# ESSAYS ON FIRM GROWTH AND SURVIVAL AS A *FORTUNE* 500 FIRM

A Dissertation

by

GAUTHAM GOPAL VADAKKEPATT

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2010

Major Subject: Marketing

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Approved by:

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| Co-Chairs of Committee, | Venkatesh Shankar |
| | Rajan Varadarajan |
| Committee Members, | David Szymanski |
| | Steve Puller |
| Head of Department, | Rajan Varadarajan |

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# ABSTRACT

Essays on Firm Growth and Survival as a *Fortune* 500 Firm. (August 2010)

Gautham Gopal Vadakkepatt, B.T.C, Trichur, Calicut University;

M.En.; M.S., Texas A&M University

Co-Chairs of Advisory Committee: Dr. Venkatesh Shankar
Dr. Rajan Varadarajan

In this dissertation, I develop frameworks and models capturing the effects of marketing capital and R&D capital on firm growth and sustained membership in the *Fortune* 500 cohort. Drawing on the resource-based view (RBV) of the firm and industrial organization theories, in the first essay, I develop hypotheses on the relationships among a firm's marketing capital, R&D capital, key firm-specific and industry-specific factors and survival as a *Fortune* 500 firm. I test these hypotheses using a proportional hazard model on a uniquely compiled large panel data set of manufacturing *Fortune* 500 firms over a 25-year period. The results show that while both marketing and R&D capitals have significant and direct positive associations with survival as a *Fortune* 500 firm, the moderating effects of industry growth on the relationships between marketing capital and survival as a *Fortune* 500 firm and between R&D capital and survival as a *Fortune* 500 firm is asymmetric. It is positive for marketing capital but negative for R&D capital. Thus, to retain firms' position on the *Fortune* 500 list, managers may want to consider investing more in marketing (R&D) when industry growth is high (low).

In the second essay, I examine the effect of advertising capital and R&D capital, their complementarities, and their interactions with the environmental contingency factors of dynamism, munificence, and complexity on sales growth, profit growth, and market value growth. Using dynamic panel data analysis of 185 firms over an eight year period (2000-2007), I uncover a nuanced understanding of how advertising and R&D capital affect these performance measures. My results show that both R&D capital and advertising capital directly affect sales growth, but neither has a direct impact on profit growth. Furthermore, R&D capital has a direct impact on market value growth. I also find that while the interaction of advertising capital and R&D capital does not directly affect sales growth or market value growth, it has a positive direct impact on profit growth. Finally, I find that environmental contingencies matter. For instance, environmental dynamism negatively (positively) moderates the relationship between R&D (advertising) capital and sales growth.

# DEDICATION

To my parents S. Narayana Menon and Meena N. Menon, my wife, Stephanie, and in memory of my Uncles Manchunath and Sasidharan

# ACKNOWLEDGEMENTS

Completing this dissertation would not have been possible without the guidance of my committee members and support of my family and friends.

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My heartfelt thanks go to my family. My loving parents, whose undefeatable faith and confidence in me has inspired me through the ups and downs of the Ph.D.

program. My grandmother and brother have been my biggest cheerleaders, always reminding me of my goals and the family that stands behind me. My Uncles Manchunath and Sasidharan, who have passed on before I could achieve this milestone, but who played a very important role in me getting to this stage. My Uncle Ramgopal and Aunt Lakshmi, who have provided a multitude of support during my time in the U.S. Finally, my dissertation would not be complete without the love and support of my wife, Stephanie. I am extremely thankful for her patience, understanding, and her numerous sacrifices.

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# CHAPTER I

# INTRODUCTION

Recent years have seen the emergence of intangible assets as a key source of competitive advantage (Nakamura 2003). Two key intangible assets are R&D capital, defined here as the cumulative stock of a firm's R&D expenditures after they have been appropriately depreciated, and marketing capital, defined here as the cumulative stock of a firm's marketing expenditures after they have been appropriately depreciated.

R&D capital and marketing capital have grown in importance for numerous reasons. First, innovation and marketing are two core functions of a firm (Drucker 1993) and a firm's R&D and marketing capital reflects its emphasis on these core functions. Second, R&D capital and marketing capital align well with two core competencies of a firm: value creation competency and value appropriation competency (Mizik and Jacobson 2003). Finally, both R&D capital and marketing capital align very well with the resource based view (RBV) of the firm which argues that it is hard to imitate and/or hard to transfer assets that are a key source of sustained competitive advantage (Barney 1991).

While studies have separately examined the impact of R&D expenditures and marketing expenditures on various measures of firm performance, there is a relative dearth of studies that have simultaneously examined the resource allocation decision

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This dissertation follows the style of *Journal of Marketing*.

between these two key strategic assets (Shankar 2008). This is the first void that my dissertation seeks to address. Moreover, studies that have simultaneously examined R&D and marketing expenditures have typically focused on the direct effect of these expenditures on firm performance. This is a critical limitation of prior research. While the RBV of the firm suggests that it is only the level of investments in these intangible assets that matter, others are quick to point out that it is not just the level of these resources, but how these resources are deployed in the operating environments that matter (e.g., Sirmon, Hitt, and Ireland 2007). This perspective calls for an examination of the interaction of R&D capital and marketing capital with environmental factors. However, by and large, prior research is deficient on this dimension. This is the second void that my dissertation seeks to address. I address these voids through two essays.

In the first essay I examine the following questions. 1) How do marketing capital and R&D capital impact survival as a *Fortune* 500 firm, and 2) How does industry growth moderate the focal relationship. I test the hypotheses developed in my conceptual model using a proportional hazard model on a uniquely compiled large panel data set of manufacturing *Fortune* 500 firms over a 25-year period. The results offer interesting insights with important managerial implications. Particularly, my results show that while both marketing and R&D capitals have significant and direct positive association with survival as a *Fortune* 500 firm, considering the environmental contingency of industry growth is crucial. This is because industry growth positively moderates the relationships between marketing capital and survival as a *Fortune* 500 firm and negatively moderates the relationship between R&D capital and survival as a *Fortune* 500 firm.

Today, there is mounting pressure on firms to exhibit organic (due to internal efforts) growth in sales, profit, and market value. Unfortunately, there is a limited understanding of the drivers of organic growth. In my second essay I examine how a firm's advertising and R&D capital, two key organic drivers of growth, influences a firm's sales growth, profit growth, and market value growth. I extend my analysis to examine how complementarities between these two strategic variables and their interactions with environmental contingency factors of dynamism, munificence, and complexity impact these dimensions of growth. My analysis of a 185 firms tracked over an eight-year period (2000-2007) reveals that while both R&D capital and advertising capital directly affect sales growth, neither have a significant impact on profit growth, and only R&D capital has a direct influence on market value growth. Importantly, I find evidence for the existence of complementarities between advertising capital and R&D capital only in the profit growth dimension and not in the sales growth or market value growth dimension. Finally, I provide evidence that environmental contingencies matter when making resource allocation decisions between these two critical strategic assets. For instance, I find that environmental dynamism negatively (positively) moderates the relationship between R&D (advertising) capital and sales growth. These findings help managers make more informed resource allocation decisions and further advances our understanding of how advertising and R&D capital influence firm performance.

# CHAPTER II

## A STUDY OF THE FACTORS AFFECTING SURVIVAL OF MANUFACTURING FIRMS IN *FORTUNE* 500: THE ASYMMETRIC ROLES OF MARKETING CAPITAL AND R&D CAPITAL

Making the *Fortune* 500 list marks a major milestone in the corporate history of any firm. Interestingly, while some firms retain their elite status year after year, several others drop off the list. Retaining the status of a *Fortune* 500 firm is particularly challenging for manufacturing firms in the face of increasing global competition, deregulation, and the rapid rise of the service sector. What explains the survival of manufacturing firms as *Fortune* 500 firms? What roles do the marketing capital (a value appropriating asset) and the research and development (R&D) capital (a value creating asset) of these firms play in their survival as *Fortune* 500 firms? This paper addresses these questions. Drawing on the resource-based view (RBV) and industrial organization theories, the authors develop hypotheses on the relationships among a firm's marketing capital, R&D capital, key firm-specific and industry-specific factors and survival as a *Fortune* 500 firm. They test these hypotheses using a proportional hazard model on a uniquely compiled large panel data set of manufacturing *Fortune* 500 firms over a 25-year period. The results offer interesting insights with important managerial implications. While both marketing and R&D capitals have significant and direct positive associations with survival as a *Fortune* 500 firm, the moderating effects of industry growth on the relationships between marketing capital and survival as a *Fortune*

500 firm and between R&D capital and survival are asymmetric. It is positive for marketing capital but negative for R&D capital. If a *Fortune* 500 manufacturing firm were to incrementally spend 1% of the average sales revenues for five years on marketing (R&D), then its hazard of exit from *Fortune* 500 would drop by 12.0% (17.9%). To retain firms' position on the *Fortune* 500 list, managers may want to consider investing more in marketing (R&D) when industry growth is high (low).

## INTRODUCTION

*Fortune* 500 firms are the engine of the United States (U.S.) economy with their combined revenues accounting for 73% of the U.S. GDP in 2008. To put the importance of *Fortune* 500 firms in perspective, if I were to view them as a separate country, then they would be the second largest economy in the world (Labor Research Foundation 2006). Furthermore, over two-thirds of the Marketing Science Institute (MSI) member firms are *Fortune* 500 firms.

*Fortune* 500 firms enjoy a number of pecuniary and non-pecuniary benefits. First, they benefit from size advantages such as: (1) the ability to force customers and suppliers to be price-takers (e.g., Dobrev and Carroll 2003), (2) the ability to achieve market shares disproportionate to their sizes due to factors like reputation, information spillover and customer preference (e.g., Borenstein 1991), (3) the ability to leverage their technical legitimacy when introducing innovations (Ruef and Scott 1998), and (4) the capability to attract and retain the best talents (e.g., Doorley and Donavan 1999).

Second, being listed as a *Fortune* 500 firm generates a high degree of awareness

about the firm in the investor community. This awareness typically helps boost the share price of the firm (e.g., Chen, Noronha, and Singhal 2004).

Finally, stature as a *Fortune* 500 firm engenders favorable perceptions about the future prospects of the firm. Specifically, the view that *Fortune* 500 firms are more stable and less prone to failure provides them with benefits like lower cost of capital and higher sales (Pathania and Pope 2007). The outperformance of the S&P 500 Index by the *Fortune* 500 Index (Carty and Blank 2002) strengthens investor perceptions about the superior performance of these firms. Some people go so far as to invest only in *Fortune* 500 firms (Navellier 2009). Potentially due to reasons discussed thus far, *Fortune* 500 firms enjoy increases in their share prices specifically associated with their entry in this list (Pathania and Pope 2007).

While many *Fortune* 500 firms continue to retain their position in the *Fortune* 500 list year after year, others fall off this elite list. A fall from the list can be precursor to adverse corporate outcomes such as bankruptcy and hostile takeover. For example, Outboard Marine fell off the list in 1994, eventually going out of business in 2000. Likewise, Zenith Electronics fell off the list in 1994 and ended up declaring bankruptcy in 2000. These examples highlight the importance to firms of retaining the *Fortune* 500 firm stature once they achieve it.

Maintaining the *Fortune* 500 firm standing is quite challenging. Of the inaugural *Fortune* 500 firms published in 1955, only 84 firms retained the distinction in 2006. These observations raise important questions: What explains the survival of some firms as *Fortune* 500 firms and the non-survival of others as part of this elite cohort? How

critical are investments in value creation (research and development [R&D]) and value appropriation (marketing) activities to survival as a *Fortune* 500 firm?

Research focusing on the broader phenomenon of survival and failure of firms sheds some light into this issue. However, the *determinants of survival as a Fortune 500 firm* differ from the *determinants of survival as an ongoing firm, per se* (i.e., staying in business). For example, while a firm that achieves the stature of a *Fortune* 500 firm can be profitable and survive as a business in a particular industry, its survival in the *Fortune* 500 list may depend on whether its sales growth is comparable to, or higher than, those of firms in other industries. This possibility suggests that the role of industry factors such as industry growth in the survival of firms as *Fortune* 500 firms may be more nuanced than their role in the context of survival as a firm, per se. Furthermore, given the size of *Fortune* 500 firms, the effects of marketing and R&D investments on the sales revenues for *Fortune* 500 firms can be different from those for other firms. This possibility suggests that the roles of firm-specific determinants on survival as a *Fortune* 500 firm will also differ from those in the context of survival as a firm, per se.

While survival as a *Fortune* 500 firm is difficult for all firms, it is particularly challenging for firms operating in the manufacturing sector. A review of the firms populating the *Fortune* 500 lists over the years lends support to this observation. For example, the primary metals industry, once home to a number of *Fortune* 500 firms, now finds scarce representation on the list. Rising global competition, deregulation, and rapid growth in the service sector (Sharma, Krishnan, and Grewal 2001) are some of the factors fuelling the decline of manufacturing firms on the *Fortune* 500 list. While some

manufacturing industries may be impacted more than others, within industry heterogeneity in survival probabilities is also high. For example, although both Nalco and PPG Industries, two firms operating in the chemicals industry, were able to achieve the elite status of being a *Fortune* 500 firm, Nalco fell from the *Fortune* 500 list in 1994, while PPG Industries continues to remain as a *Fortune* 500 firm.

While many firm-specific factors can impact survival as a *Fortune* 500 firm, I focus on two strategic variables: R&D capital and marketing capital, which represent value creating (innovation) asset and value extracting asset, respectively. R&D capital can be viewed as the stock of R&D expenditures, whereas marketing capital can be regarded as the stock of marketing expenditures. At the highest level of decision-making, these variables are critical to a firm's allocation of resources (Shankar 2008). By gaining insights into the nature and relative magnitudes of the effects of marketing and R&D capitals on survival as a *Fortune* 500 firm, firms can better plan their marketing and R&D investments.

A number of considerations underscore the importance of a firm's marketing capital to survival as a *Fortune* 500 firm. For instance, some researchers argue that the failure of leading firms, such as *Fortune* 500 firms, may be due to inertia in target marketing (e.g., Christensen and Bower 1996; Slater and Narver 1998). Other research provides extensive evidence of the positive effect of a firm's marketing effort or its specific components on various measures of firm performance, including sales (e.g., Dekimpe and Hanssens 1995), market value (e.g., Srinivasan and Hanssens 2009) and systematic risk (e.g., McAlister, Srinivasan, and Kim 2007). However, there is a paucity

of research that investigates the effect of a firm's marketing capital on its survival as a *Fortune* 500 firm.

The importance of R&D capital is highlighted by a number of considerations such as the growing emphasis on innovation (e.g., Srinivasan, Haunschild, and Grewal 2007) and the associated increase in R&D spending by firms (e.g., Jaruzelski and Dehoff 2007; Taub 2004). Some prior research (e.g., Hall 1987) suggests a positive relationship between R&D expenditures and sales growth. However, increased R&D capital may not directly translate into improved firm performance. For instance, the 2007 Global Innovation 1000 Survey (Jaruzelski and Dehoff 2007) finds no statistically significant relationship between the levels of R&D investment and the financial performance of the top spenders on R&D. This begs the question of how, after controlling for other firm- and industry-specific factors, R&D capital impacts its survival as a *Fortune* 500 firm. To my knowledge, no research has explicitly examined the link between R&D capital and survival as a *Fortune* 500 firm.

In this regard, the strategic fit perspective argues that it is not merely the strategic choices of the firm, but how the strategic choices of the firm fit with the contingencies surrounding the firm, that determine the impact of these actions. This viewpoint highlights the role of environmental or industry-specific contingency factors. An industry-specific moderating factor particularly relevant to survival as a *Fortune* 500 firm is industry growth. Consider for instance, the industry composition for the top 100 leading manufacturing firms in the years 1919 and 1964 as identified by Boyle and Sorensen (1971). While in 1919, 52 firms from six industries that were identified as

declining industries were part of the leading firm cohort, only 29 firms from these six industries were part of the cohort in 1964. On the flip side, seven industries that were identified as growth industries in 1919 accounted for 60 of the top 100 leading manufacturing firms in 1964, an increase from the 45 firms that represented these industries in 1919. While these statistics highlight the importance of industry growth to survival as a *Fortune* 500 firm, there is a dearth of research that examines the moderating effects of industry growth on the relationships between marketing capital and survival as a *Fortune* 500 firm and between R&D capital and survival as a *Fortune* 500 firm.

My research fills this void by examining the moderating effects of industry growth in addition to the main effects of marketing and R&D capitals on survival as a *Fortune* 500 firm. I develop a conceptual framework and hypotheses related to the above and test the hypotheses using a survival analysis on a uniquely compiled large dataset of 143 U.S. manufacturing firms from the 1981 *Fortune* 500 list.

My empirical analysis reveals several important and interesting findings. The effects of marketing and R&D capital on survival as a *Fortune* 500 firm are asymmetric. While both R&D capital and marketing capital show a significant and direct positive association with survival as a *Fortune* 500 firm, the moderating effects of industry growth on the relationships between marketing capital and survival as a *Fortune* 500 firm and R&D capital and survival as a *Fortune* 500 firm is asymmetric. Specifically, I find that marketing capital also indirectly improves survival as a *Fortune* 500 firm through the positive moderating effects of industry growth. In contrast, R&D capital

indirectly undermines survival as a *Fortune* 500 firm due to the negative moderating effect of industry growth. Thus, to retain firms' positions in the *Fortune* 500 list, managers may want to consider investing more in marketing (R&D) when industry growth is high (low).

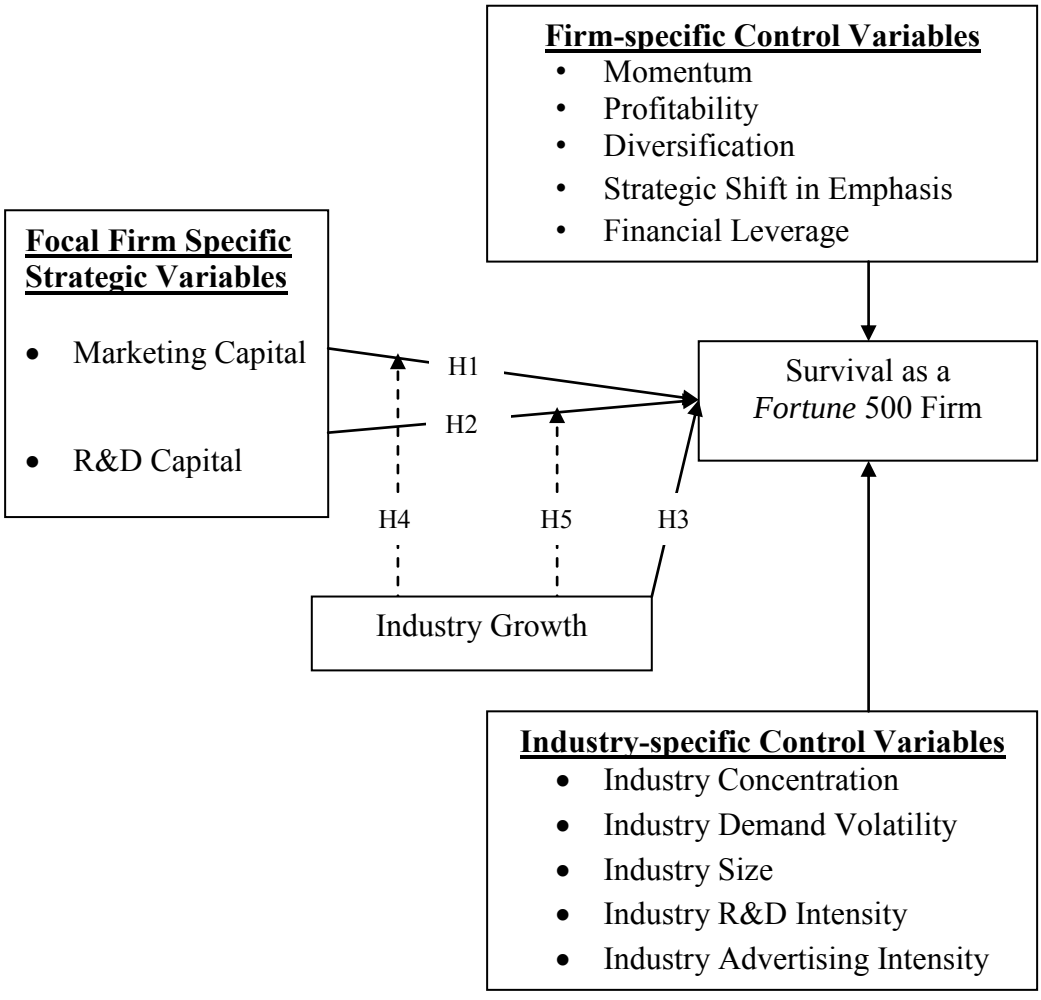
## CONCEPTUAL FRAMEWORK AND HYPOTHESES

Figure 1 presents a conceptual model delineating the relationships between a firm's marketing capital and survival as a *Fortune* 500 firm and between R&D capital and survival as a *Fortune* 500 firm. As shown in Figure 1, I posit that industry growth (an environmental contingency variable) moderates these relationships. Figure 1 also shows a number of firm-specific and industry-specific control variables that affect firm survival. The resource-based view (RBV) of the firm and the structure-conduct-performance (SCP) paradigm provide the theoretical underpinnings for this conceptual model.

At its essence, the RBV posits that the bundle of valuable, rare, inimitable, and non-substitutable resources at a firm's disposal is its source of competitive advantage (Barney 1991). A firm's marketing and R&D capitals represent firm-specific resource bundles that exhibit these characteristics. Marketing capital produces sustained competitive advantage through the creation and strengthening of market-based relational assets (e.g., brand equity, customer equity, and channel equity) and market-based intellectual assets (i.e., market knowledge and marketing knowledge), both of which are valuable, difficult to imitate and idiosyncratic to the firm (e.g., Srivastava, Fahey, and

Christensen 2001). Similarly, it has been argued that R&D capital creates sustained competitive advantage through the mechanisms of organizational knowledge (e.g., Cohen and Levinthal 1989) and innovation capability (e.g., Geroski, Machin, and Van Reenan 1993), which are hard-to-imitate and valuable resources.

**FIGURE 1**
**Industry and Firm-specific Factors Affecting Survival as a Manufacturing *Fortune* 500 Firm: A Conceptual Model**



The SCP paradigm postulates that certain industry structural characteristics (e.g., growth, entry barriers, and industry concentration), by virtue of their effect on the behavior of firms in the industry, impact their profitability (e.g., Bain 1956). Prior research suggests that industry growth moderates the relationship between strategic variables and various measures of firm performance (e.g., Gatignon and Xuereb 1997). Building on these streams of research, I posit industry growth as a moderator of the relationships between marketing capital and survival as a *Fortune* 500 firm and between R&D capital and survival as a *Fortune* 500 firm. A detailed discussion of the hypothesized linkages follows.

**Main Effect of Marketing Capital**

A firm's marketing capital comprises investments in marketing variables such as advertising, sales force, and sales promotions (Shankar 2008). I expect that a *Fortune* 500 firm's marketing capital will enhance its probability of survival in the *Fortune* 500 firm cohort in at least two ways. First, marketing capital can influence key measures of firm performance directly and hence improve the probability of survival as *Fortune* 500 firm. Second, it can create market-based assets that serve as a source of sustained competitive advantage, further improving the probability of survival as a *Fortune* 500 firm.

Expenditures on marketing variables have a positive effect on the different dimensions of firm performance. For instance, advertising spending has a direct effect on sales (Dekimpe and Hanssens 1995), profit (Erickson and Jacobson 1992), firm value (Joshi and Hanssens 2010), and systematic risk (McAlister, Srinivasan, and Kim 2007).

Investments in sales force activities also have a direct effect on firm performance (Narayanan, Desiraju, and Chintagunta 2004). Investments in sales promotions also generate a short term boost in sales with market leaders enjoying the largest surge (Dekimpe, Hanssens, and Silva-Risso 1999).

Consistent with the RBV of the firm, marketing capital can also impact survival as a *Fortune* 500 firm through the creation of market-based relational or intellectual assets (Srivastava, Fahey, and Christensen 2001). Brand equity is a market-based relational asset with the potential to insulate a firm's fortunes from its competitors' actions and macroeconomic changes (Leone et al. 2006) through mechanisms such as decreasing customer price sensitivity (e.g., Kalra and Goodstein 1998) and increasing the ability to charge a premium relative to its competitors (Shankar, Azar, and Fuller 2008). Customer equity, another market based asset, also impacts market capitalization (Kumar and Shah 2009). Finally a firm's market-focused intelligence generation related activities (Kohli and Jaworski 1990; Slater and Narver 2000) facilitate the creation of market based intellectual assets that can enhance its survival as a *Fortune* 500 firm. For these reasons, I posit that:

> *$H_1$: The greater the marketing capital of a Fortune* 500 firm*, the higher its probability of survival as a Fortune 500 firm.*

**Main Effect of R&D Capital**

In scholarly business literature as well as in the business press, innovation has been widely heralded as the cure-all for organizations. The importance of innovation stems from its positive impact on firm profits (Bayus, Erickson, and Jacobson 2003), market valuation (Chaney, Devinney, and Winer 1991), and market-expansion ability

(Nijs et al. 2001). There is, however, a paucity of research that examines the impact of R&D capital on firm survival and virtually no research examines the effect of R&D capital on survival as a *Fortune* 500 firm.

I posit that a *Fortune* 500 firm's R&D capital will be positively associated with survival as a *Fortune* 500 firm, based on the following considerations. First, absolute R&D expenditures are positively associated with firm size (Cohen and Klepper 1996), a key variable determining *Fortune* 500 ranking. Thus, *Fortune* 500 firms typically have the largest investments in R&D within their industries. Second, there is a positive relationship between R&D investment and innovation output (e.g., Mansfield 1968). Taken together, these arguments suggest that firms with high R&D capital will have high innovation outputs, and because innovation is positively linked to market expansion abilities (Nijs et al. 2001), these firms are in a strong position to retain membership in the *Fortune* 500 firm cohort. Sustained innovations, incremental or radical, can help *Fortune* 500 firms retain their status as a *Fortune* 500 firm through their positive effect on market shares (e.g., Banbury and Mitchell 1995).

Second, R&D capital can impact survival through the creation of intangible, difficult to imitate assets that serve as a source of sustained competitive advantage. R&D capital can create these assets in at least two ways. It can improve a firm's absorptive capacity (Cohen and Levinthal 1989), which in turn allows it to more easily adapt to or adopt technological changes introduced by competition. It can also lead to an improved innovation process (Geroski, Machin, and Van Reenan 1993), potentially allowing the firm to renew its capabilities.

For these reasons, I posit:

> *$H_2$: The greater the R&D capital of a Fortune* 500 firm*, the higher its probability of survival as a Fortune* 500 firm*.*

**Main Effect of Industry Growth**

A firm is said to be operating in a munificent environment if adequate resources are available in the environment to sustain its growth (Bahadir, Bharadwaj, and Parzen 2009; Dess and Beard 1984). Munificent operating environments reduce the motivation of firms to engage in competitive retaliation and also provide the focal firm with the many strategic options (Castrogiovanni 1991).

Typically, high growth industries are associated with high environmental munificence. In contrast, low growth industries create an environment that results in fierce competition among firms within an industry (Dess and Beard 1984). This increased competition among firms may be one reason why Boyle and Sorenson (1971) observe that *Fortune* 500 manufacturing firms operating in low growth industries are more likely to exit the *Fortune* 500 cohort than those operating in high growth industries. Another reason is that low growth industries impose a natural limit on the growth of these firms. In contrast, firms that operate in high growth industries have a greater probability of retaining their leadership position than others because in high growth industries, firms can focus on gaining new customers rather than on poaching customers away from competition. Furthermore, it is likely that under conditions of high industry growth, a *Fortune* 500 firm is able to grow by leveraging factors like reputation, information spillovers and network effects.

The above line of reasoning leads me to postulate that:

> *$H_3$: The greater the rate of growth of the primary industry in which a Fortune 500 firm operates, the higher its probability of survival as a Fortune 500 firm.*

**Moderating Effects of Industry Growth**

*Moderating effect on the link between marketing capital and survival as a Fortune 500 firm*.[1] In low-growth industries, customers' needs and preferences are relatively stable and predictable. Although the absolute number of new customers is a function of the size of the market, for a given market size, low industry growth rate implies a relatively small number of new customers. To sustain firm growth in such an environment, a firm is faced with the need to attract customers away from its competitors. Enticing competitors' customers to switch will require a greater investment in marketing activities such as sales promotion. Furthermore, and as a consequence of having to expend a greater level of effort toward understanding the needs of the customers, firms operating in low-growth industries will be required to make larger investments in marketing than those operating in high-growth industries (Kohli and Jaworski 1990).

In contrast to firms operating in low-growth industries, firms operating in high-growth industries need to expend less effort in acquiring new customers (Dess and Beard 1984). In addition, operating in high-growth markets is advantageous to *Fortune* 500 firms because high-growth markets are associated with evolving customer preferences (Gatignon and Xuereb 1997) and a *Fortune* 500 firm, through its marketing activities

[1] For expositional ease, I use the terms moderating effect and interaction effect interchangeably throughout the paper.

and reputation, can influence and shape customers' preference formation. For these reasons, I hypothesize that:

> *$H_4$: Industry growth moderates the positive effect of marketing capital on survival as a Fortune 500 firm such that at higher levels of industry growth, the effect of marketing capital on probability of survival as a Fortune 500 firm is greater.*

*Moderating effect on the relationship between R&D capital and survival as a Fortune 500 firm.* I expect R&D capital to have a weaker effect on survival as a *Fortune* 500 firm for firms that operate in high-growth industries than in low-growth industries. This is because high-growth industries attract and sustain a larger number of entrants than do low-growth industries (Dess and Beard 1984). Furthermore, in high-growth industries, new entrants engage in more innovative activities and are typically larger in size than those in low-growth industries (e.g., McDougall et al. 1994). The increase in competition and the increased innovative activities of new entrants have the potential to decrease the effect of the *Fortune* 500 firm's R&D capital on its survival as a *Fortune* 500 firm. In particular, in high-growth industries, because of the greater innovative activities of new entrants, the possibility that the next innovation will be introduced by a rival is higher. In low-growth industries, the need for innovation is high, so greater R&D capital will likely be associated with higher sales revenues. Given the importance of innovation to sustained membership in the *Fortune* 500 firm cohort, I posit that:

> *$H_5$: Industry growth moderates the positive effect of R&D capital on survival as a Fortune 500 firm such that at higher levels of industry growth, the effect of R&D capital on probability of survival as a Fortune 500 firm is smaller.*

**Firm-specific Control Variables**

*Momentum*. I define momentum as the change in sales revenues between the current and immediate past time periods. I expect that the greater the momentum, the higher is the probability of survival as a *Fortune* 500 firm.

*Profitability.* Because firms cannot spend their way to high sales and maintain their *Fortune* 500 membership without regard to profits, I control for profitability. Jacquemin and Berry (1979) observe that the initial profitability of a firm has a positive impact on its subsequent growth rate. Coad (2007) finds a positive effect of second and third period lags of profits on firm growth rates. I expect the probability of survival as a *Fortune* 500 firm to increase with firm profitability.

*Diversification.* Jacquemin and Berry (1979) show that both diversification within the two-digit SIC code in which a firm currently operates (related diversification) and diversification into industries in other two-digit SIC codes (unrelated diversification) resulted in positive growth rates for 460 *Fortune* 500 firms in 1960. Therefore, I expect an increase in the probability of survival as a *Fortune* 500 firm with increasing diversification.

*Strategic shift in emphasis.* A shift in emphasis between marketing and R&D spending at appropriate times in the firm's life can influence a firm's survival as a *Fortune* 500 firm. Spending more (less) on R&D than on marketing implies firms placing a strategic emphasis on value creation (value appropriation) and stock markets reward companies for a strategic shift to value appropriation (Mizik and Jacobson 2003). Furthermore, marketing capability may be more valuable to a firm than R&D capability

(Krasnikov and Jayachandran 2008). Therefore, I expect that the greater the strategic shift toward marketing from R&D, the higher is the probability of survival as a *Fortune* 500 firm.

*Financial leverage*. Financial leverage refers to a firm's debt to asset ratio. Debt financing involves a trade-off that pits its advantages, namely, interest tax shields and lower need for capital (Ross, Westerfield, and Jordan 2007) against its disadvantages, namely, managerial loss of control rights and increased probability of bankruptcy (e.g., Hillegeist et al. 2004; Shumway 2001). However, financial leverage may be positively related to the probability of bankruptcy due to two main reasons. First, greater leverage is associated with increased probability of defaulting on payments. Second, an increased diversion of internal finance into servicing debt detracts from the firm's ability to invest in future growth opportunities (Lang, Ofek, and Stulz 1996; Zingales 1998). Based on this reasoning, I expect the link between financial leverage and survival as a *Fortune* 500 firm to be negative.

**Industry-specific Control Variables**

*Industry concentration.* Industries with high concentration are conducive to *Fortune* 500 firms controlling their level of output by tacitly colluding with other firms in the industry. In the limit, the abilities of the largest firm in a highly concentrated industry can be tantamount to monopoly power. Often, in highly concentrated industries, customers are price takers and suppliers are faced with the imperative to accept the terms set by the largest firms. These considerations suggest that the probability of survival as a *Fortune* 500 firm increases with increasing concentration.

*Industry demand volatility*. Companies that operate in environments characterized by greater demand uncertainty have a higher hazard of failure (Anderson and Tushman 2001). Fluctuations in industry revenues are likely to decrease the probability of survival as a *Fortune* 500 firm because volatility may be negatively associated growth.

*Industry size.* The size of the primary industry in which a *Fortune* 500 firm operates can be expected to have a positive impact on survival as a *Fortune* 500 firm.

*Industry R&D intensity*. Industry level R&D intensity is a widely used measure of product differentiation related entry barriers (e.g., Grabowski and Mueller 1978; Sutton 2007; Waring 1996). The greater the R&D intensity of an industry, the higher the barriers are to enter the industry. In turn, barriers to entry are positively associated with the profitability of incumbents in an industry. Industry R&D intensity has a positive impact on the persistence of profits (e.g., Grabowski and Mueller 1978; Sutton 2007; Waring 1996). These considerations suggest that the R&D intensity of an industry will be positively associated with survival as a *Fortune* 500 firm.

*Industry advertising intensity*. Industry level advertising intensity is another widely used measure of product differentiation-related entry barriers (Davies and Geroski 1997; Sutton 2007). Comanor and Wilson (1967) observe that industry advertising expenditures have a substantial positive effect on the average profit rates of incumbents in the industry. Therefore, I expect industry advertising intensity to be positively related to survival as a *Fortune* 500 firm.

## METHODOLOGY

### Sample Selection

While firms have typically engaged in R&D activities for decades, the focus on R&D and marketing activities as sources of competitive advantage came into sharper focus in the late 1970s (Nakamura 2003). It is also around this time frame that more firms began reporting their marketing and R&D expenditures. For these reasons, the 1981 cohort of *Fortune* 500 firms in the manufacturing sector forms the basis of my empirical analysis.

I arrived at the final list of firms in my data set by adopting the following sample selection procedure. In the first step, I identified the firms in the *Fortune* 500 list for which COMPUSTAT data on the variables in my conceptual model are available. I identified 400 such firms. In the second step, I retained the manufacturing firms, which are firms whose primary operating industry is in the SIC codes 20-39. This reduced the database of potential firms to 324 firms. In the third step, given my focus on marketing capital and R&D capital, I dropped companies that did not report both sales and general administration (SG&A) expenditures and R&D expenditures, the bases of marketing capital and R&D capital, respectively. I also dropped 13 firms that reported insignificant R&D expenditures as the data on this variable for these firms could have been misreported. This resulted in a final sample of 234 firms.

A possible reason for changes in the list of *Fortune* 500 firms over time is the acquisition of one *Fortune* 500 firm by another and not poor performance. For this reason, I eliminated from my database, those companies whose exit from the *Fortune*

500 firm cohort was due to their being acquired.[2] This step further reduced the active dataset to 176 firms. Finally, to analyze the uninterrupted longevity of leadership, I omitted 33 firms that had recurrent events, i.e., firms which re-entered the list after dropping out earlier. Thus, the final dataset included 143firms from 18 different manufacturing industries. Table 1 describes the SIC industries included in the database and the number of companies by the two digit SIC code in the operating database. The sectors that have more companies on the *Fortune* 500 also have a larger representation in the final database. I did this tracking through multiple archival sources, including LexisNexis and Hoovers.

**TABLE 1**
**Breakout of Database by Manufacturing Industries and Number of Companies**

| Two-Digit SIC Code | Industry Description | Number of Companies |
|---|---|---|
| 20 | Food and Kindered Products | 11 |
| 22 | Textile Mill Products | 1 |
| 23 | Apparel and Other Textile Products | 1 |
| 24 | Lumber and Wood Products | 2 |
| 25 | Furniture and Fixtures | 3 |
| 26 | Paper and Allied Products | 7 |
| 27 | Printing and Publishing | 1 |
| 28 | Chemical and Allied Products | 31 |

[2] I subsequently include these firms in my sample and repeat my analysis as a robustness check.

**TABLE 1 Continued**

| Two-Digit SIC Code | Industry Description | Number of Companies |
|---|---|---|
| 29 | Petroleum and Coal Products | 3 |
| 30 | Rubber and Misc Plastic Products | 3 |
| 32 | Stone Clay & Glass Products | 7 |
| 33 | Primary Metal Industries | 6 |
| 34 | Fabricated Metal Products | 5 |
| 35 | Industrial Machinery and Equipment | 19 |
| 36 | Electronics and Other Electric Equipment | 14 |
| 37 | Transportation | 16 |
| 38 | Instruments and Related Products | 10 |
| 39 | Misc Manufacturing | 3 |

**Variables and Data Sources**

Table 2 describes the variables, the measures and data sources. I utilize two main sources for data: (1) the 1981 *Fortune* 500 list forms the initial sampling frame and (2) the COMPUSTAT database for the set of firm- and industry-specific measures that I have listed in Table 2.

I discuss the operationalization of only the focal strategic constructs, namely, marketing capital and R&D capital and the variable that involves a new operationalization, namely, shift in strategic emphasis. The operationalizations of the remaining variables are consistent with those in prior research and are described in Table 2.

*Marketing capital and R&D capital.* I operationalize marketing capital and R&D capital through stock measures that capture the cumulative asset value of marketing expenditures and R&D expenditures, respectively.

**TABLE 2**
**Variables, Measures, and Data Sources**

| Conceptual Variable | Notation | Operationalization | Data Source |
|---|---|---|---|
| **Focal Independent Variables** | | | |
| Marketing Capital | MKT | Koyck structured variable constructed using marketing expenditures (where marketing expenditures = SG&A - R&D) | COMPUSTAT, 10K |
| R&D Capital | RD | Koyck structured variable constructed using R&D expenditures | COMPUSTAT, 10K |
| Industry Growth | IG | Change in total industry sales revenue between two consecutive years | COMPUSTAT |
| **Firm-Specific Control Variables** | | | |
| Momentum | MOM | Year-to-year change in sales revenue | COMPUSTAT |
| Profitability | ROA | Ratio of net income to total assets | COMPUSTAT |
| Diversification | DIV | Number of segments in which the firm operates | COMPUSTAT Segments File |
| Strategic Shift in Emphasis | SS | The difference between change in marketing expenditures and change in R&D expenditures | COMPUSTAT |
| Financial Leverage | FL | Debt to asset ratio | COMPUSTAT |
| **Industry-Specific Control Variables** | | | |
| Industry Concentration | IC | Sum of the squared market share of each firm operating in the primary industry | COMPUSTAT |

**TABLE 2 Continued**

| Conceptual Variable | Notation | Operationalization | Data Source |
|---|---|---|---|
| Industry Demand Volatility | DVOL | Three year moving average of the coefficient of variation of total sales revenues of the primary industry | COMPUSTAT |
| Industry Size | IS | Total sales of the two-digit SIC industry | COMPUSTAT |
| Industry R&D Intensity | IRD | Five year moving average of the ratio of industry R&D spending to industry sales revenues | COMPUSTAT |
| Industry Advertising Intensity | IADV | Five year moving average of the ratio of industry advertising spending to industry sales revenues | COMPUSTAT |
| Year of Services Firms Introduction | SIY | Dummy variable set to 1 for firms that exit the *Fortune* 500 list due to the introduction of service firms on the *Fortune 500* list | *Fortune* 500 list |

Consistent with prior research (e.g., Hanssens, Parsons, and Schultz 2003), I use a Koyck structure to compute the lagged effects of R&D and marketing expenditures. Formally, the marketing capital (*MKT*) for period *t* is given by:

(2.1) $$MKT_t = \sum_{k=1}^{t} \lambda^{t-k} MKTE_{kt}$$

where λ is the retention rate for marketing investment, i.e., the proportion of marketing stock from the previous year that carries over to the present year and *MKTE* is the marketing spending.

Similarly, the R&D capital (*RD*) for period *t* is given by:

$$(2.2) \qquad RD_t = \sum_{k=1}^{t} \theta^{t-k} RDE_{kt}$$

where $\theta$ is the retention rate for R&D investment and RDE is the R&D spending. Consistent with Mizik and Jacobson (2007) and Luo (2008), I proxy annual marketing expenditures by the difference of SG&A and R&D expenditures, which I obtained from COMPUSTAT. I use this measure and not advertising expenditures as a proxy for marketing expenditures the following reasons. First, because advertising is just one element in a firm's marketing mix, my measure better captures a firm's investment in all marketing activities than does advertising expenditure. For instance, a decline in advertising spending may not reflect a decrease in marketing expenditures, but indicate a shift in spending to other marketing mix elements. Second, many of the firms in my data did not directly report advertising expenditures for the period of my analysis. Finally, there is a high correlation (0.73) between my measure of marketing expenditures and advertising expenditures for the sample of firms in COMPUSTAT that report R&D, advertising and SG&A expenditures during the period 1981-2006.

I estimate the retention rates for each of these variables separately using the Koyck transformation on an equation that regresses sales revenues on the focal strategic variable. Through this procedure, I obtain retention rates of 60% and 84% for marketing capital and R&D capital, respectively. While the rate for R&D capital is consistent with prior research (e.g., Hall, Jaffe, and Trajtenberg 2005), the rate for marketing capital is slightly higher than the average rate for advertising from prior research (50%). A

possible reason is that because marketing covers more elements than advertising, the retention rate for marketing capital will likely be higher than that for advertising capital. I calculate the initial marketing capital and R&D capital by using appropriate back year data.

*Strategic shift in emphasis.* I use a modified form of the strategic shift in emphasis variable used by Mizik and Jacobson (2003). I operationalize shift in strategic emphasis as the difference of the annual change in marketing expenditures and the annual change in R&D expenditures because my focus is on membership in the *Fortune* 500 list, which is based on absolute sales revenues. In addition, my measure captures the broad set of marketing activities.

*Year of services firms introduction*. Until 1994, only manufacturing firms were considered for inclusion in the *Fortune* 500 list. In 1995, the list was extended to include services firms, many of which displaced several manufacturing firms from the 1994 list. To account for this onetime event reason for exit from the *Fortune* 500 list, I use a dummy variable to represent those firms that exit the list in 1995.

**Data**

The constructed database contains new entrants as well as firms that have been in existence since the inaugural *Fortune* 500. Table 3 presents the descriptive statistics for key variables used in the analysis. There are a few notable characteristics of the database. There is considerable heterogeneity in firm-specific factors. The marketing capital and R&D capital of these *Fortune* 500 firms also exhibit a wide range of values. Marketing capital ranges between $92.118 million to $45,813 million and R&D capital

ranges from $4.28 million to $39,321 million. Measures of financial leverage differ widely with some *Fortune* 500 firms being debt-free and other firms being highly leveraged.

**TABLE 3**
**Descriptive Statistics**

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| Marketing Capital (in MM of 2006$) | 4,705.08 | 6,123.09 | 92.12 | 45,812.71 |
| R&D Capital (in MM of 2006$) | 2,339.52 | 3,839.47 | 4.28 | 39,321.22 |
| Industry Growth (in MM of 2006$) | 13,288.59 | 65,792.93 | -402,520.00 | 733,229.90 |
| Momentum (in MM of 2006$) | 411.88 | 4,369.01 | -36,839.20 | 70,302.66 |
| Profitability | 0.06 | 0.09 | -2.52 | 0.60 |
| Diversification | 3.52 | 1.89 | 1.00 | 11.00 |
| Strategic Shift in Emphasis (in MM of 2006$) | 27.12 | 575.48 | -8,595.01 | 9,734.25 |
| Financial Leverage | 0.18 | 0.14 | 0.00 | 1.44 |
| Industry Concentration | 0.05 | 0.02 | 0.02 | 0.21 |
| Industry Demand Volatility | 0.06 | 0.04 | 0.00 | 0.33 |
| Industry Size (in MM of 2006$) | 577,289.60 | 451,743.00 | 17,837.71 | 2,598,977.00 |
| Industry R&D Intensity | 0.03 | 0.02 | 0.00 | 0.09 |
| Industry Advertising Intensity | 0.01 | 0.01 | 0.00 | 0.06 |
| Year of Services Firms Introduction | 0.14 | 0.35 | 0.00 | 1.00 |

Note: Profitability, financial leverage, industry concentration, industry demand volatility, industry R&D intensity, and industry advertising intensity are ratios. Diversification is a count variable

**TABLE 4**
**Correlation Matrix**

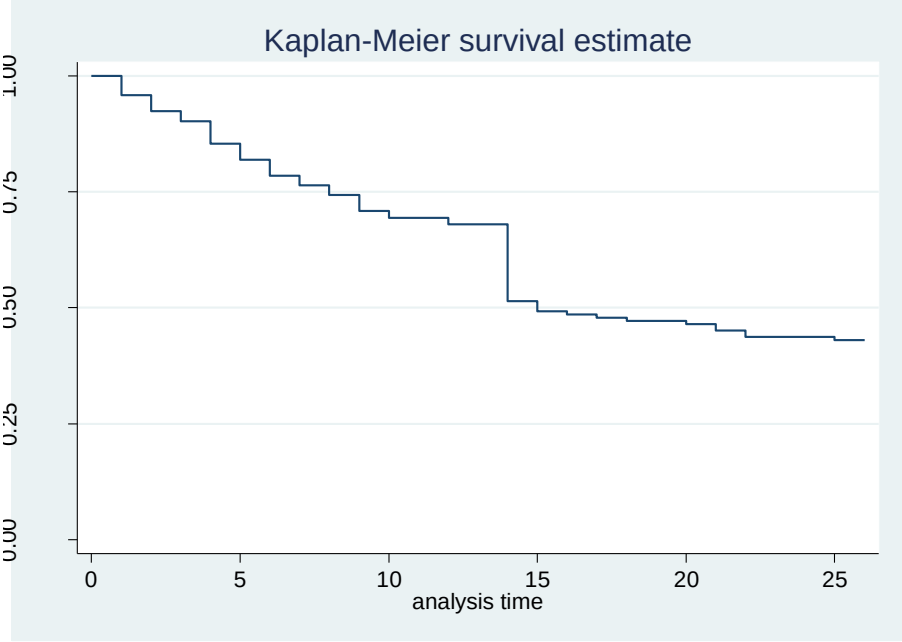
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Marketing Capital | 1.00 | | | | | | | | | | | | | |
| 2 | R&D Capital | 0.61* | 1.00 | | | | | | | | | | | | |
| 3 | Industry Growth | 0.10* | 0.10* | 1.00 | | | | | | | | | | | |
| 4 | Momentum | 0.13* | 0.08* | 0.30* | 1.00 | | | | | | | | | | |
| 5 | Profitability | 0.12* | 0.13* | 0.09* | 0.07* | 1.00 | | | | | | | | | |
| 6 | Diversification | 0.14* | 0.20* | 0.05* | 0.14* | -0.05* | 1.00 | | | | | | | | |
| 7 | Strategic Shift in Emphasis | 0.02 | 0.05* | 0.16* | 0.26* | 0.07* | 0.06* | 1.00 | | | | | | | |
| 8 | Financial Leverage | -0.10* | -0.18* | -0.07* | -0.05* | -0.19* | 0.07* | -0.03 | 1.00 | | | | | | |
| 9 | Industry Concentration | -0.10* | -0.19* | -0.08* | 0.01 | -0.21* | 0.10* | -0.02 | 0.18* | 1.00 | | | | | |
| 0 | Industry Demand Volatility | 0.07* | 0.03 | 0.13* | 0.17* | -0.06* | 0.11* | 0.02 | 0.05* | 0.21* | 1.00 | | | | |
| 1 | Industry Size | 0.42* | 0.32* | 0.20* | 0.19* | 0.03 | 0.12* | 0.04* | -0.10* | -0.12* | 0.06* | 1.00 | | | |
| 2 | Industry R&D Intensity | 0.31* | 0.52* | 0.20* | 0.01 | 0.11* | 0.13* | 0.03 | -0.10* | -0.44* | -0.08* | 0.36* | 1.00 | | |
| 3 | Industry Advertising Intensity | 0.06* | 0.04* | 0.03 | -0.03 | 0.18* | -0.13* | 0.02 | -0.01 | -0.36* | -0.24* | -0.02 | 0.16* | 1.00 | |
| 4 | Year of Services Firms Introduction | -0.25* | -0.21* | -0.06* | -0.04* | -0.08* | -0.19* | -0.02 | 0.06* | -0.01 | -0.06* | -0.11* | -0.10* | 0.02 | 1.00 |

* $p < .05$, $N = 2414$.

Table 4 presents the correlations among the explanatory variables.[3] The variance inflation factors (VIFs) and condition indices are much lower than 10 and 30, respectively, suggesting that multicollinearity is not an issue (Belsley, Kuh, and Welsch 1980).

Figure 2 shows the Kaplan-Meier estimate of survival as a *Fortune* 500 firm for the data. Exits from the *Fortune* 500 firm cohort occur in every year except 2006. The most number of exits occur at the end of Year 1994. As mentioned earlier, service sector firms Ire first introduced in the *Fortune* 500 list in 1995.

**FIGURE 2**
**Kaplan –Meier Probability of Survival**




[3] I do not report correlations involving interaction terms due to save space. All variables included in the final model had correlations below .71. Interested readers can contact the authors for an extended correlation matrix.

**Model Formulation**

The time to exit from the *Fortune* 500 firm cohort is censored at the end of the observation period, that is, Year 2006. This condition requires us to use a duration model because standard regression techniques would result in biased results. The hazard function is the distinguishing idea behind survival models and can be defined as the instantaneous probability of an event occurring given that the event has not occurred until that point of time. Thus, the hazard $h_i(t)$ of failure or dropping off the *Fortune* 500 list for a firm *i* with event time $T_i$ at time *t* can be written as:

$$(2.3) \quad h_i(t|X_i) = \underset{\Delta t \to 0}{Lim} \frac{\Pr_i[t < T_i \le t + \Delta t | T_i > t, X_i]}{\Delta t} = \frac{f_i(t)}{S_i(t)}$$

where $X_i$ is a vector of covariates, $Pr_i$ is probability, $f_i(t)$ is the probability density function and $S_i(t)$ is the survival function, all relating to firm *i*, and $\Delta t$ is small incremental time. The Cox proportional hazards model (PHM) is the most popular model used in survival analysis. A key advantage of this model is that it allows us to model the interaction between marketing and R&D capitals even when there is high correlation between the two variables. It is given by:

$$(2.4) \quad h_i(t|X_i) = h_o(t)\exp(X_i\beta)$$

where $h_o(t)$ is the baseline hazard function and $\boldsymbol{\beta}$ is a parameter vector associated with the covariate vector.

Therefore, the equation I estimate is the relative hazard ($h_{ri}(t)$, the ratio of hazard of firm *i* at time *t* to the baseline the hazard) model in the following form:

$$(2.5)\ \ log h_{ri}(t) = \beta_1 MKT_{i(t-1)} + \beta_2 RD_{i(t-1)} + \beta_3 IG_{i(t-1)} + \gamma_1 IG_{i(t-1)} * MKT_{i(t-1)} + \gamma_2 IG_{i(t-1)} * RD_{i(t-1)} + \boldsymbol{\delta Z}_{i(t-1)} + \boldsymbol{\rho Y}_{i(t-1)} + \sum_{k=1}^{K-1} \pi_k IND_{ki}$$

where the left-hand side of the equation is the log of the relative hazard rate, $IG_i$ is industry growth of the primary operating industry of the firm *i*, $\boldsymbol{Z_i}$ is a vector of time varying firm-specific control variables for each firm *i* and $\boldsymbol{Y_i}$ is a vector of time varying industry-specific control variables for each firm *i.* K is the number of industries in the dataset, ***IND*** is a vector of industry-specific dummy variables, ***β, γ, δ, ρ,*** and **π** are parameter vectors, and the remaining terms are as defined earlier. I use lagged independent variables to avoid potential endogeneity problems. I include the industry dummies to control for unobserved industry heterogeneity.

**Model Estimation**

The Cox proportional hazard model uses the partial likelihood method for estimation. Stated simply, partial likelihood can be viewed as the probability that a firm *i* has experienced the event at duration time *t* given that firm *i* is in the risk set at this duration time. Following Bolton (1998) and Schmittlein and Helsen (1993), the individual partial likelihood *L* can be expressed as:

$$(2.6)\qquad L\left(i\middle|t, f_1, f_2, \ldots . f_{n(t)}\right) = h_i(t) \Big/ \sum_{k=1}^{n(t)} h_k(t)$$

where $f_1, f_2, \ldots, f_{n(t)}$ are firms in the risk set, n(t) is the number of firms in the risk set at duration time *t*, and the remaining terms are as described earlier. Substituting Equation 4 into the above equation results in a likelihood function written in terms of the vector of

covariates $\boldsymbol{X_i}$. The total partial likelihood is the product of these individual likelihood functions calculated at all duration times. I obtain the parameter estimates by maximizing this total partial likelihood function.

A distinguishing aspect of my data set is that some of the firms in my database were at risk of the event even prior to 1981, i.e., observations for these firms are left-truncated. The presence of left–truncated subjects is an econometric concern because it highlights the possibility of sample selection. In particular, because high-risk subjects can drop out of the data set before the beginning of the observation period, left-truncated subjects tend to have lower risks than those in a normal sample (Bolton 1998; Schmittlein and Helsen 1993). Thus, I need to account for left truncation. When start times are unknown, left truncation is generally accounted for by either assuming a constant hazard rate or by discarding all left-truncated subjects (Allison 1995). However, when start times are known, semi-parametric models can account for left truncation (Bolton 1998; Schmittlein and Helsen 1993). To do so, the analysis needs to exclude from the risk set at any given time, those subjects who have not entered the observation period at that time, even though their duration time is longer than the time between the beginning of the observation period and the current time (Bolton 1998; Schmittlein and Helsen 1993).

In my analysis, I follow the approach described by Bolton (1998) and Schmittlein and Helsen (1993) in accounting for left truncation. Specifically, I create pseudo-observations for each duration time by identifying the correct risk sets at each

duration time, group observations into strata based on the risk sets at each duration time, and then run a stratified Cox regression model on this data set.

## RESULTS

### Hypothesized Variables

Table 5 reports the results of my fully specified model as well as those of a model without the interactions to underscore the importance of considering these interactions. Hypothesis $H_1$ argues that marketing capital is positively associated with the probability of survival as a *Fortune* 500 firm. My result provides support for this hypothesis ($p < .01$). This result is easier to interpret if I convert the coefficient into a hazard ratio, which is simply the exponential of the reported coefficient. A hazard ratio greater than one increases the probability of exiting the *Fortune* 500 cohort while a hazard ratio less than one implies that the focal variable reduces the hazard of exiting the *Fortune* 500 cohort. The hazard ratio for the direct effect of marketing capital is .9993 which implies that, all else equal, a one unit increase in marketing capital reduces the hazard of exiting the *Fortune* 500 firm cohort by .07%. To put this in perspective, consider the following. The average sales revenues for a firm in my dataset are approximately $12.5 billion. If this average firm was to increase its marketing capital by 1% ($125 million) of this average sales figure, then this action would increase its probability of survival as a *Fortune* 500 firm by 8.4%, all else equal.

Hypothesis $H_2$ posits that R&D capital is positively associated with higher probability of survival as a *Fortune* 500 firm. The effect is significant and in the

expected direction ($p < .05$). The hazard ratio for the direct effect of R&D capital is .9995 which implies that, all else equal, a one unit increase in R&D capital reduces the hazard of exiting the *Fortune* 500 firm cohort by .05%. If the average firm were to increase its R&D capital by 1% of its average sales revenue figure, then this action would increase the probability of its survival as a *Fortune* 500 firm by 7.2%, all else equal.

Hypothesis $H_3$ posits that the higher the level of industry growth, the greater is the probability of survival as a *Fortune* 500 firm. The results do not lend empirical support for the main effect of industry growth ($p > .10$).

However, the results lend empirical support for my hypotheses that the moderating effects of industry growth are asymmetric between marketing capital and R&D capital. Specifically, $H_4$ posits that industry growth positively moderates the relationship between marketing capital and survival as a *Fortune* 500 firm. This effect is significant and is in the expected direction ($p < .05$), suggesting that marketing activities are more valuable in high-growth industries than in low-growth industries. $H_5$ posits that industry growth negatively moderates the relationship between R&D capital and survival as a *Fortune* 500 firm. My result supports $H_5$ ($p < .05$). That is, for the same level of R&D capital, firms operating in high-growth industries have a higher hazard of exit or a lower probability of survival as a *Fortune* 500 firm than those in low-growth industries ($p < .01$). Thus, R&D capital is more valuable in low-growth industries than in high-growth industries.

**TABLE 5**
**Results from Extended Cox Proportional Hazards Model**
**(Accounting for Left-Truncation)**

| Variable | No Interaction Terms Coefficient (SE) | With Interaction Terms Coefficient (SE) |
|---|---|---|
| Marketing Capital $_{i(t-1)}$ | -0.0007*** | -0.0007*** |
| | (0.0002) | (0.0002) |
| R&D Capital $_{i(t-1)}$ | -0.0004 | -0.0006* |
| | (0.0003) | (0.0003) |
| Industry Growth $_{i(t-1)}$ x $10^{-3}$ | | 0.0003 |
| | | (0.0036) |
| Marketing Capital $_{i(t-1)}$ * Industry Growth $_{i(t-1)}$ x $10^{-6}$ | | -0.0031** |
| | | (0.0015) |
| R&D Capital $_{i(t-1)}$ * Industry Growth $_{i(t-1)}$ x $10^{-6}$ | | 0.0062** |
| | | (0.0027) |
| Momentum $_{i(t-1)}$ | -0.0004** | -0.0005*** |
| | (0.0001) | (0.0002) |
| Profitability $_{i(t-1)}$ | -2.8496** | -3.1322** |
| | (1.3833) | (1.4212) |
| Diversification $_{i(t-1)}$ | -0.0206 | -0.0316 |
| | (0.0862) | (0.0875) |
| Strategic Shift in Emphasis $_{i(t-1)}$ | -0.0013 | -0.0001 |
| | (0.0013) | (0.0015) |
| Financial Leverage $_{i(t-1)}$ | 0.5256 | 0.5581 |
| | (0.8137) | (0.8189) |
| Industry Concentration $_{i(t-1)}$ x $10^{4}$ | -0.0034** | -0.0033* |
| | (0.0017) | (0.0017) |
| Industry Demand Volatility $_{i(t-1)}$ | -6.4611 | -6.7294 |
| | (4.1473) | (4.2125) |
| Industry Size $_{i(t-1)}$ x $10^{3}$ | -0.0025* | -0.0027* |
| | (0.0015) | (0.0015) |
| Industry R&D Intensity $_{i(t-1)}$ x $10^{4}$ | 0.0050** | 0.0051** |
| | (0.0020) | (0.0020) |
| Industry Advertising Intensity $_{i(t-1)}$ x $10^{4}$ | 0.0071 | 0.0073 |
| | (0.0045) | (0.0045) |
| Year of Services Firms Introduction | -0.4985 | -0.5433 |
| | (0.3431) | (0.3468) |

**TABLE 5 Continued**

| Variable | No Interaction Terms Coefficient (SE) | With Interaction Terms Coefficient (SE) |
|---|---|---|
| Industry Dummy Variables | 2 out of 17 significant | 2 out of 17 significant |
| Log Likelihood | -196.7856 | -194.51798 |
| LR $\chi^2$ (d.f.) | 120.60 (31) | 125.13 (33) |
| No. of Firms | 143 | 143 |

**Control Variables**

*Firm-specific control variables.* I posited that a firm's financial leverage, its momentum, its profitability, its degree of diversification, and its strategic shift in emphasis have effects on its survival as a *Fortune* 500 firm. The results of my analysis show that both momentum ($p < .01$) and firm profitability ($p < .05$) are positively associated with the probability of surviving as a *Fortune* 500 firm. However, the effects of financial leverage, strategic shift in emphasis, and diversification on the probability of survival as a *Fortune* 500 firm are not significant ($p > .10$).

*Industry-specific control variables.* The results in Table 6 highlight the importance of considering industry characteristics when explaining time of survival as a *Fortune* 500 firm. In particular, *Fortune* 500 firms that operate in more concentrated industries have a greater probability of survival as a *Fortune* 500 firm ($p < .10$). Operating in larger industries also increases the probability of survival as a *Fortune* 500 firm ($p < 0.10$). However, my results suggest that industry demand volatility is not

significant in explaining survival as a *Fortune* 500 firm ($p > .10$). Finally, firms operating in industries with high R&D intensity have a lower probability of survival as a *Fortune* 500 firm ($p < .05$), while high industry advertising intensity does not have a significant effect on survival as a *Fortune* 500 firm ($p > .10$). This result is counter to the entry barrier argument advanced earlier. A possible reason is that heightened industry R&D intensity reflects increasing competition in innovation, hampering the focal firm from exhibiting greater sales growth. Only two industry-specific dummy variables, SIC code 24 (lumber and wood products industry) and SIC code 37 (transportation equipment industry), are significant. Furthermore, the dummy variable controlling for firms exiting the list during the year that service firms Ire added to the list, is not significant ($p > .10$).

**Robustness Checks**

I conducted several robustness checks to confirm the validity of my findings. First, I examined if my results Ire robust to alternative models, namely, the logit model and a discrete hazard model. The results from these models are quite similar to those of the proposed model.

Second, because my research explicitly focuses on the survival in a group of largest of large firms, absolute sales revenues matter and I did not normalize the variables by firm assets or sales revenues. However, I also estimated alternative models with firm-specific variables normalized by assets or sales revenues. The results are substantively similar. The main difference between the results from these models and my

proposed model is that R&D capital does not have a significant main effect on survival as a *Fortune* 500 firm in these models ($p > .10$).

Third, it could be argued that the initial rank of the company in the *Fortune* 500 firm cohort is an important predictor variable. To control for this possibility, I introduced a categorical variable that classifies *Fortune* 500 firms into different groups based on their starting ranks in the list. Specifically, I classify firms that are ranked 1-50 in 1981 as belonging to Category 1, firms ranked 51-100 as belonging to Category 2, firms ranked 101-150 as belonging to Category 3, and so on. I did not find this variable to significantly affect the probability of survival as a *Fortune* 500 firm ($p > .10$).

Fourth, I recognize marketing and R&D capitals as assets and use stock measures of these variables. To control for different possible retention rates of these variables, I tried lower alternative retention rates for marketing capital (25%) and R&D capital (18% and 40%) based on some prior research (e.g., Dutta, Narasimhan, and Rajiv 2005; Hanssens, Parsons, and Schutlz 2003). However, these alternative retention rates did not substantively change the results.

Fifth, I did not consider firms whose exit from the *Fortune* 500 firm cohort was due to their being acquired. My reasoning is that such exits are not necessarily an outcome of poor performance of the acquired firm. However, to perform more comprehensive robustness checks, I estimated a cause-specific competing risks model that allows for two types of exit: exit due to acquisitions and exit due to poor relative performance. Table 6 highlights the results from this competing risk model for firms that exit due to relative poor performance. These results are similar to those reported in Table

5. The coefficient for interaction of marketing capital and industry growth is no longer significant ($p > .10$), but is in the expected direction. These results justify my dropping the acquired firms from the scope of my analysis.

**TABLE 6**

**Results of Competing Risk Model for Exit from the *Fortune* 500 Firm Cohort**

| Variable | With Interaction Terms Coefficient (SE) |
|---|---|
| Marketing Capital $_{i(t-1)}$ | -0.0004*** |
| | (0.0001) |
| R&D Capital $_{i(t-1)}$ | -0.0007** |
| | (0.0003) |
| Industry Growth $_{i(t-1)}$ x $10^{-3}$ | -0.0038 |
| | (0.0063) |
| Marketing Capital $_{i(t-1)}$ * Industry Growth $_{i(t-1)}$ x $10^{-6}$ | -0.0037 |
| | (0.0027) |
| R&D Capital $_{i(t-1)}$ * Industry Growth $_{i(t-1)}$ x $10^{-6}$ | 0.0068** |
| | (0.0027) |
| Momentum $_{i(t-1)}$ | -0.0007*** |
| | (0.0002) |
| Profitability $_{i(t-1)}$ | -2.5848* |
| | (1.4788) |
| Diversification $_{i(t-1)}$ | 0.0069 |
| | (0.0933) |
| Strategic Shift in Emphasis $_{i(t-1)}$ | 0.0001 |
| | (0.0014) |
| Financial Leverage $_{i(t-1)}$ | 1.1687 |
| | (1.0411) |
| Industry Concentration $_{i(t-1)}$ x $10^{4}$ | -0.0026 |
| | (0.0019) |
| Industry Demand Volatility $_{i(t-1)}$ x $10^{2}$ | 0.0765* |
| | (0.0442) |
| Industry Size $_{i(t-1)}$ | -0.0000 |
| | (0.0000) |
| Industry R&D Intensity $_{i(t-1)}$ x $10^{4}$ | 0.0054** |
| | (0.0023) |

**TABLE 6 Continued**

| Variable | With Interaction Terms Coefficient (SE) |
|---|---|
| Industry Advertising Intensity $_{i(t-1)}$ x $10^4$ | 0.0063 |
| | (0.0054) |
| Year of Services Firms Introduction | 0.2570 |
| | (0.4044) |
| Log Likelihood | -157.0981 |
| LR $\chi^2$ (d.f.) | 115.09 (33) |
| No. of Firms | 201 |

Sixth, to control for the mechanism for survival on the *Fortune* 500 list, I construct an indicator variable that captures whether the sales growth of the focal firm exceeds the average annual sales growth for the *Fortune* 500 cohort. The logic for including this variable is that firms whose sales growth exceeds the average annual sales growth of the *Fortune* 500 cohort may retain their elite status as a *Fortune* 500 firm, while firms that fail to do so may exit from the list. This variable did not turn out to be significant in my model ($p > .10$).

Seventh, I also estimated an alternative model, namely, accelerated failure time model, consistent with Srinivasan, Lilien, and Rangaswamy (2008). The results from this model are consistent with those from my proportional hazards model and further confirm the robustness of my findings. Since the accelerated failure time model is more appropriate for events that are certain to happen (e.g., death) and because a firm can remain in the *Fortune* 500 list indefinitely, I retain the proportional hazards model for final analysis.

Eighth, to test the robustness of the results to the operationalization of marketing expenditures, I conducted a subsample analysis of 42 *Fortune* 500 firms that reported both R&D and advertising expenditures. For this sample, I use advertising expenditures instead of marketing expenditures. The results of this analysis are consistent with those of my proposed model.

Finally, prior research suggests firm-level and industry-level characteristics may moderate the effect of a shift in strategic emphasis on *stock market response* (Mizik and Jacobson 2003). To explore the possibility of a moderating effect of shift in strategic emphasis on *survival* as a *Fortune* 500 firm, I estimated a separate proportional hazards model that includes the interaction of the strategic shift in emphasis with industry growth. The results of the main model do not substantively change and none of these interactions are significant ($p > .10$).

A summary of the results of the hypotheses with interpretation and brief rationale appears in Table 7. All the hypotheses, except $H_3$ (the main effect of industry growth) are supported. The asymmetry between the roles of marketing and R&D capitals on survival as a *Fortune* 500 firm is striking. Marketing capital enhances survival in high-growth industries. In contrast, R&D capital dampens survival in high-growth industries. A summary of the new insights on survival as a *Fortune* 500 firm appears in Table 8. Here, I compare the new insights from my research on survival as a *Fortune* 500 firm with knowledge from research on firm survival, per se. First, the insights offered by my research on the role of industry growth, which has not been previously studied, are new. Second, my research provides a more nuanced understanding of the factors that affect

survival as a *Fortune* 500 firm than those offered by research on firm survival, per se. Third, and importantly, the insights on asymmetry between the influences of marketing and R&D capitals on survival as a *Fortune* 500 firm are significantly new contributions to the literature.

**TABLE 7**
**Summary of Hypotheses Results on Survival as a *Fortune* 500 Firm**

| Hypothesis | Expected Sign | Actual Sign | Interpretation |
|---|---|---|---|
| Marketing capital ($H_1$) | + | + | Greater marketing capital directly affects sales growth significantly higher than those of other firms for continued *Fortune* 500 membership. |
| R&D capital ($H_2$) | + | + | Greater R&D capital is directly related to more innovation outputs and higher relative growth for continued inclusion in *Fortune* 500 list. |
| Industry growth ($H_3$) | - | NS | Industry growth may not directly affect a firm's survival as a *Fortune* 500 firm as growth relative to *Fortune* 500 firms outside its industry may matter more for continued inclusion in the list. |
| Industry growth-Marketing capital interaction ($H_4$) | + | + | In fast-growing industries, greater marketing capital boosts firm revenue growth relative to other firms to sustain inclusion in the *Fortune* 500 list. |
| Industry growth-R&D capital interaction ($H_5$) | - | - | In slow-growing industries, greater R&D capital boosts firm revenue growth relative to other firms to sustain inclusion in the *Fortune* 500 list. |

## DISCUSSION

My analysis uses RBV and SCP theories to explain how a firm's unique collection of resources, namely its marketing and R&D capitals, can provide it with a sustained opportunity to survive as a *Fortune* 500 firm. In addition, my results offer unique insights into how industry growth moderates the relationship between these firm-specific resource variables and survival as a *Fortune* 500 firm.

**TABLE 8**
**New Insights on Survival as a *Fortune* 500 Firm**

| Issue | Insights on Firm Survival | New Insights on Survival as a *Fortune* 500 Firm |
|---|---|---|
| Effect of marketing capital | Not previously studied. | Marketing capital has a direct positive effect on survival as a *Fortune* 500 firm. It also has an interaction effect with industry growth. |
| Effect of R&D capital | R&D capital's positive impact on survival is greater for smaller firms than for larger firms. | R&D capital has a positive direct effect on survival as a *Fortune* 500 firm. It also has an interaction effect with industry growth. |
| Direct effect of industry growth | Firms operating in growth industries have a higher likelihood of failure. | Industry growth does not have a direct effect on survival as a *Fortune* 500 firm. |
| Contingent effects of industry growth | Not previously studied. | Asymmetric effect. Industry growth negatively moderates the relationship between R&D capital and survival as a *Fortune* 500 firm, while it positively moderates the relationship between marketing capital and survival as a *Fortune* 500 firm. |

**Managerial Implications**

First, my finding on the direct effects of marketing and R&D capitals on survival as a *Fortune* 500 firm underscores the importance of sustained investments in marketing and R&D. To maintain the leadership position of their respective firms, managers should continue making investments in marketing and R&D, regardless of other factors.

Second, mine is the first study to focus on the importance of marketing to sustaining membership in the *Fortune* 500 firm cohort. My finding of the differential moderating influence of industry growth on the effects of marketing and R&D capitals on survival as a *Fortune* 500 firm points to a valuable take-away in resource allocation. Managers should give careful consideration to allocating relatively more resources to marketing in high-growth industries and more resources to R&D in stagnant or slow-growth industries.

Third, managers of *Fortune* 500 firms can use the figures in Table 9 as a general guide to assess the relative effects of marketing and R&D expenditures. Although marketing *capital* has a more positive effect than does R&D *capital* on survival as a *Fortune* 500 firm, because R&D capital has a much higher retention rate than does marketing capital, R&D *spending* has a more positive impact than does marketing spending on survival as a *Fortune* 500 firm. If a *Fortune* 500 manufacturing firm were to incrementally spend 1% of average firm sales revenues or $125 million in marketing (R&D) for five years, then its hazard of exit from *Fortune* 500 would directly decrease by 11.4% (20.5%). However, after factoring in the moderating effects of industry growth, the net decrease in hazard of exit due to incremental annual spending of 1% of

the average sales revenues in marketing (R&D) expenditures for five years would be 12.0% (17.9%). Importantly, if a *Fortune* 500 manufacturing firm were to incrementally spend 1% of average firm sales revenues on each of marketing and R&D activities for five years, then their combined effect would be a drop in hazard of exit from the *Fortune* 500 list by 27.8%.

**TABLE 9**
**Percentage Reductions in the Hazard of Exit from the *Fortune* 500 List due to Incremental Marketing and R&D Expenditures of 1% of Average Sales Revenues for 5 Years**

| Variable | Direct/Main Effect | Moderating Effect of Industry Growth | Net Effect |
|---|---|---|---|
| Marketing spending | 11.40 | 0.71 | 12.03 |
| R&D spending | 20.47 | -3.20 | 17.93 |
| Marketing spending and R&D spending combined | 29.54 | 1.02 | 27.80 |

Note: The net effect is not an additive function of the direct and moderating effects because of the nonlinear nature of the function in Cox's proportional hazard formulation. Similarly the combined effect of marketing and R&D spending is not an additive result of the individual effects of marketing spending and R&D spending.

Fourth, my results also provide insights to managers on the importance of industry-specific characteristics to survival as a *Fortune* 500 firm. The finding that firms operating in industries with high R&D intensity are more likely to exit the *Fortune* 500

firm cohort suggests that managers of *Fortune* 500 firms in such industries need to balance the direct positive effects of firm-specific R&D capital on survival as a *Fortune* 500 firm with the negative effect of industry level R&D intensity on survival as a *Fortune* 500 firm.

**Limitations and Future Research Directions**

My research suffers from certain shortcomings that merit being addressed in future research. First, while my study indirectly shows that both quality (stock variable) and quantity (expenditures) of R&D matter, future research could more precisely account for the quality of these R&D investments, perhaps, by incorporating measures such as patents in the analysis.

Second, I examine survival as a *Fortune* 500 firm. A related important variable for a *Fortune 500 firm* is growth rate. A relatively comprehensive examination of determinants of organic growth for *Fortune* 500 firms constitutes a second avenue for future research. Such research would extend work on drivers of organic growth (Bahadir, Bharadwaj, and Parzen 2009).

Third, CEO characteristics have been identified as a reason for firm failure (Charan and Useem 2002). Investigating the effects of CEO and senior management characteristics on survival as a *Fortune* 500 firm constitutes a promising avenue for future research.

Finally, I focused on manufacturing firms because they invest significantly in both marketing and R&D activities. Firms in service industries tend to invest less in R&D than firms in manufacturing industries. Research focusing on the differences in the

effects of R&D capital and marketing capital on survival as a *Fortune* 500 firm between goods versus service industries constitutes a promising avenue for future research.

## CONCLUSION

Marketing capital and R&D capital have significant effects on a firm's survival as a *Fortune* 500 firm. While both marketing and R&D capitals are directly and positively associated with survival as a *Fortune* 500 firm, there are asymmetries in the moderating effects of industry growth on these relationships. Marketing capital indirectly enhances survival as a *Fortune* 500 firm through the positive moderating effects of industry growth. In contrast, R&D capital indirectly dampens the probability of survival as a *Fortune* 500 firm through the negative moderating effect of industry growth. Nevertheless, due to a much higher retention rate for R&D spending than for marketing spending, if a *Fortune* 500 manufacturing firm Ire to incrementally spend 1 % of average sales revenues for five years on marketing (R&D), then its hazard of exit from *Fortune* 500 would drop by 12.0% (17.9%). The results suggest that from the standpoint of survival as a *Fortune* 500 firm, managers should consider investing more in marketing (R&D) when industry growth is high (low).

# CHAPTER III

# AN EMPIRICAL ANALYSIS OF THE EFFECTS OF ADVERTISING CAPITAL AND R&D CAPITAL ON SALES GROWTH, PROFIT GROWTH AND MARKET VALUE GROWTH

There is mounting pressure on firms to exhibit organic (due to internal efforts) growth in sales, profit, and market value. Unfortunately, there is a limited understanding of the drivers of organic growth. In this research, I examine the effects of advertising capital and R&D capital on sales growth, profit growth, and market value growth. I also examine how interactions between these two strategic variables and their interactions with environmental contingency factors of dynamism, munificence, and complexity impact these performance measures. Using dynamic panel data analysis of 185 firms over an eight-year period (2000-2007), I uncover a nuanced understanding of how advertising capital and R&D capital affect firm growth. My results show that both R&D capital and advertising capital directly affect sales growth, but neither has a direct impact on profit growth. Furthermore, R&D capital has a direct impact on market value growth. I also find that while the interaction of advertising capital and R&D capital does not directly affect sales growth or market value growth, it has a positive direct impact on profit growth. Finally, I find that environmental contingencies matter. For instance, environmental dynamism negatively (positively) moderates the relationship between R&D (advertising) capital and sales growth.

## INTRODUCTION

*"Back in the late '90s and even 2000, growth was everywhere. You could place lots of bets and most of them paid off because somebody was willing to buy. But now I are living in a very different world."- Pat Russo, CEO, Lucent Technologies.*

*"Revenue growth is the key. My company, like most players in my sector, is beyond cost cutting stage… Now it is about growing the top line while keeping the bottom line in check."- Survey respondent, 2004 Global CEO Study by IBM Global Services.*

In an era where the emphasis is on shareholder value maximization, numerous factors have led to the emergence of sales growth as a key performance metric. First, there is mounting evidence of the positive effect of sales growth on market value, earnings persistence, earnings growth forecasts, and earnings response coefficients (e.g., Eritmur, Livnat, and Martikainen 2003; Ghosh, Gu, and Jain 2005; Srinivasan and Hanssens 2009). Second, turbulent operating environments are placing a premium on sales growth (Day 2006). Third, consistent with the earlier quotes, firms are quickly realizing the limits to cost cutting strategies. Finally, sales growth is important because growth firms attract human and financial resources (Nicholls-Nixon 2005), enjoy higher levels of employee satisfaction (Doorley and Donavan 1999), and are five times less likely to be takeover targets (Smit, Thompson, and Viguerie 2005).

A firm can grow through internal efforts (organic growth) or through mergers and acquisitions (external growth). However, there is a growing emphasis on organic growth due to problems associated with external growth. These problems include the overvaluation of target firms by acquiring firms (Tuch and O'Sullivan 2007), difficulties in integrating the firms (Nahavandi and Malekzadah 1988), and uncertainties in aligning the strategic emphases of the firms (Swaminthan, Murshed, and Hulland 2008). Indeed,

the Marketing Science Institute held conferences on the topic of organic growth during 2009 and 2010. In 2009, *The International Journal of Research in Marketing* published a special issue on organic growth. Despite this emerging emphasis on organic growth, there is a limited understanding of *firm-specific* strategic drivers of organic growth.

I address this void in prior research by examining the effects of two under-researched strategic factors, advertising capital and R&D capital, on sales growth. Because advertising expenditures are viewed as assets (Dutta, Narasimhan, and Rajiv 1999, 2005), I define a firm's advertising capital as its cumulative stock of advertising expenditures after appropriate depreciation. Consistent with prior research (e.g., Griliches 1979; Lev and Sougiannis 2003), I define a firm's R&D capital as its cumulative stock of R&D expenditures after adjusting by the appropriate depreciation rate.

I focus on advertising and R&D capital for several reasons. First, while innovation and marketing are the two main functions of a firm (Drucker 1993), a review of extant empirical research on sales growth suggests that the there is a dearth of studies that simultaneously examine the effects of advertising capital and R&D capital on sales growth. Second, R&D capital and advertising capital can be viewed as measures of two key competencies of a firm: value creation and value appropriation competencies (Mizik and Jacobson 2003), that could potentially offer a compelling explanation of firm growth (Geroski 2000). [4] Third, the resource based view (RBV) of the firm argues that assets

[4] See Hart (2000) for a discussion on how empirical results do not match dominant theoretical perspectives. Also see Geroski (2005) for an attempt at reconciling empirical

that are difficult to imitate and/or hard to transfer are a key source of sustained competitive advantage (Barney 1991). Since advertising capital and R&D capital exhibit at least some of these characteristics (McAlister, Srinivasan, and Kim 2007), they are key sources of competitive advantage. Thus, it is unsurprising that R&D capital and advertising capital have emerged as critical resource allocation variables at the highest level of decision-making (Nakamura 2003; Shankar 2008). However, there is a paucity of studies in marketing that examine the resource allocation decisions between these key strategic activities (Shankar 2008).[5]

According to the RBV of the firm, R&D capital and advertising capital directly influence sales growth. However, the contingency perspective argues that a firm creates value only when it deploys its resources appropriately within the firm's environmental context (e.g., Lippman and Rumelt 2003; Sirmon, Hitt, and Ireland 2007). [6] According to this viewpoint, the fit between the environment and advertising and R&D capitals is a key driver of sales growth. Prior research has identified three critical dimensions of the environment, namely *dynamism* (unpredictability in the industry), *munificence* (the industry's ability to accommodate growth of all firms within the industry), and *complexity* (heterogeneity or concentration of resources in the industry) (Bahadir,

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findings with the implications of a few theoretical perspectives. For a review of explanations of firm growth, readers are directed towards Trau (1996).

[5] Shankar (2008) focuses on research that examines marketing and R&D expenditures together. Advertising is only a subset of these marketing expenditures.

[6] The contingency perspective argues that it is not merely the strategic choices or actions of the firm, but how the strategic choices of the firm fit with the context of the firm determines the effects these actions on firm performance (e.g., Ginsberg and Venkatraman 1985; Venkatraman and Prescott 1990).

Bharadwaj, and Parzen 2009; Boyd 1990; Dess and Beard 1984). Yet, to my knowledge, the interactions of these environmental variables with advertising capital and R&D capital have not been examined.

In addition to sales growth, profit growth is a key dimension of firm growth. Given the importance of profits in driving market value (Bayus, Erickson, and Jacobson 2003; Joshi and Hanssens 2010), it is critical to understand the drivers of organic profit growth. However, as with sales growth, there is scant research on the simultaneous effects of R&D capital and advertising capital on profit growth. In particular, we do not know if R&D capital or advertising capital directly affects profit growth, after controlling for their indirect effects through sales. Furthermore, prior research has not examined how environmental contingencies influence these relationships.

Beyond growths in sales and profit, growth in market value is critical to fulfill the goal of a for-profit firm—maximization of shareholder value. While prior research has examined the direct effects of advertising and R&D expenditures on market value (e.g., Chan, Lakonishok, and Sougiannis 2001; Joshi and Hanssens 2010), there are some important unanswered questions. For example, while a firm's advertising efforts can have a direct impact on market value (e.g., Joshi and Hannsens 2010), it is unclear how advertising capital and R&D capital interact with each other and with environmental contingencies to affect growth in market value. Moreover, it is unclear whether advertising capital or R&D capital influence market value growth, after controlling for their indirect effects through profits. In fact, prior research provides equivocal results. On the one hand, Erickson and Jacobson (1992) show that after

controlling for profits, a firm's advertising and R&D *expenditures* have a negative impact on its stock returns. On the other hand, Joshi and Hanssens (2010) find a positive direct effect of advertising *expenditures* on market value for a sample of firms. Can these apparently contradictory findings be explained by environmental contingencies? I address this question by examining in a single framework, the effects of advertising and R&D capital and their interactions with environmental contingency factors, on growth in sales, profit, and market value.

To summarize, my research focuses on the following questions: How do advertising capital and R&D capital influence sales growth, profit growth, and market value growth? How do the environmental dimensions of dynamism, munificence, and complexity moderate these relationships? My research is thus one of the first to examine the effects R&D capital and advertising capital on all three dimensions of firm performance.[7]

I address these questions based on an analysis of 185 public firms tracked over an eight year period (2000-07).[8] My results show that both R&D capital and advertising

[7] While Joshi and Hanssens (2010) also examine this link, my study is different in two important ways. First, while they study only nine firms, I study 185 firms. Second, unlike their research, I study the effects of environmental contingencies on the three dimensions of firm performance.

[8] My focus on public firms (typically large firms) is appropriate because prior research has established that consistently meeting growth targets is exacerbated for older and larger firms (e.g. Hart 1962; Singh and Whittington 1975; Evans 1987; Dunne and Hughes 1994). This is because even low growth targets require the generation of a large amount of additional revenue. To illustrate, in 2006, G.E., a *Fortune* 500 company, had to raise an additional fifteen billion dollars in revenue - the annual revenue of Nike, to grow at the rate of the economy.

capital directly affect sales growth, but neither has a direct impact on profit growth. Furthermore, R&D capital has a direct impact on market value growth. I also find that while the interaction of advertising capital and R&D capital does not directly affect sales growth or market value growth, it has a positive direct impact on profit growth. Finally, I find that environmental contingencies matter. For instance, environmental dynamism negatively (positively) moderates the relationship between R&D (advertising) capital and sales growth.

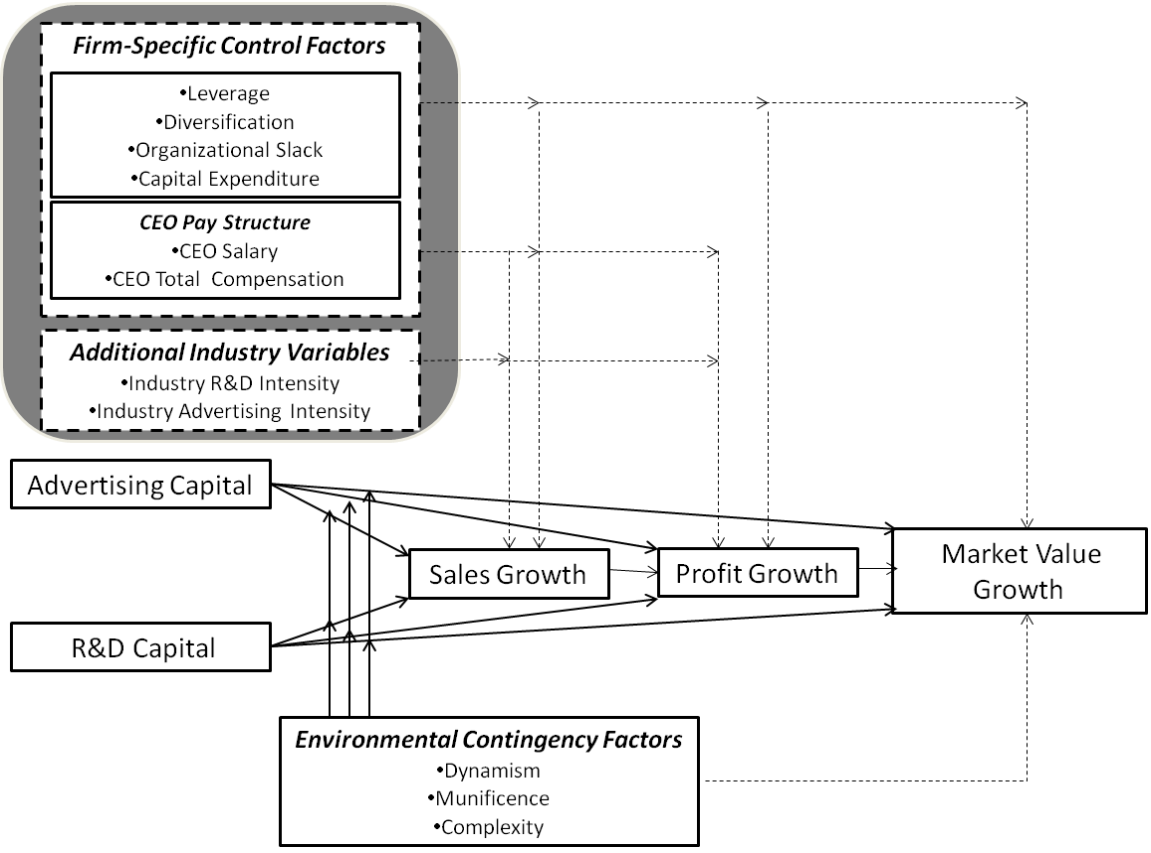
The remainder of the paper is organized as follows. Drawing on research from multiple disciplines, I first develop a conceptual model and advance key hypotheses. In the subsequent sections, I describe the database and methodology. I then discuss the results and present the theoretical and managerial implications. I close by highlighting the limitations and future research opportunities.

## CONCEPTUAL FRAMEWORK AND HYPOTHESES

Figure 3 depicts the conceptual framework adopted in this study. R&D capital and advertising capital form the building blocks of my conceptual model. R&D capital creates value by developing new products and creating intangible assets like absorptive capacity. Advertising capital helps appropriate value by engendering brand recognition and loyalty and by creating market based relational and intellectual intangible assets. While not shown in the figure, my research also examines the interactions of advertising capital and R&D capital on sales growth, profit growth, and market value growth. Environmental contingencies form the other critical building block of my conceptual

model. Finally, I control for other firm and industry specific factors that can influence growth in all three performance dimensions. These variables include leverage, organizational slack, diversification, capital expenditures, CEO pay structure, industry R&D intensity, and industry advertising intensity.

**FIGURE 3**
**The Effect of R&D Capital and Advertising Capital on Sales Growth, Profit Growth, and Market Value Growth**




As depicted in the framework, I expect that the path of the effect of advertising capital and R&D capital to be from sales growth to profit growth and from profit growth

to market value growth. However, as I subsequently argue, it is likely that these focal variables have direct effects on both profit growth and market value growth. I develop formal hypotheses for many of the relationships that have theoretical rationale. I treat the remaining relationships as empirical questions.

**Focal Determinants of Sales Growth**

*Advertising capital.* Research examining the relationship between advertising expenditures and sales is directly relevant to my study (e.g., Dekimpe and Hanssens 1995; Gatignon 1984; Leone 1983). Though a majority of the research in this domain is at the brand level, the key take away is that advertising expenditures impact sales positively, although the reported elasticity is low (Joshi and Hanssens 2010).

Advertising can impact sales growth through the persuasive, the informative, and the complementary roles of advertising identified in prior research (e.g., Bagwell 2007)[9]. In its persuasive role, advertising bonds customers to the firm's product offerings by distorting customer preferences away from competitors' products and towards the advertized product (Bagwell 2007; Wu, Chen, and Wang 2009). In its informative role, advertising informs a customer about a firm's product offering (Mehta, Chen, and Narasimhan 2008) thereby overcoming market inefficiencies and attenuating the effect of imperfect consumer information at a very low additional cost to the individual customer (Bagwell 2007). Finally, in its complementary or prestige role, advertising directly enters a consumer's utility function without necessarily providing consumers

[9] The three roles of advertising have been called different terms. For instance Mehta, Chen, and Narasimhan (2008) call it informative, transformative, and persuasive.

with any additional information (Bagwell 2007; Mehta, Chen, and Narasimhan 2008).

The three roles of advertising also explain why advertising capital aligns well with the RBV of the firm: all three roles of advertising can result in creation of assets that are hard to imitate or transfer. Particularly, advertising capital affects the creation of market-based relational and intellectual capital like brand equity, customer equity, channel equity, reputation, and trust (McAlister, Srinivasan, and Kim 2007; Srivastava, Fahey, and Christensen 2001). Based on these arguments, I hypothesize:

*H1: Advertising capital positively influences sales growth.*

*R&D capital.* Prior research has shown that R&D expenditures have a direct effect on sales growth (Del Monte and Papgani 2003; Hall 1987). Now, R&D capital can impact sales growth directly through the creation of new products. Prior research provides evidence supportive of a positive relationship between R&D expenditure and innovative output[10] (e.g., Mansfield 1968). Thus it can be argued that all else equal, a firm that possesses the most innovative product or technology will be able to gain market share at the expense of its less innovative competitors. In support of this argument, Nijs et al. (2001) shows that innovation has a positive impact on sales.

In its indirect role, R&D capital can impact sales growth through the development of a firm's absorptive capacity (e.g., Narasimhan, Rajiv, and Dutta 2006),

[10] R&D capital can result in the creation of drastic (or radical) innovation and incremental innovation. Both types of innovation can fuel firm growth, though there is evidence that betIen the two, the market values radical innovations more than incremental innovations (Sorescu, Chandy, and Prabhu 2003; Sorescu and Spanjol 2008).

which can be viewed how a firm's prior knowledge allows it to recognize the importance of new information and adapt it for the needs of the company (Cohen and Levinthal 1990). Absorptive capacity of a firm can foster sales growth in two ways. First, it allows a firm to identify nascent technologies that originate outside the firm and mold it to meet its customer's needs. Second, it provides the firm with the ability to choose from among a set of competing technologies the technology that is most appropriate for achieving its objectives. For these reasons, I hypothesize that:

*H2: R&D capital positively influences sales growth.*

*Complementarities between advertising capital and R&D capital.*

Complementarities exist between two strategies if undertaking more of one strategy results in an increase of the marginal value of the other strategy (Morgan, Slotegraaf, and Vohries 2009; Slotegraaf and Moorman 1999). It can be argued that advertising capital and R&D capital are complementary in nature, i.e. increasing one type of capital increases the marginal returns of the other capital. For instance, an increase in R&D capital will increase the marginal effect of advertising capital because advertising capital can now be used to appropriate value from the innovations generated by R&D capital. On the other hand, an increase in advertising capital results in an increase in brand equity and brand recognition, which in turn increases the returns from a firm's innovation (which is at least partially driven by its R&D capital).

There is no strong prior evidence for the existence of complementarities between R&D capital and advertising capital. While some researchers provide evidence of the existence of complementarities between R&D capital and advertising capital (e.g., Dutta,

Narasimhan, and Rajiv 1999), other researchers suggest that complementarities between R&D capital and advertising capital might, at best, exist only under certain conditions (e.g., Song et al. 2005). Additionally, firms operate on limited budgets. Therefore, a simultaneous increase in both R&D and advertising capital might result in neither capital receiving sufficient expenditure boosts. Finally, as noted by Joshi and Hanssens (2010) existence of complementarities between advertising and R&D capital depends on the effectiveness of the projects underway in these areas.

Thus, due to the lack of strong prior evidence, I do not formulate any explicit hypotheses for the interaction of these variables on sales growth, profit growth, or growth in market value.

*Environmental contingencies*. Broadly speaking, the operating environment can be viewed as anything outside the firm (Castrogiavanni 1991). However, research in strategic management typically view the environment as having three key dimensions, namely, dynamism, munificence, and complexity (Dess and Beard 1984; Keats and Hitt 1988; Lumpkin and Dess 2001; Tang and Litschert 1997).

*Dynamism.* Environmental dynamism refers to the instability or unpredictability present in the operating environment (Baum and Wally 2003; Dess and Beard 1984; Sirmon, Hitt, Ireland 2007). Dynamism is an important environmental contingent factor to consider because it results in limited knowledge available to the managers making critical decisions (Simerly and Li 2000; Milliken 1987). This in turn can affect the quality of resource allocation decisions. Moreover, environmental dynamism can result

in the generation of conflicting information, which can lead to reduced speed and quality of decision making (Hough and White 2003).

Due to these reasons I anticipate environmental dynamism to negatively moderate the relationship between R&D capital and sales growth. I advance this hypothesis because the poor quality of information that characterizes dynamic environments increases the probability of failure of innovation projects thereby decreasing sales growth. On the other hand, I posit that the positive effect of advertising capital on sales growth is strengthened in environments exhibiting higher levels of dynamism. I base my argument on the informative and persuasive role of advertising. Particularly, in increasingly dynamic environments, increasing advertising capital reflects an increase in a firm's persuasive and informative effort, which in turn helps bind customers to a firm's products, increase awareness, and further differentiate the firm's product from its competitors. Formally, I hypothesize that:

> *H3a: Environmental dynamism positively moderates the relationship between advertising capital and sales growth.*
>
> *H3b: Environmental dynamism negatively moderates the relationship between R&D capital and sales growth.*

*Munificence.* Firms are said to be operating in a munificent environment if adequate resources are available in the environment to permit organizational growth (Bahadir, Bharadwaj, and Parzen 2009; Dess and Beard 1984). A munificent environment is beneficial to firms because it lowers competitive intensity (Park and Mezias 2005). On the other hand, environments low in munificence, also called hostile

environments, are not conducive to superior firm performance because they encourage competition among firms (Park and Mezias 2005).

I posit that environmental munificence positively moderates the relationship between R&D capital and sales growth. This is because munificent environments or high growth environments are characterized by evolving customer tastes (Gatignon and Xeureb 1997). In such environments, a firm's R&D capital is more important because of its positive relationship with innovation; a crucial ingredient in successfully meeting the changing customer needs. Also due to the evolving customer taste that characterizes munificent environments, I expect a firm's advertising capital to have a positive impact on sales growth because it results in increased firm awareness, increased brand equity, and greater product differentiation. Therefore:

> *H4a: Environmental munificence positively moderates the relationship between advertising capital and sales growth.*
>
> *H4b: Environmental munificence positively moderates the relationship between R&D capital and sales growth.*

*Complexity.* Complexity refers to the concentration of resources or spread of market share among the various members of an industry (e.g., Boyd 1990, 1995). The greater the concentration of resources the lesser is the environmental complexity (Boyd 1995). I postulate asymmetric effects of advertising capital and R&D capital on sales growth with regards to the moderating effect of environmental complexity. Since less complex environments mean high concentration, there is a greater awareness about a firm's product amongst customers in such environments. On the other hand, advertising capital is more important for firms operating in high complexity environments (low

concentration industries) because the spread of resources amongst competitors makes increased brand awareness critical. For these reasons I expect that the positive effect of advertising capital on sales growth is strengthened in high complexity environments.

In less complex environments (highly concentrated industries), attracting customers away from competitors is a difficult task. One way that firms can accomplish this difficult task is by providing customers with new products that are more aligned with their needs. In other words, firms can gain market share in low complexity environments by innovation. Thus, R&D capital has a stronger effect on sales growth in environments in low complexity environments. Formally,

> *H5a: Environmental complexity positively moderates the relationship between advertising capital and sales growth.*
>
> *H5b: Environmental complexity negatively moderates the relationship between R&D capital and sales growth.*

**Focal Determinants of Profit Growth**

Broadly speaking, profits are a function of sales and cost of sales. Thus, I expect sales to have a positive impact on profit growth. However, the key focus in this analysis is whether a firm's advertising and R&D capital (along with its interactions) have any impact on profit growth *over and beyond their impact on sales*.

*Advertising capital.* Advertising capital can impact sales and through it impact profit growth. Conceivably, advertising capital can impact profit growth directly. This is can happen in one of two ways. On the one hand, since advertising spending is expensed, advertising capital is a cost that negatively influences profit growth. On the other hand, advertising capital can lower the overall cost of doing business because it

increases brand awareness, brand equity, and product differentiation, all of which reduces the cost of customer acquisition and retention. Moreover, increased advertising capital can be viewed as a reflection of the quality of the product, which again reduces the cost of acquiring a customer. Thus, based on the latter set of arguments, I hypothesize that

*H6: Advertising capital positively influences profit growth.*

It should be noted that due to the lack of strong prior research, this hypothesis remains an empirical question.

*R&D capital.* Studies examining the effect of variables such as R&D expenditures and innovation on firm profits and profit growth have been largely inconsistent. For instance, with regards to R&D expenditures some scholars report normal returns to R&D expenditures on profit (e.g., Erickson and Jacobson 1992) others report large effects (e.g., Jaffe 1986). Even when studies look at innovation, the results are ambiguous. For example, Geroski, Machin, and Reenen (1993) only report modest effect of innovation on profit. Bayus, Erickson, and Jacobson (2003) find a significant positive effect of innovation on profit, but they do not find any evidence of persistence of innovation on profit.

R&D capital can impact profit growth through sales or through its effect on firm cost (or both). R&D capital increases the cost of bringing a product to the market. Given that innovations themselves are uncertain, these costs can outweigh the sales growth associated with an innovation. In this case we expect to see a negative relationship between R&D capital and profit growth after controlling for a firm's sales. However,

R&D capital can lower overall cost through its focus on process innovations, many of which have a cost reduction emphasis. In this case, a firm's R&D capital can have a positive impact on profit growth even after controlling for its sales. Thus, along the lines of the latter argument, I hypothesize that

*H7: R&D capital positively influences profit growth.*

As with the relationship between advertising capital and profit growth, it should be noted that due to the lack of strong prior research, this hypothesis remains an empirical question.

*Environmental contingencies.* I refrain from making any formal hypotheses with regards to how environmental variables impact the focal relationships because in most cases countervailing arguments can be advanced. Moreover, the basis for the hypotheses extended for the direct effects themselves are only weakly supported by prior research, which makes formulating hypotheses for the interactions even more difficult.

**Focal Determinants of Market Value Growth**

A key ingredient of financial valuation models is profit (Bayus, Erickson, and Jacobson 2003; Joshi and Hanssens 2010). Time and time again, studies have shown a positive effect of profit on market valuation. Thus, I expect profit to have a positive impact on growth in market value. However, here, I am specifically interested in examining, the effect of advertising capital and R&D capital (along with their interactions with environmental factors) on market value growth *after accounting for its impact on profit*.

*Advertising capital.* The relationship between advertising capital and market value growth after controlling for a firm's profit levels is not obvious. Now, a firm's advertising expenditure can have a direct impact on market value growth beyond its impact through profit due to two reasons: (1) a spillover effect of advertising to consumers on to the investor community, and (2) a signaling of positive future performance of the firm (Joshi and Hanssens 2010). However, other research have shown that after accounting for a firm's profit, a firm's advertising expenditures does not impact market value of the firm (e.g., Erickson and Jacobson 1992). Thus, despite the existence of strong evidence, I hypothesize that:

*H8: Advertising capital positively influences market value growth.*

It should be noted that due to the lack of strong prior research, this hypothesis remains an empirical question.

*R&D capital.* There is a growing body of research that examines the relationship between R&D activities and market based measures of firm performance (e.g., Erickson and Jacobson 1992; Hall, Jaffe, and Trajtenberg 2005; McAlister, Srinivasan, and Kim 2007). However, based on prior research, it is not clear if there is a significant relationship between R&D capital and market value growth. Erickson and Jacobson (1992) find that stock market reaction to R&D expenditures is negative after controlling for firm profits. Using a portfolio analysis, Chan, Lakonishok, and Sougiannis (2001) find that there is no difference in returns between high R&D intensity firms and firms that do not invest heavily in R&D. On the other hand, other researchers (e.g., Hall, Jaffe, and Trajtenberg 2005) find that a firm's R&D capital has a positive impact on market

value. One reason why R&D capital can have a direct impact on market value of the firm is because it can serve as a signal for future performance of the firm. Thus despite the lack of strong evidence, I hypothesize that:

*H9: R&D capital positively influences market value growth.*

As with the relationship between advertising capital and market value growth, it should be noted that given the lack of unequivocal prior research, this hypothesis remains an empirical question.

*Environmental contingencies.* Given the lack of strong evidence for direct effects of advertising capital and R&D capital on market value growth and given that countervailing arguments can be advanced for the moderating effect of environmental contingencies on the effect of advertising and R&D capital on growth in market value, I refrain from making any formal hypotheses. As with profit growth, I choose to provide explanations for my empirical findings in the results.

**Control Variables**

*Financial leverage.* Financial leverage is defined as a firm's debt to asset ratio (e.g., Srinivasan 2006). Financial leverage can negatively impact sales growth because highly leveraged firms channel cash flow to service debt rather than pursue growth opportunities (e.g., Lang, Ofek, and Stulz 1996; Zingales 1998). Therefore, a negative relationship between leverage and sales growth is posited. Financial leverage can also negatively impact profit growth because highly leveraged firms have a greater cost of capital which directly and negatively affects profit growth. Finally, high financial leverage increases the probability of bankruptcy, an unfavorable condition as it rapidly

erodes the value of a firm's asset (Shumway 2001). Given this association, I anticipate a negative relationship between financial leverage and market value growth.

*Diversification.* Diversification has a positive effect on sales growth because of its explicit focus on market expansion (e.g., Jacquemin and Berry 1979). Therefore, a positive relationship between diversification and sales growth is expected. Prior research suggests that the relationship between diversification and profit growth depends on the nature of the diversification (e.g., Palepu 1985). However, it is likely that the cost of diversification outweighs its immediate benefits. Therefore, I anticipate a negative effect of diversification on profit growth. Finally, with regards to its influence on market value growth, researchers have provided evidence for the existence of a diversification discount (e.g., Berger and Ofek 1995; Lang and Stulz 1994) and a diversification premium (e.g.,Villalonga 2004). Due to these ambiguous findings, the relationship between diversification and market value growth is left as an empirical question.

*Capital expenditure.* A firm's investment in capital expenditure has a positive impact on firm growth. This is because investments in tangible assets like plant, property, and equipment can fuel sales growth. Thus, I expect capital expenditure to have a positive effect on sales growth. However, and after controlling for its impact on sales, I anticipate a negative effect of capital expenditures on profit growth, because this is an expenditure, which adds to the cost. Investments in tangible assets can be viewed as a signal of the available growth opportunities for the firm (Lang, Ofek, and Shultz 1996). Therefore, I expect a positive relationship between capital expenditure and market value growth.

*Organizational slack.* Organizational slack can be defined as the resources that are in excess of those required for the efficient operation of a firm (Bourgeois 1981; Sorescu and Spanjol 2008). Organizational slack is advantageous to a firm because it provides it with strategic flexibility (George 2005). I expect organizational slack to have a positive impact on sales growth because it allows the firm to pursue multiple growth opportunities. However, after controlling for its impact on sales, it is difficult to extend predictions about the relationship between organizational slack and profit growth. Therefore, I leave this relationship as an empirical question. I also leave the relationship between organizational slack and market value growth as an empirical question. This is because on the one hand markets might value slack resources as it serves as buffer against tough times while on the other hand, it could punish firms for maintaining slack resources because it does not maximize value.

*CEO pay structure.* CEO pay structures are designed to ameliorate concerns of adverse selection and moral hazard that are rampant in CEO - shareholder relationships. CEO pay structure comprises of at least two distinct components: a *baseline salary* and a *total compensation* amount (Aggarwal and Samwick 1999). It can be argued that a high baseline salary will cause managers to focus on sales growth because this makes them indispensible. However, a high salary does not motivate the managers to take risks on behalf of the firm. So, to incentivize CEOs to focus on maximizing firm value, total compensation packages are designed with incentives often in terms of stock options. This incentive structure focuses CEO attention on maximizing share prices and thus might not be correlated with sales growth. For these reasons, CEO salary can be

expected to have a positive impact on sales growth, but I do not anticipate a positive effect of CEO total compensation on sales growth.

Unlike the relationship with sales growth, I expect both CEO salary and CEO total compensation to have a positive impact on profit growth. This is because failure to increase profits, a key performance measure, can result in the termination of the position and higher the salary and total compensation, greater is incentive for CEOs to meet earning expectations. Finally, a priori, there is no theoretical reason to expect CEO pay structure to have a direct influence on market value growth (i.e., over and beyond its influence through profits). Therefore these variables are not included as control variables in the market value growth equation.

*Industry advertising intensity*. Industry level advertising intensity is a widely used measure of product differentiation-related entry barriers (Davies and Geroski 1997; Sutton 2007). However, higher levels of advertising intensity also means a higher level of competition among firms on the dimension of advertising. In accordance with the latter argument, I expect a negative relationship between industry advertising intensity and sales growth. Now, industry level advertising intensity has been shown to have a substantial positive effect on the average profit rates of incumbents in an industry (Comanor and Wilson 1967). Therefore, I expect industry advertising intensity to be positively related to profit growth. Since there is no theoretical reason to expect industry level advertising intensity to influence market value growth directly, this variable is not included as a control variable in the market value growth equation.

*Industry R&D intensity*. As with industry advertising intensity, higher industry R&D intensity creates a higher barrier to entry, which in turn is associated with higher profit for incumbents (e.g., Grabowski and Mueller 1978; Waring 1996). Similar to industry advertising intensity, higher levels of industry R&D intensity also means a higher level of competition among firms on the dimension of R&D capital. Therefore I expect a negative relationship between industry R&D intensity and sales growth and a positive relationship between industry R&D intensity and profit growth. Since there is no theoretical reason to expect industry level R&D intensity to directly influence market value growth, this variable is not included as a control variable in the market value growth equation.

## METHODOLOGY

### Sample Selection, Data Sources, and Key Variables

The final dataset is comprised of 185 firms tracked for 8 consecutive years beginning in 2000. I arrived at this final database by adopting a two step process. First, I identified all active firms in COMPUSTAT that reported *both* R&D and advertising expenditures for the period 2000 -2007. Next, I matched this list of firms with firms included in the S&P Executive Compensation database, a database that contains only S&P 500, Mid-Cap 400 and Small-Cap 600 firms, as well as firms that once belonged to these indexes. Table 10 describes the NAICS four digit industries included in the database and the number of companies per industry code.

**TABLE 10**

**Breakout of Database by Manufacturing Industries and Number of Companies**

| Four Digit NAICS Code | Industry Description | Number of Companies |
|---|---|---|
| 3112 | Grain and Oilseed Milling | 2 |
| 3113 | Sugar and Confectionery Product | 1 |
| 3116 | Animal Slaughtering and Processing | 1 |
| 3122 | Tobacco | 1 |
| 3221 | Pulp, Paper and Paperboard Mills | 1 |
| 3222 | Converted Paper Product | 1 |
| 3252 | Resin, Synthetic Rubber and Artificial Synthetic Fibers and Filaments | 1 |
| 3253 | Pesticide, Fertilizer, and Other Agricultural Chemical | 1 |
| 3254 | Pharmaceutical and Medicine | 6 |
| 3255 | Paint, Coating, and Adhesive | 2 |
| 3256 | Soap, Cleaning Compound and Toilet Preparation | 5 |
| 3259 | Other Chemical Product and Preparation | 1 |
| 3261 | Plastics Product | 2 |
| 3262 | Rubber Product | 2 |
| 3322 | Cutlery and Hand tool | 1 |
| 3329 | Other Fabricated Metal | 2 |
| 3331 | Agriculture, Construction, and Mining Machinery | 1 |
| 3332 | Industrial Machinery | 3 |
| 3333 | Commercial and Service Industry Machinery | 2 |
| 3334 | Ventilation, Heating, Air Conditioning and Commercial Refrigeration Equipment | 1 |
| 3336 | Engine, Turbine, and Power Transmission | 1 |

**TABLE 10 Continued**

| Four Digit NAICS Code | Industry Description | Number of Companies |
|---|---|---|
| 3339 | Other General Purpose Machinery | 4 |
| 3341 | Computer and Peripheral Equipment | 14 |
| 3342 | Communications Equipment | 4 |
| 3344 | Semiconductor and Other Electronic Component | 8 |
| 3345 | Navigational, Measuring, Electromedical, and Control Instruments | 4 |
| 3346 | and Reproducing Magnetic and Optical Media | 1 |
| 3352 | Household Appliance | 1 |
| 3359 | Other Electrical Equipment and Component | 3 |
| 3361 | Motor Vehicle | 2 |
| 3363 | Motor Vehicle Parts | 3 |
| 3366 | Ship and Boat Building | 1 |
| 3369 | Other Transportation Equipment | 1 |
| 3379 | Other Furniture Related Product | 1 |
| 3391 | Medical Equipment and Supplies | 3 |
| 3399 | Other Miscellaneous | 4 |
| 4411 | Automobile Dealers | 1 |
| 4413 | Automotive Parts, Accessories, and Tire Store | 3 |
| 4421 | Furniture Stores | 1 |
| 4422 | Home Furnishing Store | 3 |
| 4441 | Building Material and Supplies Dealers | 1 |
| 4451 | Grocery Stores | 2 |
| 4461 | Health and Personal Care Stores | 1 |
| 4481 | Clothing Stores | 17 |
| 4482 | Shoe Stores | 2 |
| 4483 | Jewelry, Luggage, and Leather Goods Stores | 1 |
| 4511 | Sporting Goods, Hobby, and Musical Instrument Stores | 1 |
| 4521 | Department Stores | 3 |
| 4529 | Other General Merchandise Stores | 4 |
| 4532 | Office Supplies, Stationery, and Gift Stores | 1 |
| 4539 | Other Miscellaneous Store Retailers | 2 |
| 4541 | Electronic Shopping and Mail-Order Houses | 1 |
| 5112 | Software Publishers | 19 |
| 5171 | Wired Telecommunications Carriers | 1 |

**TABLE 10 Continued**

| Four Digit NAICS Code | Industry Description | Number of Companies |
|---|---|---|
| 5179 | Other Telecommunications | 1 |
| 5182 | Data Processing, Hosting, and Related Services | 2 |
| 5191 | Other Information Services | 3 |
| 5222 | Nondepository Credit Intermediation | 1 |
| 5311 | Lessors of Real Estate | 1 |
| 5415 | Computer Systems Design and Related Services | 4 |
| 5419 | Other Professional, Scientific, and Technical Services | 1 |
| 6216 | Home Health Care Services | 1 |
| 6219 | Other Ambulatory Health Care Services | 1 |
| 7131 | Amusement Parks and Arcades | 1 |
| 7221 | Full-Service Restaurants | 6 |
| 7222 | Limited-Service Eating Places | 6 |
| 9999 | Conglomerates | 1 |

Table 11 describes the variables, the measures and data sources. In this section, I discuss my focal independent variables.

**TABLE 11**
**Variables, Measures, and Data Sources**

| Conceptual Variable | Description | Data Source |
|---|---|---|
| | ***Dependent Variable*** | |
| Sales Growth | Change in sales revenue between two consecutive years | COMPUSTAT |
| Profit Growth | Change in operating income after depreciation between two consecutive years | COMPUSTAT |
| Growth in Market Value | Change in the (market value of the firm's common stock shares+ book value of the firm's preferred stocks + book value of the firm's long-term debt + book value of the firm's inventories + (current liabilities - current assets)) between two consecutive year | COMPUSTAT/ CRSP |
| | ***Focal Independent Variables*** | |
| Advertising Capital | Koyck structured variable constructed using advertising expenditures | COMPUSTAT |
| R&D Capital | Koyck structured variable constructed using R&D expenditures | COMPUSTAT |
| Industry Munificence | Ratio of change in total industry sales revenue between two consecutive years (at the two digit SIC code level) to the total industry sales in the initial year | COMPUSTAT |
| Industry Complexity | Herfindahl index for competitive intensity | COMPUSTAT |
| Industry Dynamism | Three-year average coefficient of variation in total industry sales | COMPUSTAT |
| | ***Control Variables*** | |
| Financial Leverage | Long-term debt-to-asset ratio | COMPUSTAT |
| Diversification | Number of segments in which a firm operates | COMPUSTAT Segments |
| Organizational Slack | Ratio of net cash flow from operating activities to total assets | COMPUSTAT |
| Capital Expenditure | Ratio of capital expenditures to total assets | COMPUSTAT |
| CEO Salary | Dollar value of the base salary | S&P Executive Compensation Database |

**TABLE 11 Continued**

| Conceptual Variable | Description | Data Source |
|---|---|---|
| CEO Total Compensation | Sum of salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted, long-term incentive payouts | S&P Executive Compensation Database |
| Industry Advertising Intensity | Five year moving average of the ratio of industry advertising spending to industry sales revenues | COMPUSTAT |
| Industry R&D Intensity | Five year moving average of the ratio of industry R&D spending to industry sales revenues | COMPUSTAT |

*R&D capital and advertising capital.* In accordance with the asset nature of R&D and advertising expenditures (e.g., Dutta, Narasimhan, and Rajiv 1999), I operationalize R&D and advertising capital as stock measures that capture the cumulative asset value of these variables. Formally, the R&D capital for a period *t* is given by $RD_t = \sum_{k=1}^{k=t} \theta^{t-k} RDE_k$ where $\theta$ refers to the retention rate for R&D expenditure, i.e., the amount of R&D stock from the previous year that carries over to the present year and $RDE$ is R&D expenditure. Similarly, advertising capital for a period t is given by $AD_t = \sum_{k=1}^{k=t} \lambda^{t-k} ADE_k$ where $\lambda$ refers to the retention rate of advertising stock and $ADE$ is advertising expenditure. Consistent with prior research (e.g., Montgomery and Silk 1972; Hanssens, Parsons, and Schultz 2003), I use a Koyck structure to compute the retention rates for R&D and advertising expenditures. I estimate the retention rates for each of these variables separately using Koyck transformation on an equation which regresses firm sales on the focal firm-specific strategic variable. Through this procedure,

I obtain retention rates of 45% and 90% for marketing effort and R&D effort, respectively which are consistent with prior research (e.g., Hall, Jaffe, and Trajtenberg 2005). I calculate initial advertising capital and R&D capital by using appropriate back year data.

*Environmental contingencies.* Industry growth, as measured by rate of change of total industry sales, is a commonly used measure of environmental munificence (e.g., Hambrick and D'Aveni 1988; Yasai-Ardekani 1989). Higher industry growth rates reflect munificent environments, as the observed industry growth is a consequence of the availability of adequate resources in the environment to facilitate growth. In line with prior research (e.g., Boyd 1991, 1995), I measure environmental dynamism as the coefficient of variation of industry sales (ratio of the standard deviation of industry sales to the mean of industry sales) over a 3 year period (t), (t-1) and (t-2). I use this measure of environmental dynamism because dynamic environments are characterized by unpredictability and the level of unpredictability in an industry is reflected in industry level demand volatility. Again consistent with prior research (Boyd 1990, 2006) I measure complexity using the Herfindahl index which is the sum of the squared market shares of all firms in an industry and ranges from 0 to 1. A score of 1 refers is viewed as the least complex environment while a score of 0 is considered as the most complex environment (thus my complexity measure is reverse coded).

*Market value of the firm.* Consistent with prior research (e.g., Fang, Palmatier, and Steenkamp 2008; Lee and Grewal 2004; Sorescu and Spanjol 2008; Srinivasan 2006), I compute market value of the firm as the market value of the firm's common

stock shares and book value of the firm's preferred stocks and book value of the firm's long-term debt and book value of the firm's inventories and book value of the firm's current liabilities minus book value of the firm's current assets.

**Data**

A key objective of my research is to examine the effect of environmental contingencies on the relationship among R&D capital and advertising capital and sales growth, profit growth, and market value growth. To handle multicollinearity between the interaction terms and its constituent parts, I adopt the residual procedure adopted in prior research (e.g., Lance 1988; Bottomley and Doyle 1996; Bottomley and Holden 2001; de Jong, Ruyter, and Wetzels 2005). This procedure involves a two-step approach. In the first step I regressed each interaction term on their component variables. In the next step I used the residuals from these regressions as a measure of the interaction term (instead of the actual interaction).

Table 12 provides the correlations for the main variables[11]. To confirm that multicollinearity is not an issue, I computed variance inflation factors and condition indices for the model (Belsey, Kuh, and Welsch 1980). The highest value for VIF is 3.71 and the average value of the VIF is 1.66. These values for VIF are well below the suggested cut of value of 10, implying that multicollinearity is not an issue. Condition indices also suggest that there are no problems with multicollinearity.

[11] An extended correlation matrix is available on request.

**Model Formulation and Estimation**

Consistent with prior research on firm growth, I take Gibrat's Law[12] as the starting point for my empirical model. Fundamentally, Gibrat's law states that the expected firm growth is proportional to its current size (Gibrat 1931; Sutton 1997). The fundamental thesis of my paper is that, besides starting period size, the evidenced growth at any given time is a function of firm specific strategic factors ($F_{it}$), environmental factors ($E_{it}$), and an interaction of the two categories of factors ($F_{it}$*$E_{it}$).

Thus, the model, I am interested in is

$$(3.1) \quad S_t - S_{t-1} = \alpha_0 + \alpha S_{t-1} + \beta F_{i(t)} + \gamma E_{i(t)} + \rho F_{i(t)} * E_{i(t)}$$

where β, γ, and ρ are a vector of parameters

[12] Also known as the Law of Proportionate Effect, Gibrat's Law proposes a relationship between firm size and rate of firm growth. Specifically, it states that the expected firm growth is proportional to its current size (Sutton 1997), i.e., $S_t - S_{t-1} = \alpha S_{t-1}$ where $S_t$ denotes the size of the firm at time t and α represent the proportionate rate of growth. Interested readers are directed to Sutton (1997) and Caves (1998) for an excellent review of the research in this domain.

## TABLE 12
## Summary Statistics and Correlation Matrix

| | Variables | Mean | Std. Dev. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Sales Growth | 344.03 | 2132.40 | 1.00 | | | | | | | | | | | | | | | |
| 2 | Profit Growth | 37.68 | 562.55 | 0.51* | 1.00 | | | | | | | | | | | | | | |
| 3 | Market Value Growth | -378.45 | 9771.23 | 0.27* | 0.46* | 1.00 | | | | | | | | | | | | | |
| 4 | Advertising Capital | 111.72 | 291.90 | 0.32* | 0.18* | -0.02 | 1.00 | | | | | | | | | | | | |
| 5 | R&D Capital | 308.30 | 983.34 | 0.16* | 0.10* | -0.17* | 0.63* | 1.00 | | | | | | | | | | | |
| 6 | Env. Dynamism | 0.06 | 0.05 | -0.02 | -0.01 | -0.01 | -0.06* | -0.04 | 1.00 | | | | | | | | | | |
| 7 | Env. Munificent | 0.03 | 0.10 | 0.11* | 0.13* | 0.13* | 0.01 | 0.00 | 0.14* | 1.00 | | | | | | | | | |
| 8 | Env. Complexity | 0.15 | 0.11 | 0.12* | 0.03 | 0.07* | 0.06* | -0.13* | 0.10* | -0.01 | 1.00 | | | | | | | | |
| 9 | Leverage | 0.15 | 0.19 | 0.00 | 0.00 | 0.03 | 0.02 | -0.09* | 0.11* | 0.01 | 0.18* | 1.00 | | | | | | | |
| 10 | Diversification | 2.70 | 1.98 | 0.11* | 0.06* | -0.03 | 0.32* | 0.29* | -0.09* | -0.03 | 0.06* | 0.08* | 1.00 | | | | | | |
| 11 | Organizational Slack | 0.12 | 0.11 | 0.06* | 0.06* | 0.02 | 0.11* | 0.10* | -0.07* | 0.00 | -0.06* | -0.08* | 0.04 | 1.00 | | | | | |
| 12 | Capital Expenditure | 385.37 | 1203.83 | 0.60* | 0.07* | -0.12* | 0.52* | 0.42* | -0.01 | 0.00 | 0.14* | 0.01 | 0.21* | 0.08* | 1.00 | | | | |
| 13 | CEO Salary | 810.69 | 404.56 | 0.15* | 0.08* | 0.05 | 0.47* | 0.30* | -0.16* | -0.05 | 0.13* | 0.06* | 0.33* | 0.17* | 0.34* | 1.00 | | | |
| 14 | CEO Total Compensation | 7768.48 | 23360.95 | 0.12* | 0.03 | -0.09* | 0.14* | 0.12* | 0.00 | 0.00 | 0.00 | -0.04 | 0.07* | 0.05 | 0.14* | 0.11* | 1.00 | | |
| 15 | Industry R&D Intensity | 0.05 | 0.05 | -0.01 | 0.03 | -0.09* | 0.08* | 0.34* | 0.00 | 0.06* | -0.35* | -0.24* | 0.06* | -0.07* | -0.01 | -0.14* | 0.06* | 1.00 | |
| 16 | Industry Adv. Intensity | 0.02 | 0.02 | 0.01 | 0.05 | 0.07* | 0.28* | -0.03 | -0.06* | -0.01 | 0.18* | 0.25* | 0.01 | 0.13* | -0.05* | 0.22* | 0.02 | -0.19* | 1.00 |

*P<0.05

Note: Sales Growth, Profit Growth, Market Value Growth, Advertising Capital and R&D capital are in MM of 2007$.

In terms of the variables described in my conceptual framework, the equation is:

$$(3.2)\quad S_{i(t)} - S_{i(t-1)} = \alpha_0 + \alpha\, S_{i(t-1)} + \beta_1\, ADS_{i(t)} + \beta_2\, RDS_{i(t)} + \beta_3\, (ADS_{i(t)} * RDS_{i(t)}) + \beta_4\, DYN_{i(t)} + \beta_5\, (ADS_{i(t)} * DYN_{i(t)}) + \beta_6\, (RDS_{i(t)} * DYN_{i(t)}) + \beta_7\, MUNIF_{i(t)} + \beta_8\, (ADS_{i(t)} * DYN_{i(t)}) + \beta_9\, (RDS_{i(t)} * DYN_{i(t)}) + \beta_{10}\, COMPL_{i(t)} + \delta_1\, LEV_{i(t)} + \delta_2\, DIV_{i(t)} + \delta_3\, ORGSLACK_{i(t)} + \delta_4\, CAPEX_{i(t)} + \delta_5\, CSAL_{i(t)} + \delta_6\, CTDC_{i(t)} + \sum_{k=1}^{7} \pi_k YEAR_{ki} + \vartheta_i + \varepsilon_{i(t)}$$

where $S_{i(t)}$ is the total sales of firm (i) at time (t), $ADS_{i(t)}$ is the *a*dvertising capital of firm (i) at time (t), $RDS_{i(t)}$ is the R&D capital of firm (i) at time (t), $DYN_{i(t)}$ is the dynamism of the primary operating industry of firm (i) at time (t), $MUNIF_{i(t)}$ is the munificence of the primary operating industry of firm (i) at time (t), $COMPL_{i(t)}$ is the concentration of primary industry of firm (i) at time (t), $LEV_{i(t)}$ is the leverage of firm (i) at time (t), $OSLACK_{i(t)}$ is the organizational slack of firm (i) at time (t), $DIV_{i(t)}$ is the number of segments operated in by firm (i) at time (t), $CAPEX_{i(t)}$ is the *c*apital expenditures by firm (i) at time (t) , $CSAL_{i(t)}$ is the salary of CEO of firm (i) at time (t), $CTDC_{i(t)}$ is the total compensation for CEO of firm (i) at time (t), *YEAR* is the calendar year dummy variables, $\vartheta_i$ is the time invariant unobserved factors, $\varepsilon_{it}$ is the idiosyncratic error term with $E(\varepsilon_{it}\, \varepsilon_{is}) \neq 0$ for time $t \neq s$ , and $\beta$, $\delta$, $\pi$ are a vector of parameters. The year dummy variables allow me to control for macroeconomic change that affects all firms in the database.

To estimate this equation, I follow a few steps. First, a simple re-arrangement of the variables results in the following equation.

$$
\begin{aligned}
(3.3)\quad S_{i(t)} = {} & \alpha_0 + \beta_0 S_{i(t-1)} + \beta_1 ADS_{i(t)} + \beta_2 RDS_{i(t)} + \beta_3 (ADS_{i(t)} * RDS_{i(t)}) \\
& + \beta_4 DYN_{i(t)} + \beta_5 (ADS_{i(t)} * DYN_{i(t)}) + \beta_6 (RDS_{i(t)} * DYN_{i(t)}) \\
& + \beta_7 MUNIF_{i(t)} + \beta_8 (ADS_{i(t)} * DYN_{i(t)}) + \beta_9 (RDS_{i(t)} * DYN_{i(t)}) \\
& + \beta_{10} COMPL_{i(t)} + \delta_1 LEV_{i(t)} + \delta_2 DIV_{i(t)} + \delta_3 ORGSLACK_{i(t)} \\
& + \delta_4 CAPEX_{i(t)} + \delta_5 CSAL_{i(t)} + \delta_6 CTDC_{i(t)} + \sum_{k=1}^{7} \pi_k YEAR_{ki} + \vartheta_i \\
& + \varepsilon_{i(t)}
\end{aligned}
$$

where $\beta_0 = (1+ \alpha)$, and rest of the variables are as defined earlier.

Since a lagged dependent variable serves as an independent variable, consistent with prior research, I use the Arellano- Bond estimator (e.g., Tuli, Bharadwaj, and Kohli 2009). In a nutshell, the estimation approach involves taking the first difference of the above equation and then uses appropriate lags of the *levels* of the endogenous independent variables as instruments in the differenced equation[13]. In my analysis, the endogenous variables were instrumented by the first three lags of the endogenous variables along with industry variables which are the only variables that are assumed to be exogenous in the model[14]. The parameters can be estimated using either 2SLS

[13] A fundamental assumption of the Arellano-Bond estimator is that there is no serial correlation in the errors (Arellano and Bond 1991). It is this assumption that allows the use of lags of the levels of the endogenous variables as instruments.

[14] Although the focal firm's sales are included in our measures of industry variables we consider them as exogenous variables because the industries are oligopolies.

estimation or GMM estimation. I use the GMM estimation because (1) GMM estimators do not require any assumption about the distribution of the independent variables[15] (Cameron and Trivedi 2009), and (2) they are more efficient (Arellano 2003). It should be clear that after first differencing, $\Delta S_{i(t-1)}$ is correlated with $\Delta\varepsilon_{it.}$ i.e., $\Delta S_{i(t-1)}$ is endogenous. Similarly, theory suggests that advertising capital, R&D capital (and their interactions), and all firm specific variables are endogenous, thus these variables need to be instrumented.

Along the same lines as described above, I write models for both profit growth and growth in firm value. Specifically, profit growth equation is written as:

$$
\begin{aligned}
(3.4)\quad & P_{i(t)} - P_{i(t-1)} \\
&= \alpha_0 + \alpha\, P_{i(t-1)} + \beta_1\, ADS_{i(t)} + \beta_2\, RDS_{i(t)} + \beta_3\, (ADS_{i(t)} * RDS_{i(t)}) \\
&+ \beta_4\, DYN_{i(t)} + \beta_5\, (ADS_{i(t)} * DYN_{i(t)}) + \beta_6\, (RDS_{i(t)} * DYN_{i(t)}) \\
&+ \beta_7\, MUNIF_{i(t)} + \beta_8\, (ADS_{i(t)} * DYN_{i(t)}) + \beta_9\, (RDS_{i(t)} * DYN_{i(t)}) \\
&+ \beta_{10}\, COMPL_{i(t)} + \delta_1\, LEV_{i(t)} + \delta_2\, DIV_{i(t)} + \delta_3\, ORGSLACK_{i(t)} \\
&+ \delta_4\, CAPEX_{i(t)} + \delta_5\, CSAL_{i(t)} + \delta_6\, CTDC_{i(t)} + \delta_7\, S_{i(t)} \\
&+ \sum_{k=1}^{7} \pi_k YEAR_{ki} + \vartheta_i + \varepsilon_{i(t)}
\end{aligned}
$$

where $P_{i(t)}$ is the operating income after depreciation for firm (i) at time (t), and the other variables are as defined earlier. I repeat the procedure described in the sales growth model to estimate this equation.

[15] This is important because some variables do not have a normal distribution. This is also why we do not log transform the independent variables.

Finally, I model market value growth as

$$(3.5)\ MV_{i(t)} - MV_{i(t-1)} = \alpha_0 + \alpha\, MV_{i(t-1)} + \beta_1\, ADS_{i(t)} + \beta_2\, RDS_{i(t)} + \beta_3\, (ADS_{i(t)} * RDS_{i(t)}) + \beta_4\, DYN_{i(t)} + \beta_5\, (ADS_{i(t)} * DYN_{i(t)}) + \beta_6\, (RDS_{i(t)} * DYN_{i(t)}) + \beta_7\, MUNIF_{i(t)} + \beta_8\, (ADS_{i(t)} * DYN_{i(t)}) + \beta_9\, (RDS_{i(t)} * DYN_{i(t)}) + \beta_{10}\, COMPL_{i(t)} + \delta_1\, LEV_{i(t)} + \delta_2\, DIV_{i(t)} + \delta_3\, ORGSLACK_{i(t)} + \delta_4\, CAPEX_{i(t)} + \delta_5\, P_{i(t)} + \sum_{k=1}^{7} \pi_k YEAR_{ki} + \vartheta_i + \varepsilon_{i(t)}$$

where $MV_{i(t)}$ is the market value for firm (i) at time (t), and the other variables are as defined earlier. I do not include CEO pay structure as a covariate in this model because there is no a priori theoretical reason to expect these variables to have an impact on market value growth after controlling for its impact on profit. I repeat the procedure described in the sales growth model to estimate this equation. I estimate the three equations separately because these are three different organizational goals.

## RESULTS

### Sales Growth Equation Results

Table 13 provides the results of my analysis on sales growth. Column (1) results ignores the moderating effects of environmental variables, along with interaction of R&D capital and advertising capital on the relationship between advertising capital,

R&D capital, and sales growth. Column (2) reports the results of the fully specified model.

H1 posited that advertising capital is positively associated with sales growth. I find support for this hypothesis ($p < .05$). This finding drives home the importance of including advertising capitals in models of sales growth.

H2 posits a positive effect of R&D capital on sales growth. Consistent with prior research, the results lend support for this hypothesis ($p < .05$). Comparing the two coefficients, consistent with Krasnikov and Jayachandran (2008), I find that advertising capital has a greater impact on sales growth as compared to R&D capital.

In light of the presence of countervailing arguments, a formal hypothesis was not advanced for the relationship between the interactions of R&D capital and advertising capital. Interestingly, the empirical analysis shows that the interaction term does not have a significant effect on sales growth ($p > .10$).

**TABLE 13**
**Results from the Sales Growth Model**

| | Baseline Model Coefficient (SE) | Full Model Coefficient (SE) |
|---|---|---|
| Advertising Capital $_{i(t)}$ | 5.438*** | 3.447** |
| | (1.756) | (1.696) |
| R&D Capital $_{i(t)}$ | 3.0120*** | 1.915** |
| | (1.083) | (0.812) |
| Advertising Capital $_{i(t)}$ * R&D Capital $_{i(t)}$ | | 0.000 |
| | | (0.000) |
| Advertising Capital $_{i(t)}$ * Environmental Dynamism $_{i(t)}$ | | 25.339* |
| | | (15.328) |
| R&D Capital $_{i(t)}$ * Environmental Dynamism $_{i(t)}$ | | -14.593** |
| | | (6.032) |
| Advertising Capital $_{i(t)}$ * Environmental Munificence $_{i(t)}$ | | 3.542 |
| | | (5.392) |
| R&D Capital $_{i(t)}$ * Environmental Munificence $_{i(t)}$ | | 4.620*** |
| | | (1.523) |
| Advertising Capital $_{i(t)}$ * Environmental Complexity $_{i(t)}$ | | 10.240 |
| | | (13.690) |
| R&D Capital $_{i(t)}$ * Environmental Complexity $_{i(t)}$ | | 28.236* |
| | | (15.404) |
| Sales Momentum $_{i(t-1)}$ | 0.857*** | 0.787*** |
| | (0.056) | (0.048) |
| CEO Salary $_{i(t)}$ | 0.293 | 0.585** |
| | (0.514) | (0.259) |
| CEO Total Compensation $_{i(t)}$ | -0.019 | -0.017 |
| | (0.015) | (0.014) |
| Leverage $_{i(t)}$ | 224.629 | 1,129.173 |
| | (643.032) | (764.071) |
| Diversification $_{i(t)}$ | 92.311 | -36.820 |
| | (179.586) | (126.773) |
| Organizational Slack $_{i(t)}$ | 597.543 | 1,208.232 |
| | (942.196) | (748.317) |
| Capital Expenditure $_{i(t)}$ | 1.302 | 1.843* |
| | (1.212) | (0.999) |

**TABLE 13 Continued**

| | **Baseline Model Coefficient (SE)** | **Full Model Coefficient (SE)** |
|---|---|---|
| Environmental Dynamism $_{i(t)}$ | -639.409 | -1,119.051 |
| | (983.698) | (742.421) |
| Environmental Munificence $_{i(t)}$ | 1,549.667*** | 1,072.913*** |
| | (585.725) | (290.721) |
| Environmental Complexity $_{i(t)}$ | 4,324.543** | 5,676.710*** |
| | (2165.966) | (1902.952) |
| Industry R&D Intensity $_{i(t)}$ | -16,742.576 | -14,716.587 |
| | (19316.354) | (19168.963) |
| Industry Advertising Intensity $_{i(t)}$ | -33,345.410** | -41,995.681*** |
| | (14339.335) | (14245.134) |
| Year Dummy Variables | 4 out of 7 Significant | 4 out of 7 Significant |
| Wald $\chi^2$ | 21578.84 | 36760.78 |
| AR (II) Test | -0.21 | 0.872 |
| Hansen Test $\chi^2$ | 176.96 | 173.68 |
| Goodness of fit: (Square of Corr. b/w predicted Y and actual Y)[16] | 0.493928 | 0.559205 |

The results pertaining to the main effects dynamism, munificence, and complexity on sales growth shows that dynamism does not have a significant negative impact on sales growth ($p > .10$). In contrast, environmental munificence has a direct positive effect on sales growth ($p < .01$) as does complexity ($p < .01$).

A key takeaway from comparing the results reported in column (1) and column (2) in Table 4 is the importance of considering industry contingencies while making resource allocation decisions. H3a posits that environmental dynamism positive moderates the relationship between advertising capital and sales growth. My analysis supports this hypothesis ($p < .10$). In 3b, I posited that environmental dynamism

[16] Goodness of fit was calculates as suggested by Bloom, Bond, and Van Reenen (2007)

negatively moderates the relationship between R&D capital and sales growth. Here too, I find support for my hypothesis ($p < .05$). Thus, an increase in environmental dynamism lowers the effect of R&D capital on sales growth, and increases the effect of advertising capital on firm growth.

H4a posits that the positive association between advertising capital and sales growth will increase in with environmental munificence. Though the coefficient is in the right direction, the relationship is not significant ($p > .10$). H4b posits that environmental munificence will positively moderate the relationship between R&D capital and firm growth. My analysis supports this hypothesis ($p < .01$) suggesting that innovation activities are even more important munificent environments.

In H5a, I posited that the relationship between advertising capital and sales growth should be positively moderated by complexity. I do not find evidence to support H5a ($p > .10$). However, I find support for H5b ($p > .10$), wherein I hypothesized that the R&D capital sales growth relationship is negatively moderated by environmental complexity. The positive sign for the coefficient is because complexity is reverse coded.

*Control variables.* As regards the control variables, first, the results show that leverage, diversification, and organizational slack do not have a significant impact on firm growth ($p >.10$). However, capital expenditures ($p < .10$) have a significant impact on firm growth. These findings highlight the importance of controlling for a firm's capital expenditure. Second, the results show that CEO salary has a significant effect on sales growth while CEO compensation does not have a significant effect on sales growth

as expected. I also find that increases in advertising intensity lower sales growth ($p < .01$). Finally, 4 out of 7 year dummy variables were significant in my results.

**Profit Growth Equation Results**

Table 14 provides the results of my analysis on profit growth. Column (1) results ignores the moderating effect of industry variables, along with interaction of R&D capital and advertising capital, on the relationship between advertising capital, R&D capital, and profit growth. Column (2) reports the results of the fully specified model.

First, let me examine the baseline model. Here I find advertising capital has a significant and positive impact on profit growth ($p < .10$). This shows that advertising capital can impact profit growth over and beyond its impact on sales by reducing the cost of goods sold. Interestingly, in my baseline model, profit growth is not significantly impacted by R&D capital ($p > .10$).

I turn to the results of the full model (column 2). The story change dramatically. I do not find support for H6 and H7, i.e., when you look at the full model, I find that over and beyond its impact on sales, neither advertising capital nor R&D capital have a significant impact on profit growth ($p > .10$ each). However, I find that advertising capital interacts with R&D capital to positively affect profit growth ($p < .01$), thereby providing evidence of complementarities between these two variables. These results also suggest that there are synergies to be gained from a firm's R&D and advertising capital and these synergies are salient only when you consider the right performance metric. Additionally, this analysis further reveals the importance of considering environmental contingencies. Specifically, I find that the interaction of R&D capital and environmental

complexity lowers profit growth ($p < .10$). (The positive coefficient is because complexity is reverse coded). A potential explanation for this finding is that in industries with increasing concentration, firms engage more in process innovation thereby lowering cost and boosting profits. My analysis does not find support for any of the other focal variables ($p < .10$).

**TABLE 14**
**Results from the Profit Growth Model**

| | **Baseline Model Coefficient (SE)** | **Full Model Coefficient (SE)** |
|---|---|---|
| Advertising Capital $_{i(t)}$ | 2.250* | -0.461 |
| | (1.357) | (2.099) |
| R&D Capital $_{i(t)}$ | -0.382 | -0.436 |
| | (0.559) | (0.421) |
| Advertising Capital $_{i(t)}$ * R&D Capital $_{i(t)}$ | | 0.001*** |
| | | (0.000) |
| Advertising Capital $_{i(t)}$ * Environmental Dynamism $_{i(t)}$ | | 6.577 |
| | | (9.065) |
| R&D Capital $_{i(t)}$ * Environmental Dynamism $_{i(t)}$ | | 2.340 |
| | | (2.234) |
| Advertising Capital $_{i(t)}$ * Environmental Munificence $_{i(t)}$ | | -2.143 |
| | | (4.883) |
| R&D Capital $_{i(t)}$ * Environmental Munificence $_{i(t)}$ | | 0.998 |
| | | (0.983) |
| Advertising Capital $_{i(t)}$ * Environmental Complexity $_{i(t)}$ | | 1.779 |
| | | (5.197) |
| | | (5.197) |
| R&D Capital $_{i(t)}$ * Environmental Complexity $_{i(t)}$ | | 14.013* |
| | | (7.729) |
| Profit Momentum $_{i(t-1)}$ | 0.121 | 0.078 |
| | (0.165) | (0.158) |

**TABLE 14 Continued**

| | Baseline Model Coefficient (SE) | Full Model Coefficient (SE) |
|---|---|---|
| Sales $_{i(t)}$ | 0.066 | 0.070** |
| | (0.042) | (0.035) |
| CEO Salary $_{i(t)}$ | 0.802** | 0.557** |
| | (0.374) | (0.276) |
| CEO Total Comp $_{i(t)}$ | -0.002 | 0.001 |
| | (0.004) | (0.005) |
| Leverage $_{i(t)}$ | 675.801 | 639.330* |
| | (552.376) | (362.451) |
| Diversification $_{i(t)}$ | -115.998 | -26.661 |
| | (84.290) | (59.433) |
| Organizational Slack $_{i(t)}$ | 2,627.156 | 1,613.032* |
| | (1610.046) | (904.333) |
| Capital Expenditure $_{i(t)}$ | -0.278 | -0.055 |
| | (0.321) | (0.244) |
| Environmental Dynamism $_{i(t)}$ | -73.355 | -216.517 |
| | (301.749) | (337.913) |
| Environmental Munificence $_{i(t)}$ | 287.103* | 357.757** |
| | (149.704) | (142.499) |
| Environmental Complexity $_{i(t)}$ | -477.840 | -348.842 |
| | (592.385) | (675.935) |
| Industry R&D Intensity $_{i(t)}$ | 7,233.751 | 8,010.027 |
| | (8338.754) | (10068.557) |
| Industry Advertising Intensity $_{i(t)}$ | -3,103.801 | -2,454.247 |
| | (5854.161) | (4589.967) |
| Year Dummies | 1 out of 7 significant | 4 out of 7 significant |
| Wald $\chi^2$ | 189.46 | 1732.18 |
| AR (II) Test | -1.22 | -1.10 |
| Hansen Test $\chi^2$ | 67.35 | 155.39 |
| Goodness of fit: (Square of Corr. b/w predicted Y and actual Y)[17] | 0.163 | 0.186 |

[17] Goodness of fit was calculates as suggested by Bloom, Bond, and Van Reenen (2007)

*Profit growth control variables.* As regards the control variables, first, the results show that CEO salary ($p < .05$), leverage ($p < .10$), and organizational slack ($p < .10$) have a significant impact on profit growth ($p > .10$). However, capital expenditures and diversification ($p > .10$) do not have a significant impact on profit growth. These findings highlight the importance of controlling for these variables in profit growth equations. Amongst environmental variables, my results show that environmental munificence has a positive impact on profit growth beyond its impact on profit growth through sales growth ($p < .05$). In the full model, 4 out 7 year dummies are significant, supporting my decision to include these variables in my model.

**Market Value Growth Equation Results**

Table 15 provides the results of my analysis on market value growth. Column (1) results ignores the moderating effect of industry variables, along with interaction of R&D capital and advertising capital, on the relationship between advertising capital, R&D capital, and market value growth. Column (2) reports the results of the full model. In my conceptual development I had argued that both advertising capital and R&D capital would have a direct impact on market value growth over and beyond its impact on profit. I do not find evidence in support of H8 ($p > .10$). Put differently, advertising capital does not have a direct impact on growth in market value after controlling for its impact through profits. However, and consistent with H9 I find that R&D capital has a direct impact on growth in market value of the firm ($p < .05$). In other words, a firm's R&D capital has some information content. This is not to say that advertising capital does not have an impact on market value growth. What my results highlight is that the

information content of advertising comes to play in a particular environmental context. Specifically, I find that the interaction of the advertising capital and environmental complexity is significant ($p < .05$). Interestingly, none of my other focal variables are significant ($p > .10$). Again, this does not mean that they do not have an impact on market value growth. All it means is that their impact on market value growth is through their impact on profit.

**TABLE 15**
**Results from the Market Value Growth Model**

| | **Baseline Model Coefficient (SE)** | **Full Model Coefficient (SE)** |
|---|---|---|
| Advertising Capital $_{i(t)}$ | 15.808 | 3.363 |
| | (16.626) | (18.411) |
| R&D Capital $_{i(t)}$ | 3.329*** | 3.563** |
| | (1.113) | (1.459) |
| Advertising Capital $_{i(t)}$ * R&D Capital $_{i(t)}$ | | 0.001 |
| | | (0.003) |
| Advertising Capital $_{i(t)}$ * Environmental Dynamism $_{i(t)}$ | | -55.939 |
| | | (84.117) |
| R&D Capital $_{i(t)}$ * Environmental Dynamism $_{i(t)}$ | | 15.921 |
| | | (19.973) |
| Advertising Capital $_{i(t)}$ * Environmental Munificence $_{i(t)}$ | | -7.656 |
| | | (33.383) |
| R&D Capital $_{i(t)}$ * Environmental Munificence $_{i(t)}$ | | -1.832 |
| | | (7.749) |
| Advertising Capital $_{i(t)}$ * Environmental Complexity $_{i(t)}$ | | 94.990** |
| | | (45.717) |

**TABLE 15 Continued**

| | **Baseline Model Coefficient (SE)** | **Full Model Coefficient (SE)** |
|---|---|---|
| R&D Capital $_{i(t)}$ * Environmental Complexity $_{i(t)}$ | | -4.295<br>(62.404) |
| Market Value Momentum $_{i(t-1)}$ | 0.434***<br>(0.058) | 0.424***<br>(0.056) |
| Profit $_{i(t)}$ | 3.324*<br>(1.961) | 3.281*<br>(1.783) |
| Leverage $_{i(t)}$ | 1,364.585<br>(2213.339) | 2,158.157<br>(2288.766) |
| Diversification $_{i(t)}$ | 105.493<br>(730.565) | 4.241<br>(697.477) |
| Organization Slack $_{i(t)}$ | 8,678.196<br>(6652.794) | 10,016.306<br>(6661.823) |
| Capital Expenditure $_{i(t)}$ | -2.733<br>(3.023) | -3.431<br>(3.119) |
| Environmental Complexity $_{i(t)}$ | 9,856.133<br>(11851.217) | 6,475.854<br>(11600.613) |
| Environmental Munificence $_{i(t)}$ | 1,834.974<br>(1316.053) | 1,981.355<br>(1438.887) |
| Environmental Dynamism $_{i(t)}$ | 2,806.666<br>(4073.665) | 4,375.899<br>(4263.404) |
| Year Dummies | 1 out of 7 significant | 2 out of 7 significant |
| Wald $\chi^2$ | 621.04 | 1839.84 |
| AR (II) Test | 0.81 | 0.95 |
| Hansen Test $\chi^2$ | 187.44 | 180.58 |
| Goodness of fit: (Square of Corr. b/w predicted Y and actual Y)[18] | 0.183 | 0.173 |

[18] Goodness of fit was calculated as suggested by Bloom, Bond, and Van Reenen (2007)

*Market value growth control variables.* As regards the control variables, I find that neither firm-level variables nor industry-level variables have a significant impact on market value growth over and beyond their impact through profit. Finally, I find that 2 out of the 7 year dummies are significant in this model.

**Robustness Checks**

A key assumption for the estimation method is the lack of serial correlation between the error terms. I test this assumption using an AR (2) test for serial correlation (Cameron and Trivedi 2009; Tuli, Bharadwaj, and Kohli 2009). Based on this test, the null hypothesis that there is no serial correlation between the error terms cannot be rejected. This indicates the validity of the instruments and the appropriateness of the methodology. The results of the Hansens test for over-identifying restrictions further confirm the validity of the instruments (Tuli, Bharadwaj, and Kohli 2009). Based on this test, I fail to reject the null hypothesis that the population moment conditions are correct.

I recognize the asset nature of advertising and R&D expenditures and therefore use stock measures of these variables. To control for different possible decay rates of these variables, I tried alternative decay rates for advertising capital (25%) and R&D capital (75% and 60%) based on prior research (e.g., Dutta, Narasimhan, and Rajiv 2005; Hanssens, Parsons, and Schutlz 2003). However, the use of these alternative measures did not substantively change the results.

For the primary analysis, all the endogenous variables were instrumented by their first three lags of the endogenous variables along with industry variables which are the only variables that are assumed to be exogenous in the model. As noted by Tuli,

Bharadwaj, and Kohli (2009), it is important to test the sensitivity of the results to a reduction in the number of instruments. To this end, I reran the analysis using 2 lags as instruments along with industry variables. The results are substantively the same.

For the primary analysis, all environmental variables are considered as exogenous variables. I did this because most industries in my dataset were competitive. However, to ensure that the reported results were not sensitive to this assumption, I re-estimated the three models with environmental variables also considered as endogenous variables. The results are robust to this assumption.

Strategic emphasis between value creation and value appropriation is a variable that has gained traction in marketing research on stock market reactions (Mizik and Jacobson 2003; Swaminthan, Murshed, and Hulland 2008). I introduce this variable as an additional control variable in the equations on sales growth, profit growth, and market value growth. In my fully specified models, strategic emphasis does not have a significant on any of the three dependent variables.

In my dataset, I have firms that are heavily diversified and firms that are narrowly focused (i.e., operate in a single industry). It is possible that the result obtained could vary if I used a subset of firms that operated in only a single industry. To see if my results are robust to this manipulation, I re-estimated the model on a dataset that contains only firms reporting a single operating segment. While this is a very conservative definition of firms operating in a single industry, I find results that are similar to the results obtained from the larger dataset.

Finally, I replaced profits with sales in the market value equation to see if sales levels of a firm had a direct impact on market value of the firm. While R&D capital and the interaction of advertising capital with environmental complexity are still significant in this analysis, the effect of sales on market value growth is not significant ($p > .10$). This is important, because it suggests that sales growth is important only so far as it has a positive impact on profit growth.

A summary of the tests of the hypotheses and a brief rationale for the results appears in Table 16. While I find evidence that advertising capital and R&D capital directly impacts sales growth, my full models do not find either capital directly impacting profit growth. Additionally, I find evidence of a direct affect of only R&D capital on market value growth. Finally, I find evidence for some of my hypothesized contingencies, while I do not find significant effects for others.

## DISCUSSION

### Theoretical Implications

The contributions of this study to theory development are three-fold. First, according to the RBV of the firm, hard-to-imitate and difficult-to-transfer intangible capital is a source of sustained competitive advantage. My results show that advertising capital and R&D capital have important effects on sales growth, profit growth, and market value growth. A key contribution of this study to theory development is showing that advertising capital influences sales growth in tandem with R&D capital. Therefore, future models of firm growth should include both advertising capital and R&D capital.

Second, my results show that advertising capital influence and R&D capital, even after controlling for sales and profit, can have direct effects on profit growth and market value growth. These results reveal the existence of mechanisms that capture the true effects of advertising capital and R&D capital on market value growth.

**TABLE 16**
**Summary of Hypothesized Results on Sales Growth, Profit Growth, and Market Value Growth**

| Hypothesis | Expected Sign | Actual Sign | Interpretation and Brief Rationale |
|---|---|---|---|
| **Sales Growth Model** | | | |
| Advertising capital | + | + | Advertising capital fuels sales growth by creating intangible market based assets. |
| R&D capital | + | + | R&D capital fuels sales growth by developing new products, and by creating intangible assets. |
| Advertising capital * Environmental dynamism | + | + | Environmental dynamism positively moderates the relationship between advertising capital and sales growth by accentuating the importance of market based assets. |
| R&D capital* Environmental dynamism | - | - | Environmental dynamism negatively moderates the relationship between R&D capital and sales growth because it increases uncertainty of innovation success. |
| Advertising capital* Environmental munificence | + | N.S | Environmental munificence does not moderate the relationship between advertising capital and sales growth. |
| R&D capital* Environmental munificence | + | + | Munificent environments strengthen the relationship between R&D capital and sales growth. Thus, managers should invest more into R&D in munificent environments. |
| Advertising capital* Environmental complexity | + | N.S | Environmental complexity does not moderate the relationship between advertising capital and sales growth. |

**TABLE 16 Continued**

| Hypothesis | Expected Sign | Actual Sign | Interpretation and Brief Rationale |
|---|---|---|---|
| R&D capital * Environmental complexity | - | - | Increasing complexity weakens the relationship between R&D Capital and sales growth. Thus, managers should invest more in R&D in less complex environments. |
| **Profit Growth Model** | | | |
| Advertising capital | + | N.S | After controlling for its impact on sales, advertising capital has a direct and positive impact on profit growth in the baseline model. However, in the full model, advertising capital only impacts profit growth indirectly through its interaction with R&D capital. |
| R&D capital | + | N.S | After controlling for its impact on sales, R&D capital does not have a direct impact on profit growth in the baseline model or full model. It impacts profit growth positively only through its interaction with advertising capital and through its interaction with environmental complexity. |
| **Market Value Growth** | | | |
| Advertising capital | + | N.S | After controlling for its impact on profit, a firm's advertising capital does not have a direct impact on market value growth. However, it positively impacts market value growth indirectly through its interaction with industry complexity. Specifically, the information content of advertising capital is valid in concentrated industries (low complexity environments) |
| R&D capital | + | + | Even after controlling for its impact on profit, a firm's R&D capital does a direct impact on market value growth. However, environmental contingencies do not strengthen or weaken this relationship. |

Third, as noted by Moorman and Slotegraaf (1999), while numerous studies in marketing have examined the direct effects of marketing and technology efforts on firm performance, few studies have considered environmental contingencies that can affect the relationships. Thus, a second key theoretical contribution of this research is capturing how environmental contingencies impact the relationships among advertising capital and R&D capital and sales growth, profit growth, and market value growth.

**Managerial Implications**

A number of managerial implications stem from the findings of this research. If sales growth is a key corporate objective, then R&D capital and advertising capital are critical to fuelling sales growth. However, resource allocation between advertising and R&D should consider the environmental contingencies of dynamism, munificence, and complexity. My results show that R&D capital has a stronger impact on sales growth for firms operating in munificent environments than in hostile environments. In contrast, the relationship between advertising capital and sales growth is not significantly moderated by environmental munificence. Therefore, managers of firms operating in munificent environments may want to invest more in R&D than in advertising. Managers should also consider environmental dynamism in making resource allocation decisions. My results show that R&D capital of firms operating in dynamic environments has less impact on sales growth than those operating in static environments. By contrast, a firm's advertising capital and sales growth relationship is positively moderated by dynamism. Taken together, these findings suggest that managers of firms operating in dynamic environments should invest more in advertising than in R&D. Finally, my results show

that executives should invest more in R&D than in advertising when environmental complexity is low. Thus, one way that firms can grow their sales in concentrated industries is by investing in innovation activities.

In addition to their direct effects, the interaction of R&D capital with advertising capital and environmental complexity boosts profit. The former result highlights the synergies that exist between R&D capital and advertising capital. For managers seeking to improve profits this finding suggests that resource allocation decisions between these two capitals should not be taken in isolation. These results also suggest that managers should consider environmental contingencies even when trying to boost profits.

R&D capital also has a positive impact on market value growth as does the interaction of complexity and advertising capital, even after controlling for profit. These findings suggest that if managers want to grow the market value of the firm then they need to invest more in R&D capital. Also, these results show that the market rewards firms for increased advertising capital in more concentrated industries.

An important takeaway is that the value of sales growth to market value growth is realized through profit. Therefore, to boost the market value of their firms, managers should focus their efforts on advertising and R&D for sales growth, ensuring that such growth does not come at the expense of profit.

**Limitations and Directions for Future Research**

The research reported takes an important step towards understanding the nuances that characterize the impact of two key drivers of organic growth. While this is an important first step, there is a need for further research along the following avenues.

First, future research should expand the number of contingencies considered to include firm-specific contingencies. Such research has the potential to provide insights into more nuanced implications for resource allocation decisions between advertising capital and R&D capital. Second, there is a need for future research to incorporate a more expansive list of corporate level marketing activities that can facilitate growth. This would serve to address potential concerns about misspecified growth models. Finally, there is a need for future research examining the interdependencies between acquisitive R&D capital and internally developed R&D capital and how interactions between these two capitals impact firm performance.

## CONCLUSION

My results show that advertising capital and R&D capital have positive effects on firm growth and that these effects depend on the dimension of growth. Complementarities exist between these two strategic assets. My results show that both R&D capital and advertising capital directly affect sales growth, but neither has a direct impact on profit growth. Furthermore, R&D capital has a direct impact on market value growth. I also find that while the interaction of advertising capital and R&D capital does not directly affect sales growth or market value growth, it has a positive direct impact on profit growth. The findings underscore the importance of considering environmental contingencies in making resource allocation decisions. For instance, environmental dynamism negatively (positively) moderates the relationship between R&D (advertising) capital and sales growth.

# CHAPTER IV

# SUMMARY

Increasingly, intangible assets are becoming crucial to sustained superior performance of firms. As such, there is a growing emphasis on better understanding resource allocation decisions between intangible assets. With this as the background, the objectives of this dissertation were two-fold. First, I wanted to examine how a firm's marketing capital and R&D capital, two key intangible assets, influences its critical measures of firm performance. Second, I wanted to see if a consideration of environmental contingencies would shed a deeper insight into the relationship between a firm's marketing capital, R&D capital, and the various measures of performance.

Based on the analysis conducted in the first essay, I find that marketing capital and R&D capital have significant positive effects on a firm's survival as a *Fortune* 500 firm. My analysis also shows that while industry growth positively moderates the relationship between marketing capital and survival as a *Fortune* 500 firm it negatively moderates the relationship between R&D capital and survival as a *Fortune* 500 firm. Nevertheless, due to a much higher retention rate for R&D spending than for marketing spending, if a *Fortune* 500 manufacturing firm were to incrementally spend 1% of its average sales revenues for five years on marketing (R&D), then its hazard of exit from *Fortune* 500 would drop by 12.0% (17.9%).

The focus on the second essay was to shed light on the organic drivers of firm growth. Based on the analysis conducted in my second essay, I find that a firm's

advertising capital and R&D capital have significant positive effects on firm growth though these effects depend on the dimensions of growth. Particularly, my results show that both R&D capital and advertising capital directly affect sales growth, but neither has a direct impact on profit growth. Furthermore, R&D capital has a direct impact on market value growth. I also find that complementarities exist between these strategic assets. However, their effect once again depends on the dimension of growth. More importantly, my findings underscore the importance of considering environmental contingencies of dynamism, munificence, and complexity in making resource allocation decisions.

Taken together, these studies showcase three important takeaways. First, a firm's marketing capital and its R&D capital have significant impact on firm performance. Second, managers must consider environmental contingencies while making resource allocation decisions. Finally, these studies show that how a firm's marketing capital and R&D capital affect firm performance depends on the performance metric considered along with characteristics of its operating environment.

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# VITA

**GAUTHAM GOPAL VADAKKEPATT**
Department of Marketing
College of Business Administration
University of Central Florida
4000 Central Florida Blvd.
Orlando, Florida 32816-1400
gvadakkepatt@bus.ucf.edu

## EDUCATION

Mays Business School, Texas A&M University, College Station, TX
Ph.D. in Marketing, 2010
M.S. in Marketing, 2004

Zachary College of Engineering, Texas A&M University, College Station, TX
M.En. in Industrial Engineering, 2002

Government College of Engineering, Trichur, Calicut University, Kerala, India
B.T.C. in Mechanical Engineering, 1999