sgs276@academicfora.com

附件二　接受函 (International Conference on Engineering, Technology and Management, 15-16 July, 2016, Singapore)

---------- Forwarded message ----------
From: **ICETM - July 2016** <icetmjuly2016@easychair.org>
Date: 2016-05-30 13:21 GMT+08:00
Subject: ICETM - July 2016 submission 24
To: Fen-May Liou <fmayliou@gmail.com>

Dear authors,

Please give confirmation of your participation after receiving this mail which helps us for good organization.

On behalf of the Program Committee of the ICETM - July' 2016, it is a pleasure to inform you that your submission entitled:

The mediating role of ambidexterity between R&D and marketing with performance: The case of semiconductor industry in Taiwan.

has been accepted for the presentation in the ICETM - July' 2016.

Hereby we attach the reviewers' comments at the end of this email.
Please try your best to address the comments (if any) and resubmit the revised version in the Conference MS Word version.

This revised version should be submitted on or before 25th June' 2016 (Early bird registration) or 30th June' 2016 (Regular registration) or 5th July' 2016 (Late Registration) along with registration fee under extended round. The paper will be included into the proceedings of the ICETM - July' 2016 after receiving the Registration fee along with the Copyright. Otherwise, the paper will not be included into the proceedings.

The registration of your accepted paper can be done by paying the registration fee on or before 25th June' 2016 (Early bird registration) or 30th June' 2016 (Regular registration) or 5th July' 2016 (Late Registration) under extended round. Scan and send the registration receipt along with the Copyright form and camera ready paper to: info.icetmjuly2016@worldairco.org

For more information, please visit conference website:
http://www.worldairco.org/ICETM%20July%202016/ICETM%20July%202016.html

Congratulations! Looking forward to meet you at the conference.

Reviewer's comments:

****

1. Paper must fit to the conference paper format. Please check your paper with the format given in downloads page of the conference site.
2. Paper organization and presentation is very good.
3. The author has done a good and valuable study on the topic.

Best regards,
Ryan Man.

Certificate of Best Paper

This is to certify that the paper titled

"The Effects of Cost Configuration on Performance of Heterogeneous Subpopulations"

Presented by

Fen-May Liou

(SGS-276-105)

Was declared as the **BEST PAPER** of the **Business, Economic, Social Science & Humanities**

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Singapore 16th International Conference on Business, Economics, Social Science & Humanities, July11-12, 2016 Singapore

BESSH-2016

The Effects of Cost Configuration on Performance of Heterogeneous Subpopulations

Fen-May Liou and Shih-Yu Yang

Department of Finance, Chihlee University of Technology

Content

1. Abstract
2. Introduction
3. Literature review
4. Methodology
5. Empirical study
6. Conclusions and managerial implications

Definitions

- **Cost configuration: consists of the ratios of sales, general, and administrative expenses (SG&A) and of research and development expenditure (R&D) relative to total sales**

- **Heterogeneous population: the within-industry groups that show different growth patterns of performance**

Abstract-1

- **SG&A are booked as expenses but they are more than costs. They are incurred to procure strategic resources, which are expected to benefit the firm continuingly into the future.**
- **This study (1) reviewed the negative and positive perspectives on the function of SG&A in business operations, and (2) proposed hypotheses regarding the effects of SG&A on the persistence of performance in different subpopulations of performance trajectory.**

Abstract-2

- **Two approaches were applied to the pharmaceutical industry to test the hypotheses.**
  - **(1) latent class growth analysis (LCGA), by which firms are grouped into and mapped as superior and inferior subpopulations according to the firms' performance trajectories; and**
  - **(2) the effects of SG&A and R&D (measured as the percentage of sales) on performance in different trajectory subpopulations were subsequently examined by panel data analysis.**

Abstract-3

- **The results showed that**
  - **(1) LCGA identified two groups of firms with different performance trajectories: firms classified in upper trajectory performed superior to those in lower trajectory**
  - **(2) SG&A and R&D ratios are important factors for distinguishing superior performing group from others.**
  - **(3) Effects of these two cost items on performance are not significant within-group.**

Introduction

The aspect of cost

- SG&A is taken as the cost for generating expected outcomes from corporate strategy or resource deployment,
- Smaller percentage of SG&A to sales represents higher efficiency and better performance.

(e.g., D'Aveni and Ravenscraft, 1994; Morgan and Rego, 2009; Boulding and Christen, 2008)

The aspect of benefit

- SG&A contributes to creating intangible assets and improving operating profits in the future.
- It measures productivity or capabilities .
- A high SG&A expenditure may not necessarily result in a lower return

(Lev and Sougiannis, 1996; Baumgarten et al. 2010; Lee and Rugman, 2012).

Contribution of this research

This paper is different from previous research in that it

- **examined the effects of SG&A on the trajectories of firm performance, and**
- **investigated whether these effects differ in heterogeneous groups of performance trajectories.**

Literature review-1

The "high SG&A to sales ratio is bad" perspective

- **An increase in the percentage of SG&A to sales represents deteriorating operating cost efficiency (Lev and Thiagarajan, 1993; Abarbanell and Bushee, 1997)**
- **Saving in SG&A was used as the economic benefits of vertical integration strategy (D'Aveni1 and Ravenscraft, 1994) and was one of the cost disadvantages (Boulding and Christen, 2008).**
- **SG&A ratio was the measurement of marketing efficiency or marketing capability for examining brand portfolio strategy and firm performance (Morgan and Rego, 2009; Lee and Rugman, 2012).**
- **Lower SG&A against sales is better.**

Literature review-2

The "high SG&A to sales ratio is good" perspective

- **Resources created by SG&A expenses are associated with future profitability.**
- **R&D and advertising expenses create intangible assets and are positively related to future operating earnings (Lev and Sougiannis, 1996).**
- **SG&A expenses have long-term impacts on firm performance and market value (Chen, 2014)**
- **SG&A expenses or "stocks" (Dutta et al., 1999) were taken as an effective measure of marketing capabilities (Dutta et al., 1999; Wuyts et al., 2004; Lee and Rugman, 2012).**

Literature review-3

The "SG&A is sticky" perspective

- **as demand increases, managers tend to increase committed resources to accommodate additional sales, resulting in SG&A costs increase in sales-increasing periods.**
- **managers' expectation of future sales recovery affects their decision to retain slack resources in sales-decreasing periods (Anderson et al. 2003).**
- **SG&A ratio as evidence of inefficiency and loss of cost control is not necessarily applicable for revenue-decreasing periods since during these periods, cost fixity leads to a reduction in the SG&A ratio (Baumgarten et al. (2010).**

Strategic Viewpoint-1

The strategic viewpoint and research hypotheses

- **SG&A ratio is positively related to future performance from strategic viewpoint.**
- **Firm performance can reveal its own causes (Tang and Liou, 2010).**

$$PM = \frac{EBIT}{Sales} = \frac{(Sales - costs)/Q}{Sales/Q} = \frac{p - c}{p}$$

- **A firm can generate profits via either a higher price from differentiation of products or a lower cost from efficacy management (Porter, 1980; 1985).**

Strategic Viewpoint-2

The strategic viewpoint and research hypotheses

$$PM = \frac{EBIT}{Sales} = \frac{(Sales - costs)/Q}{Sales/Q} = \frac{p - c}{p}$$

- **Firms that enjoy large difference in $p - c$ have stronger ability to retain slack resources in sales-decreasing periods. Managers may take a less proportionate change in SG&A.**
- **On the other hand, firms that have small difference in $p - c$ may have higher pressure to decrease SG&A so as to retain a target return.**

Hypothesis-1

The strategic viewpoint and research hypotheses

- **Hypothesis 1: There are two subpopulations operating along different patterns of performance trajectory, the upper-performance trajectory and the lower-performance trajectory (Powell and Arregle, 2007).**

- **Hypothesis 2: The effects of SG&A excluding R&D ratio on performance trajectory are lower for the upper-performance trajectory subpopulation than the lower-performance trajectory subpopulation.**

Research Hypothesis-2

The strategic viewpoint and research hypotheses

- **Hypothesis 3: The effects of R&D ratio on performance trajectory are higher for the upper-performance trajectory subpopulation than the lower-performance trajectory subpopulation.**

Methodology-1

Latent class growth analysis (LCGA)

- **LCGA groups firms with similar individual growth parameters (Jones *et al*., 2001).**
- **It identifies *K* latent classes (the latent trajectory groups) with distinct developmental trajectories depicted by different growth parameters including intercept and slopes.**
- **The growth trajectory identified for each group is based on the vector describing the longitudinal sequence of firm *i*'s performance over *T* points in time for *n* firms.**

$$\Pr(Y_{itk}=1)=p_{itk}=\frac{\exp\left(\beta_{0k}+\beta_{1k}Time+\beta_{2k}Time^{2}+\ldots+\delta_{1k}Y_{i,t-1}+\delta_{2k}ecog_{t}\right)}{1+\exp\left(\beta_{0k}+\beta_{1k}Time+\beta_{2k}Time^{2}+\ldots+\delta_{1k}Y_{i,t-1}+\delta_{2k}ecog_{t}\right)}$$

Methodology-2

Latent class growth analysis (LCGA)

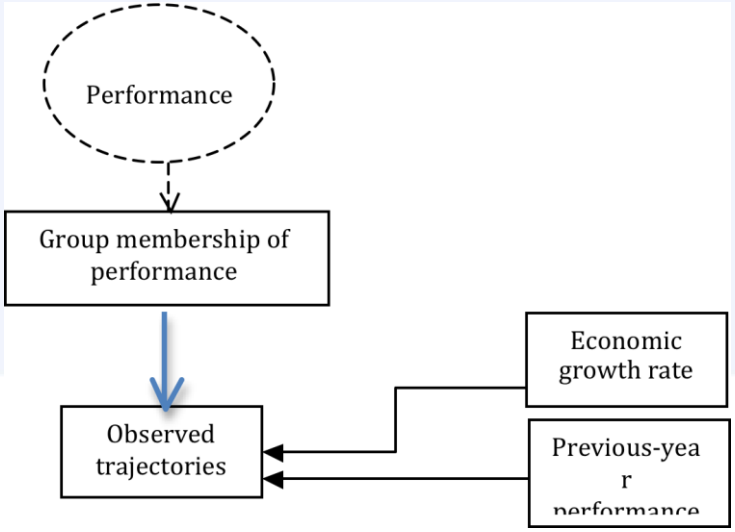
- **LCGA allows for incorporating variables including both time-dependent covariates and time-invariant predictors (Jones *et al*., 2001) into model.**
- **This research included performance of previous year (see Bollen and Curran, 2004 and 2006, Section 7.5) and the annual global economic growth rate, both time-varying variables, in order to partial out the effects of path dependence (Antonelli, 1997) and environmental changes.**
- **The adjusted latent trajectories of the firms better reflect the latent factors driving the performance changes over time. .**

$$f(\boldsymbol{y}) = \sum_{k=1}^{K} Pr(\boldsymbol{Y} = \boldsymbol{y} | c = k, ECOG = ecog) Pr(c = k | Entry_i = entry_i)$$

Methodology-3

Latent class growth analysis (LCGA)

- **The maximum likelihood method is used to estimate these unknown parameter vectors that determine the shapes of the trajectories (Jones *et al*., 2001; Jones and Nagin, 2007; Haviland *et al*., 2011). The marginal density function for the time series *y* can be estimated.**



Methodology-4

Panel regression model

- **All-sample model**

$$Y_{it} = INT_k + a_1 \times Y_{i,t-1} + \sum_{k=1}^{K} \alpha_k \times POP_{ik} + \beta_1 \times EXP_{it} + \beta_2 ECO_t + \beta_3 SCALE_{it} + \beta_4 HHL_t + \varepsilon_{it}$$

- **Subpopulation model: the upper- and the lower-performance**

$$Y_{ikt} = INT_k + a_{k1} \times Y_{i,t-1} + \beta_{k1} \times EXP_{kit} + \beta_{k2} ECO_t + \beta_{k3} SCALE_{kit} + \beta_4 HHL_t + \varepsilon_{kit}$$

Y_{it} : performance of firm *i* at time *t*; Y_{ikt} : performance of firm *i* in subpopulation *k* at time *t*; *POP*: the subpopulation dummy variables; *EXP*: the item of expenses; *HHL*: a measure of market concentration; *k:* subpopulation

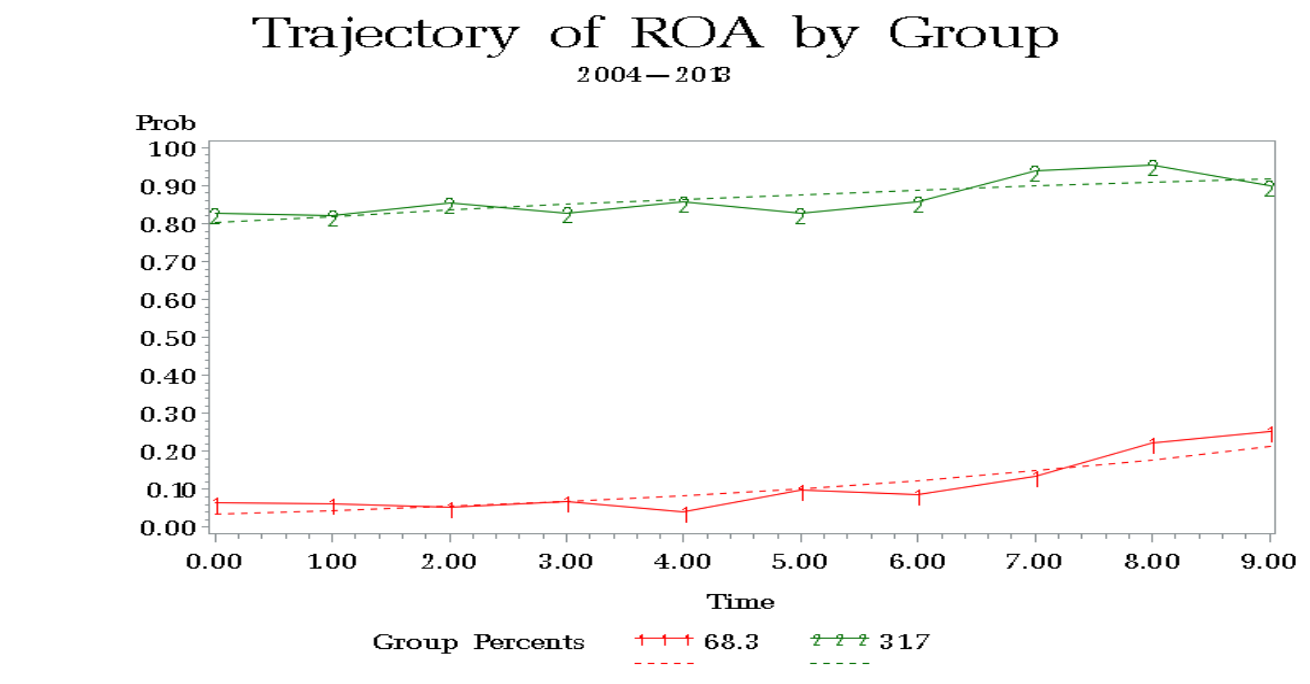
Empirical Study

Sample

- **Sample firms in this research are pharmaceutical companies in the Compustat North American Database by standard industrial classification (SIC) code 283x, which includes 2833 ("Medicinal chemicals and botanical products"), 2834 ("Pharmaceutical preparation"), 2835 ("In vitro and in vivo diagnostic substances"), and 2836 ("Biological products, except diagnostic substances").**
- **There are 1093 such companies in the Compustat database from 2000 to 2014 in total.**

Empirical Study

Result of LCGA



Empirical Study

Results of panel data analysis

	All firms	Grouping firms	Superior group	Inferior group
Constant (C)	–0.059***	–0.019***	–0.013***	–0.021*
d(SG&A) (dm)	0.018***	0.011***	–0.009	–0.007
d(R&D) (drd)	–0.006***	–0.003***	0.004	0.004
d(Scale) (dsca)	0.142***	1.457***	0.164***	0.229***
d(Growth) (dg)	3.342***	0.256***	–0.076	3.922***
d(Herfindhle index) (dHDF)	–4.312***	–0.145***	0.019	0.828
Group		–0.022***		
Group*dm		–0.026***		
Group*drd		0.010***		
AR(1)		–0.258***	[a]–0.04***	–0.374***
R^2	49%	48%	32%	28%
Durbin-Watson test	1.99	1.87	2.04	2.09

Group: 0-superior; 1-inferior; [a]AR(2); ***p<0.001, **p<0.01, *p<0.05.

Conclusion

- **SG&A and R&D ratios are important factors for distinguishing superior performing group from others.**
- **However, the effects of these two cost items on performance were not significant within each of the two groups.**
- **These results imply that the diverse cost configuration explains at least a part of the heterogeneity in the sustainability of firm performance.**

Conclusion

- **The results confirmed the first hypothesis that there are two subpopulations operating along different patterns of performance trajectory in the pharmaceutical industry.**
- **Furthermore, the effect of SG&A ratio on ROA was lower (-0.026***) for the inferior group than for the superior group (0.011***).**
- **On the contrary, the effect of R&D ratio on ROA was higher (0.01***) for the inferior group than for the superior group (-0.003***).**

Research Constraints

- **The research constraint was mainly associated with data availability.**
- **SG&A costs consist of expenditures on R&D, advertising, and the combined payroll costs including salaries and executive compensations, commissions, legal expenses, and travel expenses of executives, sales people and employees a company incurs.**
- **Advertising expense data is not available for many companies so this variable was not included in the model.**

Thank you for listening.
Any questions or comments are welcome.

International Conference on Engineering, Technology and Management
15-16 July, 2016, Singapore

The mediating role of ambidexterity between R&D and marketing with performance

Fen-May Liou, Yuan-Hui Tsai and Chih-Pin Huang

Department of Finance, Chihlee University of Technology

Content

1. Abstract
2. Introduction
3. Theoretical background and hypotheses
4. Empirical study
5. Conclusions and managerial implications

Abstract

- **This paper examined the mediating roles of ambidexterity, which was measured by exploration and exploitation, in the relations between resource employments of research and development (R&D) and marketing with performance from financial perspective.**

Abstract

- **With the data from the semiconductor industry in Taiwan in 2015, This paper found that**
  1. **both R&D and marketing resource employments had direct positive effects on performance;**
  2. **while the employment of marketing resources had a positive effect on exploitation, the R&D resources had a negative effect on exploration;**

Abstract

- **With the data from the semiconductor industry in Taiwan in 2015, This paper found that**
  3. **the mediating role of the exploration between the employment of R&D resources and the performance was supported; and**
  4. **the exploration reduced the effects of the R&D resource employments on performance.**

Research Questions

- **The perspective of dynamic capabilities indicates the top managers' decision to reallocate and reconfigure organizational resources to build ambidexterity (O'Reilly and Tushman, 2013).**
- **The unanswered questions are:**
  - **how the allocation of organizational assets affect ambidexterity building; and**
  - **how ambidexterity transforms resource employments to performance?**

Research Approach

- **Instead of using subjective measurements, this paper estimated exploration and exploitation with financial variables, an objective measurement that is easy to assess and allows long-term analysis.**

Introduction

- **Organizational ambidexterity is reflected in a complex set of decisions and routines that enable an organization to sense and seize new opportunities through the reallocation of organizational assets (O'Reilly and Tushman, 2013).**
- **This paper focuses on one single aspect of ambidexterity from the perspectives of managerial employment of resources to R&D vis-a-vis marketing.**

Introduction

- **Which of R&D or marketing functions should be empowered more to achieve management objectives has been a subject of debate (O'Connell, 2014).**
- **marketing usually represents a significant aspect of exploitation of existing assets of a firm with relatively certainty of proven benefits (Stock and Reiferscheid, 2014).**
- **R&D represents exploration to secure new yet uncertain business opportunity over a longer period (Mudambi and Swift, 2014).**
- **There is an inherent tension between marketing and R&D given scarce resources.**

Theoretical Model and Hypotheses

- **Management consists of two simultaneous tasks involving maximizing value through the optimal employment of existing resources and capabilities and developing firm's resource base for the future (Grant, 1996).**
- **Resource allocation not only affects performance directly but also enhances capacity building of functional activities and final performance (Tang and Liou 2010).**

Theoretical Model and Hypotheses

R&D and performance

- **R&D expenditure is generally believed to drive technological advancements and firms' growth. The relationship between R&D expenditure and firm performance is unclear.**
- **While some studies found a positive relationship between R&D and firm performance (Anderson, 1988; Chan et al., 1990; Hall, 2007), others found a negative relationship (Artz, 201) or insignificant relationship (Chan et al., 2001).**

Theoretical Model and Hypotheses

Marketing and performance

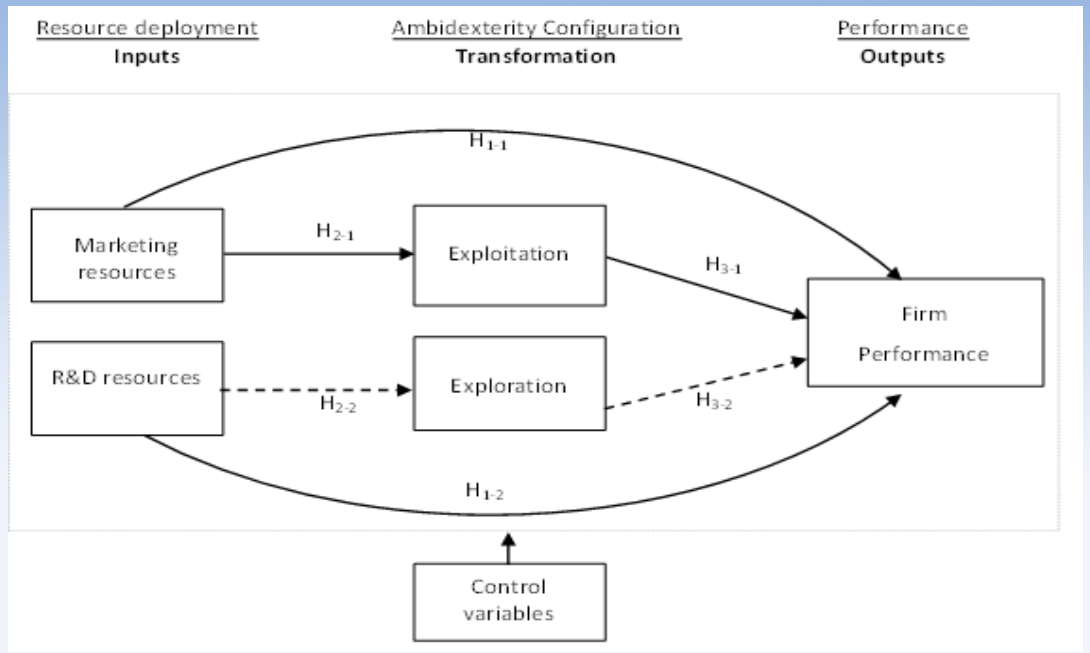
- **Marketing spending strengthens product differentiation, enhances consumer recognition (Aaker and Myers, 1987), and creates brand equity and market-based assets (Mizik, and Jacobson, 2003), all of which contribute to profitability.**
- **A number of studies have signified the positive relationships between marketing or advertising spending and performance (Morgan, 2009; Mizik, and Jacobson, 2007; Luo, 2008; Kim and McAlister, 2011).**

Theoretical Model and Hypotheses

The mediating role of ambidexterity between resource employments and performance

- **Ambidexterity suggests that firms have to be aligned and efficient in managing their current business demands while simultaneously being adaptive to changes in the environment (March, 1991).**
- **To achieve concurrent and future goals, ambidextrous firms not only allocate resources to maintain the mature part of the business but also devote existing assets and capabilities to new sectors for sustainability (Floyd and Lane, 2000; O'Reilly III and Tushman, 2013).**

Theoretical Model and Hypotheses



- **Proposition 1: The employments of R&D and marketing resources have direct effects on the financial performance.**
- **Proposition 2-1: The exploitation mediates the effect of the employments of marketing resources on firm performance.**
- **Proposition 2-2: The exploration mediates the effect of the employments of R&D resources on firm performance.**

Empirical Study

Variables

- **Resource employment:** $rd = \frac{R\&D}{Sales}$ $m = \frac{Selling\ expense}{Sales}$
- **Exploration and exploitation:** $EPR = \frac{PB\ ratio}{rd}$ $EPI = \frac{NOP}{m}$
- **Performance:** $ROE = \frac{Net\ income}{total\ equity}$
- **Control variables:**
  - **Scale: the logarithm of total assets**
  - **equity multiplier:** $EM = \frac{Total\ assets}{total\ equity}$

Empirical Study

Data source

- **The present paper collected 145 semiconductor firms in the Taiwan Economic Journal Database, which provides expenses items including selling, R&D, and general management.**
- **Most semiconductor players are business-to-business (B2B) manufacturers, which provide chips or services to the branded products.**

Empirical Study

Modeling procedure

- **The present paper used the EViews 7.0 object to perform regression analysis for the sample data.**
- **The variation inflation factor (VIF) showed a value less 10, indicating that there is no collinearity problem with the regression model.**

Empirical Study

Hypotheses testing

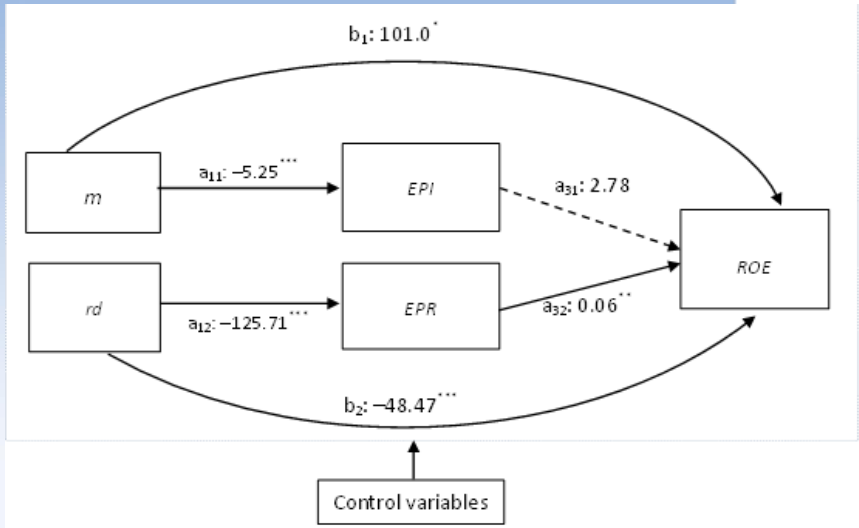
Direct effects

Testing the indirect effects

	Model 1	Model 2-1	Model 2-2	Model 3	Model 4
Dependent Variables	ROE	EPI	EPR	ROE	ROE
Intercept	–54.48**			-118.59***	-47.02***
m	101.00*	–5.25***			82.68*
rd	–48.74***		–125.17***		-30.32**
Exploitation (NOPLAT/m)				2.78	3.79†
Exploration (mb/rd)				0.06***	0.04†
Scale (log(TA))	5.12***	0.05***	2.89***	5.30***	4.28***
Equity multiplier	–1135.48***	-5.21	976.64*	0.55***	-1073.47***
Adjusted R square	0.33	0.29	0.35	0.22	0.35
Observations used	178	173	172	167	167

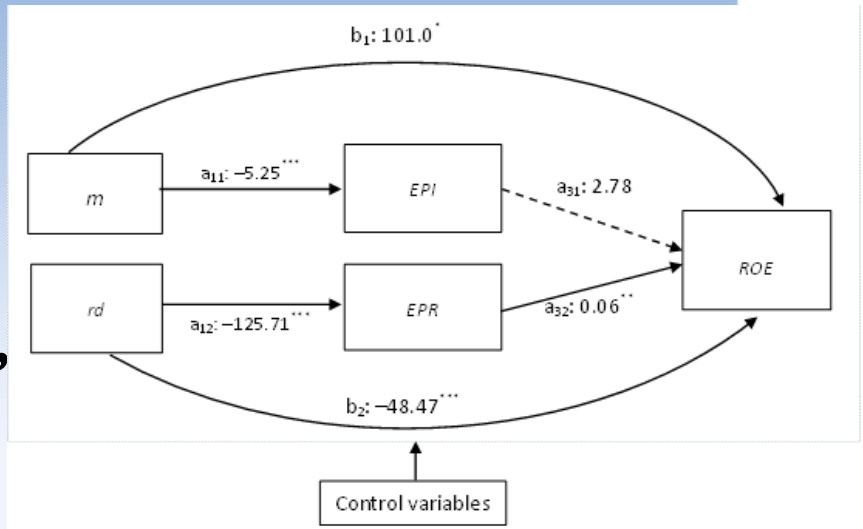
Conclusions

- The direct effects of employments of marketing and R&D resources on performance were positive .
- The effect of exploration on performance was also positive but the linkage between exploitation and performance was not significant.



Conclusions

- **The relationship between R&D resource employment and exploration was negative, which reduced the effects of the R&D resource employments on performance.**



The relationship between exploitation and performance was not significant.

- **The coefficient of R&D in Model 4 was smaller than that in Model 1, indicating a partial mediating effect.**

Managerial Implications

- **For the semiconductor firms in Taiwan, the employment of marketing and R&D resources failed to build up the exploitation for short-term profitability and the exploration for long-term growth.**
- **These findings suggest that Taiwan semiconductor players generate more profits from tangible capital expenditure than from intangible capability building. The weakness in ambidextrous operation might be a challenge for them to meet the competition from the red supply chain in China.**

Research Constraints

- **The constraints of this research associated mainly with data availability.**
- **The proxy variables, R&D and marketing, are expense items in accounting books, which do not include intangible resources; thus, they might underestimate resources actually employed.**
- **The present study only investigated one year data. Longitudinal data could be used to examine the mediating role of dynamic ambidexterity between resource employments and firm performance.**

Thank you for listening.
Any questions or comments are welcome.

科技部補助計畫衍生研發成果推廣資料表

日期:2016/07/15

科技部補助計畫	計畫名稱: 雙軌效果存在嗎?檢驗成本構型對不同績效軌跡群組之影響
	計畫主持人: 劉芬美
	計畫編號: 104-2410-H-263-005- 學門領域: 策略管理

無研發成果推廣資料

104年度專題研究計畫成果彙整表

計畫主持人：劉芬美	**計畫編號：**104-2410-H-263-005-
計畫名稱：雙軌效果存在嗎?檢驗成本構型對不同績效軌跡群組之影響	

成果項目					量化	單位	質化 （說明：各成果項目請附佐證資料或細項說明，如期刊名稱、年份、卷期、起訖頁數、證號...等）
國內	學術性論文	期刊論文			0	篇	1. Latent trajectories of competitive heterogeneity: Bridging the gap in theories between persistent performance and value creation. Corporate Management Review, 36(1),2016,1-36.(TSSCI) 2.公私合夥專案計畫於規劃階段合約談判之最佳解，中國土木水利工程學刊，第二十八卷，第二期，117－128, 2016。(EI)
		研討會論文			0		「雙元能力與永續成長：行銷與研發資源之配置對企業績效之影響」，企業倫理、企業社會責任與永續發展研討會，台北，致理科技大學，民國105年5月14日。(優秀論文獎)
		專書			0	本	
		專書論文			0	章	
		技術報告			0	篇	
		其他			0	篇	
	智慧財產權及成果	專利權	發明專利	申請中	0	件	
				已獲得	0		
			新型/設計專利		0		
		商標權			0		
		營業秘密			0		
		積體電路電路布局權			0		
		著作權			0		
		品種權			0		
		其他			0		
	技術移轉	件數			0	件	
		收入			0	千元	
國外	學術性論文	期刊論文			1	篇	1. The mediating role of ambidexterity between R&D and marketing with performance: The case of semiconductor industry in Taiwan. International Journal of Conceptions on Management and Social Sciences Vol. 4, Issue. 3,

						June, 2016; ISSN: 2357－2787. 2. The effects of mass rapid transit station on the house prices in Taipei: the hierarchical linear model of individual growth. Pacific Rim Property Research Journal, 22(1), 3-16.
		研討會論文			1	Full Paper Proceeding BESSH-2016, Vol. 228- Issue.16, 1-9: The Effects of Cost Configuration on Performance of Heterogeneous Subpopulations.(Best Paper Award)
		專書			0	本	
		專書論文			0	章	
		技術報告			0	篇	
		其他			0	篇	
	智慧財產權及成果	專利權	發明專利	申請中	0	件	
				已獲得	0		
			新型/設計專利		0		
		商標權			0		
		營業秘密			0		
		積體電路電路布局權			0		
		著作權			0		
		品種權			0		
		其他			0		
	技術移轉	件數			0	件	
		收入			0	千元	
參與計畫人力	本國籍	大專生			4	人次	
		碩士生			3		
		博士生			0		
		博士後研究員			0		
		專任助理			0		
	非本國籍	大專生			1		
		碩士生			0		
		博士生			0		
		博士後研究員			0		
		專任助理			0		

其他成果 （無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。）	1. 最佳論文獎一篇，Singapore 16th International Conference on “Business, Economics, Social Science & Humanities, 11-12 July, 2016, Singapore。 2. 優秀論文獎一篇，企業倫理、企業社會責任與永續發

	展研討會(全國徵稿)，2016年5月14日，致理科技大學。 3. 期刊論文:TSSCI 一篇、EI 一篇，其他兩篇。

科技部補助專題研究計畫成果自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現（簡要敘述成果是否具有政策應用參考價值及具影響公共利益之重大發現）或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估
   ■達成目標
   □未達成目標（請說明，以100字為限）
   　□實驗失敗
   　□因故實驗中斷
   　□其他原因
   說明：

2. 研究成果在學術期刊發表或申請專利等情形（請於其他欄註明專利及技轉之證號、合約、申請及洽談等詳細資訊）
   論文：■已發表　□未發表之文稿　□撰寫中　□無
   專利：□已獲得　□申請中　■無
   技轉：□已技轉　□洽談中　■無
   其他：（以200字為限）
   (1)TSSCI: Corporate Management Review, 36(1), 1-36. (2)Best Paper Award: Singapore 16th International Conference, July11-12, 2016.(3)優秀論文獎，企業倫理、企業社會責任與永續發展研討會，105/5/14。

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性，以500字為限）
   本研究在國際研討會獲得〔最佳論文〕榮譽。本研究利用潛在群組成長分析法，找出全球生技產業長期績效高與低兩個異質性群體，並且發現個別資源投入對各群體之效果相異，此結果整合資源基礎理論及動態能力：資源本身不足以決定企業之長期績效，必須佐以動態能力，才能達到長期較優績效。本研究將心理學之研究方法應用於策略管理，在研究方法上具有創新；研究結果除了對生技產業發展提出管理意涵外，亦對研究策略與績效相關之學術研究具參考價值，亦即，利用財務指標分析競爭策略與績效之關係時，不宜忽略產業內異質群體之差異。

4. 主要發現
   本研究具有政策應用參考價值：□否　■是，建議提供機關經濟部工業局
   （勾選「是」者，請列舉建議可提供施政參考之業務主管機關）
   本研究具影響公共利益之重大發現：■否　□是
   說明：（以150字為限）
   本研究發現生技產業內，長期表現優勢之企業在研發及行銷上都呈現報酬遞增

趨勢，顯示享有規模經濟之效益；而長期績效較低之企業，在行銷上卻呈現報酬遞減趨勢，顯示這些企業欲提昇競爭力，必須在產品或技術上有創新改變才能竟功。