MARKET VALUATION OF FIRM INVESTMENTS IN TRAINING AND HUMAN CAPITAL MANAGEMENT

BY

SHAWN M. RILEY

DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Business Administration
in the Graduate College of the
University of Illinois at Urbana-Champaign, 2011

Urbana, Illinois

Doctoral Committee:

Professor Steven C. Michael, Chair
Professor Joseph T. Mahoney
Assistant Professor Douglas J. Miller
Associate Professor Paul M. Vaaler

ABSTRACT

The relationship between a firm's human capital management and its performance is a topic of growing interest in recent years. With the increasing role of technology and the rapid innovations in many industries, having highly skilled and knowledgeable employees is often necessary for success. Firms make these investments in training and education, along with implementing various policies regarding employee involvement, improvement, satisfaction, and retention with the expectation that they will result in positive economic performance. This dissertation examines the economic value to firms of investing in the training of their employees. The primary research questions are: (1) whether firms benefit, financially, from investments in training and human capital, and (2) if firms do benefit, what are the firm-level factors that affect *how much* they benefit?

This dissertation contributes to the growing management literature on human capital by providing empirical tests that firm investments in human capital have a positive impact on economic performance, and by identifying firm-level factors that are complementary to these human capital investments. To conduct these empirical tests, I first use event study methodology to obtain a measure of the economic impact of information regarding a firm's human capital management investments and policies. Subsequent regression analyses are then used to test hypotheses regarding possible complementary relationships between firm-level factors and its human capital investments. Results of the event study provide robust support that training matters; significant abnormal returns are found at appropriate event windows for investments in human capital. Subsequent analysis of the abnormal returns offers some but not unqualified support for the complementarity of investments in advertising, physical capital, and R&D as explaining the return to human capital.

ACKNOWLEDGEMENTS

I am deeply grateful for the many people who guided, supported, and inspired me throughout this dissertation process. Without their contributions and faith in my abilities, this dissertation would not have been possible.

I am indebted to my dissertation chair, Dr. Steven C. Michael, and to committee members Dr. Joseph T. Mahoney, Dr. Douglas J. Miller, and Dr. Paul M. Vaaler. I benefited in this dissertation from the unique contributions each of them made. I particularly appreciate the continued support and guidance Steve provided throughout the extended process of this dissertation. I greatly respect his scholarship and appreciate the generosity he extended to me in this project. I am also deeply indebted to Professor Joe Mahoney. His contributions to this project, and to my intellectual growth throughout the PhD program, have been great and I won't ever forget them. Thanks, Joe, for being a true friend. I appreciate Professor Doug Miller's willingness to serve on my committee and his thoughtful, constructive advice, particularly on methodological issues. I am also grateful to Professor Paul Vaaler for serving on my committee, and for teaching me so much about empirical research during my first two years in the PhD program.

In addition to my committee members, I also owe a debt of gratitude to fellow students here at the University of Illinois: Pao-Lien Chen, Barclay James, Marko Madunic, Lihong Qian, Martin Ganco, Guzel Tulegenova, I-Chen (Kim) Wang, Chih Liu, Joshua Sears, and Min-Young Kim. A special thanks to Pao-Lien and Barclay for the friendship, support, and example they continue to provide, and to Min-Young Kim for his intellectual support and for being so generous with his time at critical stages of the project.

Finally, a deep thanks to my family – Mom, Dad, Melissa, Sergio, Megan, and Emily. Thank you for your patience, understanding, and support as I've pursued my PhD. I realize studies have kept me busy these past few years, but hearing your voices and seeing your smiling faces when I've had the chance has often given me the strength to continue and has made all the difference. I hope I've made you proud.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1: INTRODUCTION

Increased diffusion of information technology and globalization is leading to increased competition in many product markets. As these product markets become more competitive, firms are less able to use industry analysis alone to identify sources of sustainable competitive advantage. According to the resource-based approach, a firm's internal development of valuable, rare, inimitable, and non-substitutable resources become more likely sources of superior performance and competitive advantage (Barney, 1986, 1991; Grant, 1996; Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984). Thus, in this new competitive landscape, investments in knowledge and human capital are potential candidates for sustainable competitive advantage. The human capital embodied in employees – whether at the individual, team, or organizational level – is intangible and often tacit in nature. In addition, this resource is often socially complex, and its relation to firm performance may be causally ambiguous, making imitation by competitors difficult (Lippman & Rumelt, 1982; Reed & DeFillippi, 1990; Barney, 1991). Moreover, such intangible investments are especially likely to be a source of sustainable competitive advantage when the human capital is firm-specific.

Thus, over the past two decades, management research has become increasingly interested in the relationship between a firm's human capital investments and its subsequent firm-level economic performance (Coff, 1997, 1999; Hatch & Dyer, 2004; Hitt, Hoskisson, Harrison, & Summers, 1994; Wang, He, & Mahoney, 2009). In this dissertation I focus on two research questions: Do firms benefit financially from their investments in human capital? If so, what factors affect the variability in their returns?

Regarding the first question, although there is growing interest in the benefits of firm investments in human capital, there is little empirical research that actually measures the

financial returns to firms of making these investments. This is primarily due to data limitations arising from difficulty with, and lack of, measurement. Actually measuring the exact levels of knowledge, know-how, skills and abilities of an employee is not something that can be done with great precision. A more limiting factor, though, is that accounting profession conventions generally do not consider money spent on the training or education of employees to be an *investment*. These actions are expensed in the year they are incurred, giving investors a less-positive impression of short-term financial performance.[1] In addition, there are few GAAP or FASB guidelines as to the reporting of these investments/expenses. Firms are generally not required to give detailed explanations in financial statements, and if they do report training or education expenses at all, it is too often only a brief summary in a footnote to the annual report. These conditions make empirical management research in this area difficult, and often results in researchers having to resort to alternative performance measures, such as productivity or survival, instead of being able to directly measure the economic impact to firms of investing in human capital. This dissertation attempts to address this issue by using event study methodology to obtain its dependent variable – abnormal stock market returns to firms following their placement on the annual "Training Top 125" award list published by *Training* Magazine. Additional variables are collected from *Compustat* and other sources before conducting regression analysis to test hypotheses regarding the value of human capital investments and their possible complementarity with other firm investments and decisions.

Regarding the second question, given the novel measurement of economic performance derived from investments in human capital, this dissertation focuses on differential firm-level characteristics that enable us to explain and predict this economic performance variation. A

[1] For clear, illustrative examples demonstrating how the "expensing" of intangibles can adversely affect a firm's income statement and balance sheet, see Flamholtz (1985: 32-33).

firm's physical capital investments, including, for example, new production machinery or new computer systems, may be complementary with investments in human capital, leading to increased economic performance. If physical capital investments embody newer technologies, a firm is likely to have superior performance if it also invests in training the research employees expected to develop and implement new ideas related to this technology, and also if it trains the managerial and production employees operating in this organizational environment. In addition to high-tech physical capital investments, other physical capital investments may also be complementary with the firm's investments in training employees. Even basic information technology in the workplace requires ongoing training of employees for efficient operation. Also, from a production perspective, even machinery operated by entry-level employees will often have a computer interface and require the operator to set programs, take measurements and make adjustments. A basic understanding of computers, measurement devices, and arithmetic will be necessary, and training on new production techniques and quality assurance procedures is also likely to be required.

Performance variation in response to training investments may also be explained by the *existing* human capital possessed by a firm's employees. The new training may be complementary with both the general and specific components of an employee's existing human capital, in part because the existing human capital provides absorptive capacity that allows the employee to more efficiently learn from new training (Becker, 1993: 51; Mowery & Oxley, 1995; Cohen & Levinthal, 1990). Additional explanations for the positive relationship between training and general human capital include that firm investments in general human capital serve to safeguard previous investments in firm-specific human capital (Hansson, 2002), and that the firm makes general human capital investments in an effort to increase employee psychic

commitment (Galunic & Anderson, 2000). In each of these last two explanations, the intent is to reduce the turnover of skilled employees in which the firm has made previous investments.

Firm investments in intangible resources related to both R&D and Advertising have also been shown to have a positive impact on firm performance (Hall, 1992, 1993). The know-how of R&D employees and the R&D capabilities the firm may develop as a result of these investments are valuable and inimitable resources. And firms invest in advertising in an effort to both provide consumers with information and to differentiate themselves from the competition. As the firm is successful either in communicating the objective attributes of its products, or in generating a perceived differentiation in the mind of the consumer, it is able to move away from direct price competition. Also, product differentiation may create a long-run barrier to entry (Carlton & Perloff, 2005: 80).

There are entry barrier-based, resource-based, and information-based (measurement difficulties, accounting conventions, signaling) reasons to expect physical capital, R&D, and advertising investments to be *potential* sources of economic profit, particularly when these investments are made in concert with consistent human capital management policies and practices that emphasize employee training. In order for these potential sources of economic profit to be realized, at least three other conditions must be met. The firm will need to manage its investments in human capital, physical capital, R&D, and advertising by efficiently *structuring*, *bundling*, and *leveraging* these resources and capabilities in an effort to create value (Sirmon, Hitt, & Ireland, 2007). Or, put differently, the firm must (1) *identify*, (2) *select*, and then (3) *develop, enhance* and *protect* assets and skills[2] that are a source of sustainable competitive

[2] Aaker (1989) uses the term "skills" at the firm level, not individual level. He uses it to mean what we would today refer to as capabilities. Also, Aaker's (1989) first two steps (identify, select) align with Sirmon et al.'s (2007) *structuring*, while his third step (develop, enhance, protect) approximates Sirmon et al.'s (2007) *bundling* and *leveraging*.

advantage (Aaker, 1989). Basically, the firm must pull each "lever" correctly as it attempts to create value with a particular human capital management strategy. Then, assuming value has been created, the firm must concern itself with the appropriation of that value.

This dissertation proceeds as follows. First, I provide a literature review of germane research streams including those in strategic management, human resources, technology adoption, and management research on rent appropriation. Second, theory is developed that explains when and if firms benefit financially from their investments in human capital. Additional theory is developed to explain what factors affect the variability in their returns. In the fourth chapter, data and research design are explained and data sources are identified, and variables are defined. In the fifth chapter, results are reported and discussed. The sixth and concluding chapter offers a discussion of implications for theory and practice, limitations of the study, and opportunities for further research.

CHAPTER 2: LITERATURE REVIEW

Prior research has examined whether firms benefit from investments in human capital. In this section of the dissertation I will review prior research from strategic management, human resources, and technology adoption, along with reviewing management research concerning the ability of firms to appropriate returns from their human capital investments.

To facilitate this discussion I find it helpful to first define a few key concepts.

Definitions

Human Capital

Early definitions of human capital were broader than is common today. Gary Becker defined human capital as arising from activities – primarily formal education and on-the-job training, but also including investments in medical care, migration, and searching for information – that influence future monetary and/or psychic income by increasing the resources in people. These resources included not only the skills and knowledge of individuals, but also their health (1964: 1) and values (1993: 16). I follow the convention in most current research of limiting my focus to those activities – primarily formal education, and various forms of on-the-job training and experience – that influence future productive and monetary value. While most employees are likely to have or develop skills or knowledge[3] of enduring value in their occupations, in situations where completely unskilled labor is required, this will be considered "labor" and not human capital.

[3] Throughout this dissertation, when using the word "knowledge" to describe a result of investing in human capital, I include explicit knowledge, along with "know how" and other forms of tacit knowledge possessed by an individual.

General Human Capital (GHC)

Investments in general human capital are those which would be equally valuable if employed at another firm. Therefore, in a competitive labor market, competition for this capital should lead to the employee receiving a wage representative of their marginal product; firms will compete and bid up the wage of this employee until the cost is equal to the benefit. Employees are receptive to this form of training, while firms will generally only provide this training at the employee's expense.

Firm-Specific Human Capital (FSHC)

This form of human capital is more valuable at the current firm than it would be if redeployed at another firm. There is a specific, idiosyncratic, and sometimes tacit nature to this capital that is valuable to the current employer, but difficult to market and redeploy in other firms. This capital may be accumulated through experience, or through on-the-job training that is generally paid for by the employer. The employee is expected to receive a wage *higher* than they could receive from other firms in the outside labor market, but *lower* than the actual value (marginal product) of their capital to the firm. In some sense, employees and employers share the returns to this capital based upon bargaining power.

Physical Capital

This capital consists of plant, equipment, machinery and other tangible investments that are at least somewhat durable in nature and can be used in the production of the firm's goods and services. The term "physical" is used to distinguish this type of capital from financial or human capital. Also, not all physical assets are defined as "capital." Assets in inventory and goods intended for sale do not count. Last, highly depreciable assets that will not be around in future

time periods to generate returns are defined by accountants and in this dissertation as "expenses" not capital.

Resources

Barney (1991) defines "strategically relevant" resources as "assets, capabilities, organizational processes, firm attributes, information, and knowledge controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (p.101). He notes that these resources can be classified into the three categories of physical (including technology), human, and organizational capital resources. Wernerfelt (1984) defines resources as "those (tangible and intangible) assets which are semi-permanently tied to the firm" (p.172), and emphasizes the importance of resources related to: brands and customer loyalty; knowledge of technology; employee skills (including technological, production, and managerial); efficient procedures; economies of scale and machine capacity; and domestic and international trade contacts. When managing the resource portfolio (the levels and proportions of these resources), Wernerfelt (1984) notes the need to focus on both the balancing of these resources in the short term, and the ability of the portfolio to contribute to the development of additional skills and capabilities that will allow additional business expansion in the longer term.

Wernerfelt (1989) focuses on those "critical resources" that can "differentiate you from the competition" (p.5), and in effect, suggests that unique resources be identified where there is an opportunity for quasi rents, due either to team effects or to specific assets of suppliers or employees. Amit and Schoemaker (1993) identify "strategic assets" as those that are firm-specific (and likely to be intangible, or "invisible," and tacit) and complementary with other strategic assets. The extent to which rents are realized will depend also on the relevance of these strategic assets to the particular industry setting, and the ability of management to overcome

decision-making biases caused by uncertainty, complexity, and conflict when attempting to develop and deploy these assets.

Intangible Assets

Intangible assets, as opposed to tangible assets of the firm, have no physical substance and are likely to be more difficult to measure and value than tangible assets such as a firm's property or equipment. Yet these intangible assets, which include knowledge and skills of employees, organizational capabilities, corporate reputation, customer loyalty, long-term relationships with buyers or suppliers, technological know-how, and forms of intellectual property, are said to be increasingly likely sources of potential competitive advantage for firms. Intangible assets including human capital, R&D and marketing-related investments have been shown to impact firm performance (Hatch & Dyer, 2004; Hall, 1992, 1993).

Hall (1992) categorizes these resources according to whether they are "people dependent" (know-how: of employees, suppliers, distributors; perceptions of quality, ability to learn, and the reputation of product and company) or "people independent." "People independent" resources included trademarks, patents, copyrights, registered designs, supply contracts, trade secrets, and databases. Although generally following accounting conventions of reserving the term "asset" for those resources which are separable (to facilitate valuation) and possess the characteristic of "belongingness" (136), these findings and conclusions show the lasting value to the firm of these "people dependent" resources and would appear to satisfy at least a basic accounting definition of an asset: "economic resources with the ability or potential to provide future benefits" (Stickney & Weil, 2003: 10). The three intangible resources rated most important to business success by the executives in Hall's (1992) survey were: Company Reputation, Product Reputation, and Employee Know-how. These same three resources also

happen to have the longest "replacement period," or time required for depreciation. Reputation was estimated by executives to depreciate in 10.8 years, Product Reputation in 6.0 years, and Employee Know-how in 4.6 years. For the purposes of this dissertation, I adopt an inclusive view of Intangible Assets, which is consistent with the perspective taken in most current management research. I include the above "people dependent" and "people independent" items and require only that the asset be expected to provide benefits beyond the current time period (year).[4] [5]

Expenditures in the intangible assets I examine in this dissertation (human capital, and R&D and marketing-related expenditures) are often irrecoverable and are made at the firm's discretion. These investment decisions managers make generate the sunk costs and commitment that is said to be a necessary condition for sustained economic profits. These decisions are strategic in nature, and the assets that are acquired or developed are prime examples of the "strategic assets" many in strategic management have argued are important sources of competitive advantage and economic profits.

Strategic Assets

In addition to my emphasis on human capital as an important strategic asset of the firm, I also include a measure of physical capital, and also the intangible assets resulting from firm investments in both R&D and advertising. Winter (1987) notes that an organizations strategy may be viewed as "a summary account of the principal characteristics and relationships of the

[4] I follow Hirschey & Weygandt's (1985) "market value perspective," which asks only whether the expenditure or resource in question would have a positive impact on the market value of the firm. If so, the expenditure should be treated for accounting purposes as an intangible asset and amortized over its useful life (p.327).

[5] See the examples of *Conventional* vs. *Human Resource* (the human resources here being treated as intangible assets) income statements, and *Conventional* vs. *Human Resource* balance sheets in Flamholtz (1985: 32-33).

organization and its environment – an account developed for the purpose of informing decisions affecting the organization's success and survival" (p.160). This "summary account" is one of state variables not amenable to change in the short term, and includes the conventionally recognized tangible assets, as well as things "not so recognized, at least in financial accounting" such as "stocks of customers, employees, advertising, and R&D capital" (p.163).

Inclusion of Physical Capital

I include a measure of physical capital (intensity) as a "strategic asset" of interest in my dissertation, as it is consistent with Winter's (1987) conception of strategic assets defined above, and because the ability of human capital and other intangible assets to generate value for the firm occurs through their interaction with the firm's tangible assets (Penrose, 1959: 78-79; Hart, 1995: 58-59).

With these definitions in place I begin the literature review on human capital.

Human Capital and Performance articles

Several literatures exist that are concerned with issues regarding returns to human capital. To narrow the focus, I chose to review four significant strands of literature that have direct bearing on the research questions. One set of studies has examined human capital using the tools of strategic management, and has primarily emphasized empirical work. A second set of studies, broadly viewed as from a strategic HR perspective, also emphasizes empirical work and often uses tools similar to those in strategic management. The perspective here is different, though, in that the focus, at least historically, has often been on the functional responsibilities of the HR department and not overall firm performance. Or, when the perspective is more strategic, overall firm strategy is generally taken as a given, and HR policies are developed that aid firm

performance by being supportive of existing firm strategy. A third set of studies, from the information and communication technology (ICT) adoption literature, has examined the complementarities of skills, information technology, and organizational structure, and has used primarily economic tools. This literature is relevant both because its questions use similar measures and metrics and because it offers some insight into the question of fit which dominates most discussions of the strategy-performance relationship. In the final section of the literature review, I consider the developing management research dealing with issues of rent appropriation. As explained in this research literature, the same properties that make human capital investments attractive from a resource-based perspective also make it possible that some rents will be appropriated by stakeholders such as employees and therefore not apparent in financial measures of firm performance.

The Strategic Management Perspective

Strategic management scholars have been increasingly interested in the relationship between firm investments in human capital and performance over the past two decades. This interest is due, in part, to the increasing relevance of human capital in a knowledge-based economy. Also, over this same time period, the Resource-Based View has gained prominence among management researchers. The Resource-Based View suggests that internal resources and capabilities are more likely to be sources of competitive advantage than strategies based on industry positioning. Strategy scholars who adopt the RBV perspective often propose that firm investments in human capital – the knowledge, skills and abilities of its employees – is an increasingly important, perhaps even primary, source of potential advantage for firms. Although strategy scholars have considered the role of human capital in a variety of contexts, including its relation to CEO/TMT performance (Harris & Helfat, 1997; Bailey & Helfat, 2003),

diversification (Farjoun, 1994, 1998; Wang & Barney, 2006), governance (Wang, He, & Mahoney, 2009), innovation (Marvel & Lumpkin, 2007) and entrepreneurship (Cooper, Gimeno-Gascon, & Woo, 1994; Gimeno, Folta, Cooper, & Woo, 1997), relatively less work has examined the effects of firm investments in training and educating employees on firm performance. I now review this limited literature below.

Hatch and Dyer (2004) examined the effects of human capital investments on learning performance in semiconductor manufacturing. This empirical study finds that selection activities, training, and deployment all had the ability to improve learning performance (measured by rate of defects). It emphasizes the ability of firm-specific human capital to provide competitive advantage over rivals, due to its ability to improve learning performance and its inimitable nature. This study is a useful building block for this dissertation because of its various training measures, all noted to represent investments in firm-specific human capital, and the finding that these measures have a significant impact on a measure of performance – learning by doing.

Hitt, Bierman, Shimizu, and Kochhar (2001) examined both the direct and moderating effects of human capital on the strategy and performance of large law firms. This study finds that human capital moderates the relationship between strategy and performance, lending support to a contingency approach, as opposed to a universal approach, to human capital investments. The financial performance measure in this study of large, and privately-held, law firms is derived from data collected by survey and reported in *American Lawyer*, and performance is measured by net income to total revenue, a measure intended to be similar to return on sales for public firms. The paper's finding of a curvilinear relationship between human capital and performance is relevant to this dissertation, as it shows that, although there are benefits to investing in human

capital, these benefits are sometimes costly. It may take time for a new partner to develop the tacit knowledge and managerial skills needed to complement their intellectual capabilities.

Kor and Leblebici (2005) examine interdependencies among human capital deployment, development, and diversification strategies of large law firms, and how these interdependencies affect performance. This empirical study finds that leveraging firm-specific human capital results in higher financial performance when performed alone, but not when the firm attempts to simultaneously pursue both geographic and service diversification. The more general human capital gained through hiring new law school graduates enabled growth and lateral knowledge that assisted with diversification. Financial performance is measured by "profitability per partner," a self-reported measure collected by survey intended to be similar to return on equity of public firms. This study is a useful building block for this dissertation because it finds inter-dependencies between the business-level strategies of service and geographic diversification, and the HR strategies of human capital development and leveraging. Human capital is shown to have value and be a potential source of competitive advantage, and returns are found to be superior when there is a "strategic fit" between the various levels of strategies.

Carmeli and Tishler (2004) maintain that there has been a lack of research examining the relationship between core strategic resources and activities, and organizational performance, and attempt to fill this research gap by measuring the impact of human capital and other intangible organizational elements (managerial capabilities, internal auditing, labor relations, organizational culture, and perceived organizational reputation) on organizational performance measures of local government authorities in Israel. This study shows the applicability of the resource-based view to a public-sector setting and finds human capital to have a positive effect on organizational performance (a measure of income generated by the local authority, and also their efficiency in

collecting that income). It also finds that the intangible organizational elements measured complement each other - "the 'marginal productivity' of each organizational element is higher the higher are the values of all other organizational elements" (p.1271).

From this section of the literature review, we see that firm investments in human capital affect the relationship between business-level strategy and measures of firm performance. Various productivity-related measures, including learning, are positively associated with human capital investments. Also, certain financial performance measures of both privately-held firms and public sector organizations are shown to be positively associated with human capital investments. And, in certain situations, firm-specific human capital may be a source of competitive advantage.

What remains to be answered is whether or not these generally non-financial measures of performance have any relationship with changes in a firm's financial performance. Additional work is also still needed to identify the variables that may be affecting the degree of any relationship between human capital and firm financial performance. In addition to identifying the types of other investments that human capital investments complement, the relationship between the *specificity* of the human capital investments and the *specificity* of the other strategic investments is a largely unexamined area. Complicating matters somewhat is that, ideally, these issues of specificity would need to be examined concurrently with issues involving the complementarity of human capital and other strategic investments.

HR Perspective

From HRM to SHRM and Human Capital Management

The next literature I review is that of Strategic Human Resources. I start with a brief overview of how the Human Resources field has evolved over the past few decades to have a

more strategic focus that often explicitly emphasizes the development and management of human capital. Early human resource management research, sometimes referred to as "personnel management," often had a sub-functional level of analysis and focused, for example, on ways in which recruitment, selection, and compensation activities supported behavioral control and coordination goals of the HR department. Aside from key personnel, most employees were considered homogenous labor that needed to be fit to specialized, but highly standardized, jobs. Executives valued having interchangeable (and replaceable) workers, and were known to substitute physical capital for labor as a way of "taking human resources out of the strategy equation" (Snell, Shadur, & Wright, 2001: 627).

In the 1980's, researchers began to consider the importance of internal fit, where the practices bundled together and performed in support of a particular HR sub-function needed to be consistent with and reinforce each other. For example, HR selection activities such as recruitment, achievement testing, and assessment should all be consistent with the firm's selection goals. Also, the practices performed in support of one HR sub-function (such as selection) need to be consistent with the practices performed in support of other HR sub-functions (such as training) (Wright & Snell, 1991: 215). With this growing awareness of the synergies that existed between the various HR sub-functions (such as training, selection, and compensation) came configurational research proposing that there were sets of best practices that would lead to "high commitment" or "high performance" work systems that would perform well in all situations.[6]

[6] Distinctions between universalistic, configurational, and contingent perspectives are not clear and agreed-upon in the literature. For instance, Delery and Doty (1996) note all three perspectives as being relevant to HR research, while Youndt, Snell, Dean, and Lepak (1996) state that the two primary perspectives within HR research are "universal" and "contingent" (p.837). Also, close configurational – universalistic (Snell, Shadur, & Wright, 2001: 632), and configurational –contingent (Delery & Doty, 1996: 812-813) relationships have been noted in the literature. I find the primary distinction to be

The field of *Strategic* Human Resource Management emerges as researchers begin to examine the relationship between HR practices and overall firm performance (external fit). Much of the early research was configurational, but more recent work has also considered contingency perspectives where different sets of HR practices are expected to perform well when matched to particular business strategies. Research to date has found support for universal (Huselid, 1995) configurational (MacDuffie, 1995) and contingent perspectives (Youndt, Snell, Dean, & Lepak, 1996; Hitt, Bierman, Shimizu, & Kochhar, 2001).

While early Strategic Human Resource Management research considered how individual and bundled HR practices affected firm performance, it often did not emphasize the importance of developing and maintaining human capital in the workforce. As the U.S. and other industrialized nations transformed to knowledge-based economies, and as global competition increased, this began to change. Firms began to realize that the knowledge, technical skills, and innovative ideas of their employees were an important source of competitive advantage. Research from the emerging resource-based view of the firm suggested that this intangible resource was scarce and difficult for competitors to imitate, making it a potential source of sustainable competitive advantage. In support of their position that HR managers should adopt the perspective of human capital managers, Becker, Huselid, Pickus, and Spratt (1997: 44) state:

> The concept of human capital management emphasizes the essential point that a firm's human resources and subsequently its HRM system can be more than a cost to be minimized. A firm's human resources have an asset value that corresponds to the present value of future cash flows that are derived from the skills, motivation, and adaptability of the firm's workforce. It requires that both the CEO and CHRO share a focus on one essential question: *How do we architect a human capital strategy that is aligned with business priorities and capable of rapidly adapting to a shifting competitive landscape?*"

---

between whether HR-firm performance relationships are universal in nature, or whether the HR activities, whether considered in isolation or in bundles, have a contingent relationship with firm performance. I adopt a generally contingent perspective. But, similar to the configurational perspective, I do note the importance of both internal and external fit. I do not, however, accept the assertion of equifinality associated with the configurational perspective (Delery & Doty, 1996: 812).

Investing in human capital can create value for the firm because this resource is properly viewed as capital (Schultz, 1960: 571; 1961: 1); investments will have productive value and generate returns in future periods. From a resource-based perspective, this intangible and often tacit resource has properties that make it difficult for competitors to imitate or substitute for, which allows for the possibility of a sustainable competitive advantage. Also, as managers make these investment decisions in a manner consistent with the firm's overall business strategy, they will be more valuable. When human capital investments are employed in concert with a particular strategy, they are used in combination with other tangible and intangible resources of the firm. It is the consistency between these human capital investments and other firm resources that allows the firm's human capital investments, and business strategy, to be successful.

Having described how HR research has evolved to have what is often a more strategic orientation that views the value of human resource investments as being contingent on their fit with overall firm strategy, I now review representative articles from this research below.

Strategic HR

Youndt, Snell, Dean, and Lepak (1996) examined whether there was a universal or contingent relationship between human resources and performance, and found that, although a direct effect did exist, the relationship was predominantly due to the moderating effect of a plant's manufacturing strategy (cost, quality, or flexibility). A human-capital-enhancing strategy had a positive effect on performance when a quality manufacturing strategy was also in place.

Chadwick (2006) examined how the effects of a firm's human capital acquisition strategies (make vs. buy) affected organizational performance in both manufacturing and service sectors, and finds evidence that the relation between a particular acquisition strategy and performance is contingent upon the organization's strategy (differentiation, low cost, quality).

This is one of very few studies to consider the effects of physical capital intensity in the human capital – performance relationship, although it is only used as a control variable.

Within HR research, work has been done that examines both determinants of training, and also effects of employer-provided training on firm performance. Hansson (2007) finds a positive association between the provision of training and company analyses of training needs, the existence of a written training policy, and the education level of employees. A negative association was found between training provided and the use of an internal labor market and the degree of unionization. Hansson (2009) notes that market failures may be resulting in an under-investment in training, and concludes that an often overlooked aspect of human capital management is the leadership skills of management. It's not enough that employees be trained, but the organization must also develop the capability in its management to "take full advantage" of the improved employee skills (p.4).

In a related work, Lynch and Black (1998) examined the effects of various employer characteristics on the likelihood of employer-provided training. Although this study does not examine the relationship between human capital and firm performance, it is relevant for its examination of both human and physical capital. Lynch and Black note: "the way in which employer investments in human capital are related to investments in physical capital is not clear *a priori*" (1998, p.66), and find that employer-provided training complements both investments in physical capital, and the education level of employees.

In summary, the HR perspective examines how human resource departments can become more effective in accomplishing their functional-level goals (such as attracting and selecting employees) and how they may perform these functional-level goals more efficiently. From a more strategic HR perspective, the relationship between HR policies and the success of firm-

level strategy is considered. In examining the relationship between human capital development or acquisition strategies and performance, this literature generally finds a contingent relationship where firm-level strategy moderates the human capital-performance relationship. What remains to be answered is how strategic HR policies affecting the recruitment, training and education, and motivation of employees interact with firm strategy to affect firm performance. Firm strategy has been shown here to moderate the success of human capital development or acquisition strategies. But, if firm-level strategy is exogenous to the HR personnel making human capital investment decisions, then how can the appropriate human capital investment decisions be made?

The Information Technology Perspective

Additional insights are gained from questions that are asked in the research literature on information technology and corporate change. This literature does not focus on physical capital investments in general, but instead emphasizes a subset of physical capital investments – information and/or communication technology (IT or ICT) investments, as well as examines the relationships between these technological investments, the composition of the workforce, and the structure of the organization. Often, questions surrounding the possibility of either Skill-Biased Technological Change (SBTC) or Skill-Biased Organizational Change (SBOC) are examined. A few recent papers have even considered the possibility of 3-way complementarity[7] among

[7] I follow the definition of complementarity used by Milgrom and Roberts (1992), which notes that the standard definition of complementarity in economics is market oriented – two inputs in a production process are said to be complements if a decrease in the price of one causes an increase in the demand for the other. In order to be able to employ the concept of complementarity usefully to examine choices of levels of various internal activities as well as levels of input purchases Milgrom and Roberts (1992) introduce "an alternative, more inclusive, definition: *Several activities are mutually complementary if doing more of any one activity increases (or at least does not decrease) the marginal profitability of each other activity in the group*." (p.108). See also Milgrom and Roberts (1990: 514).

technological investments, skills of employees, and organizational change, although with conflicting results.

Giuri, Torrisi, and Zinovyeva (2008) examine the possibility of both 2-way and 3-way complementarities between Information and Communication Technology (ICT) investments, skills, and organizational change in 680 small to medium-sized Italian manufacturing firms over the 1995-2003 time period. This empirical study finds 2-way complementarity between skills and organizational changes such as decentralization of authority, de-layering, teamwork, and job rotation. However, it does not find evidence of 2-way complementarity between ICT investments and skills of employees, and there is no evidence of 2-way complementarity between ICT investments and the implementation of modern organizational practices. Lastly, this study finds no evidence of 3-way complementarity. In fact, organizational changes have a negative effect on the productivity gains from joint adoption of ICT and human capital. This 3-way finding is likely due to higher coordination costs of attempting multiple changes simultaneously, and highlights a tension between stability and modification of organizational routines (Nelson & Winter, 1982).

Bresnahan, Brynjolfsson, and Hitt (2002) provide some of the most well-known research in this area (see also Bresnahan, 1999; Brynjolfsson & Hitt, 2000). Bresnahan et al. note that: "*In principle, IT could be a complement or substitute for skilled labor depending on how the technology is used*" (1992: 344). This study also maintains, however, that there will be only limited substitution of skilled labor with IT, perhaps for routine tasks such as record-keeping or simple calculations. More complex tasks requiring cognitive, visual, or spatial abilities will continue to be performed by skilled employees. In addition, this study hypothesizes a complementarity between IT and skilled labor due to the information overload they say occurs. The increased implementation of IT and computerization results in a greater production of data.

Skilled workers are then needed to analyze this data. Furthermore, this study maintains that since information availability increases at a rate faster than the firm's workforce can be modified, organizational changes that distribute the information processing tasks will have a complementary effect.

The primary hypotheses are that there is a complementary relationship at the firm level between labor demand behavior and (i) computerization; (ii) computer-enabled organizational change; and (iii) new computer-enabled forms of output (innovative new products and services). The "cluster" of (i) – (iii) above are emphasized; IT is more likely to be effective in organizations with a higher quality output mix, decentralized decision making, and more skilled workers (p.346). Results show that skilled labor is complementary with this cluster of changes. Also, technical change is found to positively influence the demand for skilled employees both directly, and also through the skill-biased organizational changes (SBOC) induced by the technical changes.

Similarly, Allyn and Yun (2005) find the use of technology to have both direct and indirect effects on wage rates. Using data from 4 Bureau of Labor Statistics surveys conducted over the 1989-2001 time period, this study examined both the direct effect of various computer applications on pay, and also the mediating effects that computer use had on the relationship between both human capital and pay, and between job characteristics and pay. In addition, this study finds direct relationships between human capital and pay, and between job characteristics and pay. This study also finds that computer usage, human capital variables, and job characteristics each had a direct effect on pay, and that the relationships between human capital and pay, and between job characteristics and pay, were mediated by computer use applications. Lastly, it should be noted that the findings regarding the direct effect of computer applications on

pay support the notion that implementation of this technology (a form of physical capital) has both substitute *and* complementary relationships with human capital. For managerial, technical, and administrative activities computer usage is associated with wage gains, while for more mundane clerical applications computer usage is associated with wage losses. Computers potentiate the value of human capital, raising or lowering its value depending on the specific applications – "In order to maximize the value of the computer in the productivity equation, human capital (and job characteristics) must be in alignment" (2005: 48).

Fabiani, Schivardi and Trento (2005) present a study from the technology adoption literature, which emphasizes not whether technology was adopted, but the *rate* at which adoption occurred. This study uses a survey of 1,500 Italian manufacturing firms interviewed in 2001 to examine factors at both the firm level, and at the level of the local industrial environment, which influence the speed of adoption of information and communication technologies (ICT). At the firm level, firm size and the human capital of the workforce are important determinants of ICT adoption. At the level of the local environment, firms located in areas with a dense population of firms and with a strong presence of large firms are more likely to use organizational technologies, such as intranet or enterprise resource planning systems. Fabiani, Schivardi, and Trento (2005) conclude that a more flexible workforce with enhanced human capital will be necessary to "speed diffusion and maximize returns" (p.246).

From this research literature, we see that complementarities exist between skill levels of employees and certain technological changes, and between skill levels and certain organizational changes. There may also be a 3-way interaction among skills, technology, and organizational structure.

As with the other literatures reviewed, this research literature also often uses productivity to measure performance, but there need not be a positive relationship between productivity and financial performance. Strategy should consider financial performance. Also, are "skills" equivalent to "human capital," or does any distance between these two terms lead to additional questions? Certainly, skills are part of an employee's human capital, but omission of other components of human capital (including know-how, teamwork, knowledge of organization, other tacit knowledge) is likely to be affecting the empirical results. Also, how would consideration of the specificity of these skills affect the complementarities between skills, technology, and organizational structure? Further, how are measures of technology and organizational structure used in this literature related to measures of firm strategy and strategic investments such as R&D and advertising used in the Strategy and Strategic HR literatures?

Appropriation

Can firms appropriate returns from their training and human capital investments? The value to firms of human capital investments is in part determined by how well firms are able to appropriate returns. Hence a fourth strand of relevant research literature for inclusion in this review includes whether and how firms can appropriate returns.

Although economists, including those from Industrial Organization (Porter, 1979, 1980) and Organizational Economics (Klein, Crawford, & Alchian, 1978; Williamson, 1975, 1985) have been concerned with bargaining power and appropriation-related issues for some time now, and although management research has considered appropriation in contexts including top management's ability to appropriate economic rents when faced with diffuse stockholders (Castanias & Helfat, 1991, 1992), and in an innovative firm's ability to "capture" or appropriate (before other current or potential competitors can do so) returns to innovative output (Tripsas,

1997; Teece, 1986), it was not until more recently that resource-based management research began to take a critical look at the ability of internal stakeholders (primarily employees) to appropriate rents that were, in the past, assumed to accrue to the firm and be visible in financial statements.

Coff (1997) provides an early resource-based paper that focuses on the difficulties firms face in actually improving performance following investments in human assets. Although this paper focuses primarily on the *generation* of advantage, as opposed to the *appropriation* of any rents that may arise as a result of improved performance, it is nevertheless relevant to this review of the appropriation literature. The framework developed clearly illustrates how certain human asset attributes, while attractive from an RBV perspective as potential sources of competitive advantage, may cause difficulties for managers attempting to actually generate this advantage. These same basic human asset attributes causing dilemmas for managers as they attempt to generate advantage will later be shown to cause similar dilemmas for managers as they attempt to appropriate rents that may arise following the generation of an advantage. These dilemmas are related to the threat of turnover and information problems. Human assets can quit, demand higher pay, reject authority, and shirk. The framework considers factors that allow human assets to be strategic, the associated dilemmas, and provides suggested coping strategies for managers.

In this framework, the degree of asset specificity is one attribute that may allow human assets to be strategic, but it also creates dilemmas related to the threat of turnover. Coff (1997) proposes three coping strategies here: (1) an emphasis on retention, through job satisfaction; (2) providing firm-specific pay to employees; and (3) through the provision and development of skills in employees. Social Complexity and causal ambiguity may also allow human assets to be strategic, but come with information dilemmas including adverse selection (during hiring), moral

hazard (motivational difficulties), and bounded rationality. Coff (1997) proposes coping strategies here including rent sharing with employees, organizational design changes, and acquiring additional information, about current employees and the labor market.

After developing the 1997 framework, Coff (1999) begins to directly examine the appropriation of rents. The same features of assets (firm specificity, causal ambiguity, social complexity) that may give a firm competitive advantage may also allow internal stakeholders to appropriate the rent.[8] RBV and bargaining power literature are combined to predict *when* rent will be generated, and *who* will appropriate it. The firm is not a unitary actor – it must be decomposed into its various stakeholders. There is a two-stage game: (1) rent is generated, and (2) rent is appropriated. This paper provides a new way to view/measure competitive advantage. Competitive advantage is defined as the total rents generated by the firm. The firm is defined as a nexus of contracts, and these total rents are defined as "nexus rents." Some rents may be appropriated by internal stakeholders and will, therefore, not be visible in financial statements. To predict when rent will be visible in (financial) performance measures, we need to understand both *what* resources generate rent, and *who* has bargaining power to appropriate rent.

When considering employees as a stakeholder capable of appropriating rents, Coff (1999: 128) explains that they may increasingly have (property) rights to a portion of the rents:

> Increasingly, human assets have the greatest potential to generate rent even in the corporate form … In a knowledge-based economy, property rights may be increasingly ambiguous, and the production team *may correctly claim rights to residuals* (emphasis added)

Whether or not these employees will successfully be able to make these claims and receive a portion of the residuals will be influenced by a few key factors affecting the bargaining power of both employees and management: (1) are the employees capable of unified action? How about

[8] Earlier resource-based papers acknowledging this issue include those by Wernerfelt (1989), and particularly Grant (1991: 128-129).

the managers? (2) Do the employees have access to relevant company information? (3) Will it be costly to the firm if this stakeholder leaves? And (4) How costly would it be for the employees to leave (can they make a *credible* threat of leaving when negotiating for a portion of the rents)?

Coff (2003b) explores the intersection of management and economics in the strategic management literature, particularly with regards to knowledge-based advantages. This study examines the similarities and differences between the two fields (Management and Economics) as they seek to answer three questions: (1) what is the source of an advantage? (2) What determines the sustainability of an advantage? And (3) what are the factors that predict the rent appropriation patterns from a competitive advantage?

Management literature answers the first question by stating that it is a firm's unique resources and capabilities that provide an advantage. Furthermore, knowledge is often an important component of these resources and capabilities, and it is a firm's ability to create, recombine, and transfer knowledge that provides an advantage. Bounded rationality is a critical assumption here, since without it all firms would be able to handle these issues equally well, and there would be no advantage. While much of Economics typically assumes a higher degree of rationality than the Strategy literature does, Coff (2003b) notes that the areas of Economics that intersect with Management (including Human Capital[9] research) do assume bounded rationality. These areas of Economics view advantage as arising from a firm's ability to make competitive moves, acquire and manage human capital, and design efficient production processes.

[9] While Becker (1962b) allows that there are costs to gaining information or transacting, and that there is uncertainty, for example in whether an employee will quit or be terminated after receiving training, this study also generally proposes that decision makers will make rational decisions, given these constraints. The study also proposes that irrational behavior (i.e., impulsive or habitual) is more likely to be observed at the individual or household level of analysis. According to Becker (1962b), irrational behavior will be constrained by an individual's opportunity set. Budgetary constraints and downward-sloping demand curves limit irrational behavior. Also, any deviations from rationality at the individual level are said to be "smoothed" (p.13) when taken as a group "implying rationality at the market level" (p.2).

In answering the second question (sustainability), the Management literature focuses on attributes of knowledge that hinder transfer and imitation. The lack of a competitive factor market is important here, since, without it, factors would be easily traded at their full value and would not confer an advantage. The Economics literature, on the other hand, focuses on industry structure, along with factors in the institutional environment (patents, IP protection) as factors that lead to sustainability of an advantage. Interestingly, the Strategy literature highlights the benefits of tacit knowledge, while the Economics literature also focuses on the need to codify, and then protect, knowledge.

The Economics literature addresses the third question (appropriability) largely by focusing on bargaining power that arises from asset ownership, asset specificity, monitoring costs, and incentives. The Management literature addresses this question by exploring the implications of coalitions, unique information, switching costs, networks, and political power. Similarities exist in that both Management and Economic analyses rest on underlying assumptions of bounded rationality and asymmetric information. While Management literature has concerned itself more with rent *generation*, the Economics literature has been more concerned with rent *appropriation*. Clearly, both areas need to be addressed.

Coff (2003a) maintains that the existing knowledge-based literature gives insufficient consideration to the threat of opportunism. Much of the existing knowledge literature focuses on the difficulties with coordinating and transferring knowledge, and in fact the threat of opportunism is often held constant (at zero). Coff (2003a), on the other hand, sees knowledge-intensive firms as providing *increasing* opportunities for opportunistic behavior.

Bidding wars during corporate acquisitions of R&D intensive firms provide an appropriate context to test Coff's (1999) hypotheses. Opportunistic behavior in this context can

be viewed as efforts by the target firm's management to discourage unfriendly bids that may be higher (and benefit shareholders) in favor of lower, and friendlier, bids that will offer better job security to the existing management. Coff (2003a) suggests that the threat of existing management behaving opportunistically and offering a "lockup" agreement that may discourage bidders will increase with the knowledge intensity of the firm. Since the value of a knowledge-intensive target in an acquisition depends on the acquirer being able to transfer complex and tacit knowledge, they will be increasingly dependent upon the cooperation of the target firm for the transfer of knowledge. This need for cooperation is key. Absent this, the hostile bidder would not be discouraged by the target firm's tactics, and would continue to bid aggressively. The need for cooperation also means that a lockup agreement given to a friendly bidder will serve as a more powerful, and credible, signal to potential hostile bidders. The potential hostile bidder may be discouraged from even making an attempt to acquire the target, since it is clear that cooperation would not be forthcoming.

Coff (2003a) tests his hypotheses using a sample of attempted acquisitions during 1980-1999 taken from the SDC mergers and acquisitions database. The following three hypotheses are tested: (1) the likelihood that targets will grant lockup agreements increases with target R&D intensity; (2) the likelihood of bidding wars decreases as target R&D intensity increases, and (3) management buyouts will be positively associated with bidding wars as target R&D intensity increases. The first two are supported, while the third, which is based on the argument that an attempted management buyout will serve as a signal that the firm is undervalued, is not. An important conclusion related to the focus of this dissertation is that the market for corporate control may be less efficient for knowledge-intensive firms. This evidence of market

inefficiency lends additional support to the position held in this dissertation that, on average, financial markets respond inefficiently to firm investments in human capital.

Bowman and Swart (2007) explain how the firm's ability to "capture" or appropriate value is dependent upon the forms of capital (separable, embodied, and embedded) involved in the creation and capture of value. This study maintains that simply making a distinction between physical and human capital is not sufficient to provide insights regarding generation and capture of value. Valuable resources are embedded in the interrelationship between the firm and individual. Capital is "embedded" and of greater value to the firm when there is ambiguity surrounding the rent creating contributions of human capital. This embedded capital consists of the rent generating synergies between separable and human forms of capital.

The capture of these rents by either the firm or employees will be a function of the perceived dependence, or bargaining power, of the parties involved. The two key conditions that the study sees as giving employees with embodied human capital influence over the capture of value are: 1) whether their skills are difficult for the firm to replicate; and 2) whether the skills are mobile. Also, this perceived power relationship may be affected by other components, either separable or embodied, in the value creation process that give control over the *deployment* of the valuable embedded capital. The firm may attempt to codify and convert embedded into separable capital to improve their bargaining position, while employees may resist this codification and attempt to convert embedded into embodied capital. So, particularly in knowledge-intensive industries where employees are less dependent upon firm resources to deploy their embodied capital, they may be in a stronger bargaining position. The study concludes that the bargaining strength of employees is primarily a function of the firm's capital structure (separable, embodied, embedded): "the more separable capital in the structure, *ceteris paribus*, the weaker the

bargaining power of employees, and the more the structure is dominated by embodied capital, the stronger the bargaining power of employees" (p.499).

This article also builds upon Coff (1999) in at least two ways. First, it introduces the concept of embedded capital to situations of bargaining and rent capture. Second, it begins to introduce a time dimension when it cautions that firms overaggressive in rent capture in one period may suffer in future periods as employees either quit or become less productive.

In a recently-published paper, Coff (2010) continues this investigation of the dynamic relationship between rent generation (capability development in this article) and appropriation, and highlights a shortcoming in existing approaches to rent appropriation in that they are static and only consider bargaining power at a particular point in time. A more complete theory of rent appropriation requires that we consider the coevolution of capabilities and stakeholder bargaining power over time. Coff uses Helfat and Peteraf's (2003) capability life cycle model to illustrate how those with knowledge asymmetries who are in a position to develop capabilities and create value, may balance current value creation concerns with their anticipated future ability to appropriate rents that may be generated. Organizational form and resource investment decisions are made with concern for how they will affect the future ability to appropriate rent. This can result in decisions that do not always maximize the value creation potential of a capability. While Bowman and Swart (2007) contribute to our understanding of the dynamic relationship between value generation and appropriation by noting possible effects of overzealous appropriation on future turnover and motivation, Coff (2010) explains how this dynamic relationship may actually affect the allocation of resources and development of capabilities over time. The changing knowledge asymmetries, composition of stakeholders, and opportunities for *ex ante* bargaining "influence both the magnitude of rent that would be

observable in measures of firm performance and the timing of when such effects might be apparent" (p.726).

Human capital may be a source of potential competitive advantage, but actually realizing this advantage is no simple task. Management of employees with higher levels of human capital is a complex task, and appropriating any returns that may arise from investing in human capital is also difficult. This difficulty in appropriation depends on several factors affecting the bargaining power between employee and the firm.

Summary and Conclusion of the Literature Review

The existing research literature shows that there are both direct and indirect relationship between human resources strategies and firm performance. Most findings are of a contingent nature, and for the most part show human capital as either moderating, or being moderated by, firm strategy. Aside from the Lynch and Black's (1998) study there has been little explicit consideration of the relationship between physical capital and human capital, except for the use of physical capital intensity as a control variable. From the Technology literature, we see that technology may serve as either a complement or substitute for skilled labor, depending upon how the technology is used. Also, from this literature we see that technology investments can influence skill requirements either directly, or through the organizational changes that often accompany technology investments. This research literature begins to ask interesting questions, but unfortunately does not consider the *specificity* of either the physical capital (technology) or human capital.

CHAPTER 3: THEORY AND HYPOTHESES

Human Capital Theory

Human capital theory (Becker, 1962a, 1964) states that investments in the training and education of employees have economic value because they benefit the knowledge and skills of these employees, thereby improving their productivity.[10] At its most basic, the relationship between an employee's human capital and their wages and productivity is said to be as follows: an investment by either the firm or employee in training or education increases the employee's human capital; this increase in human capital, whether general or firm-specific, is expected to have a positive influence on the employee's productivity; and this increase in productivity is then expected to have a positive impact on employee wages. The specificity of human capital will determine whether the increase in an employee's wages fully reflects their increase in productivity, and it will also influence who pays – the firm or employee – for the training or education that generates this increase in human capital.

If the training or education generates human capital that is of a general nature, meaning that it is equally valued by firms in the external labor market, then, assuming an efficient labor market, the employer will need to pay the employee their marginal product and will not profit from any increase in this employee's productivity. The employer, realizing that they will be unable to appropriate returns from investments they make in the general human capital of an employee, will be reluctant to provide such training or education, unless it is at the employee's expense. So, the employee is expected to pay for, and retain the returns to, investments in general human capital.

[10] As noted in previous chapter, Becker's (1962a, 1964) original, broader, definition of human capital also considered investments in medical care, migration, and information and the influence of these investments on monetary and psychic income.

If, on the other hand, investments in training or education result in human capital that is firm specific in nature, then the employee's productivity in their current position would increase, but they would not have increased value in the external labor market. The employer will value this firm-specific human capital because it is tailored to the physical capital and production processes of their specific firm and therefore assumed to be more productive than equivalent levels of general human capital operating standardized machinery (Becker, 1993). The willingness of the firm to pay for the training that develops this firm-specific human capital will depend in part on factors including turnover rates, wage rates, and layoff rates (Becker, 1962a: 20). It is assumed that whatever portion of the investment in training each party makes, they will receive the same proportion of any returns to the investment (Becker, 1993: 45; Hashimoto, 1981). Employees are likely to earn a wage higher than what would be possible in the external labor market, but lower than the full value of their marginal product. To the extent that this wage is higher than the employee's next best option at another firm, they are said to be "appropriating" quasi rents from their current employer. But, the employee is only receiving some portion of these quasi rents – the firm keeps the remainder. The employer is therefore more willing to make (pay for) an investment in the employee's firm specific human capital, as opposed to general human capital, since the employer may also have an opportunity to benefit from the investment.

From the perspective of human capital theory, firms make these investments in employees because they expect an improvement in the productivity and/or efficiency of the employees, because they hope to retain a portion of any returns generated by this investment, and because this investment in human capital is considered a capital investment that will continue to generate returns in future time periods. The theory provides a rationale explaining when firms

will be willing to invest in their employees' human capital, but the equilibrium perspective of Becker's (1964) human capital theory does not provide any insights with regards to whether these investments will generate economic profits for the firm. Becker states that: "Firms would collect the return from such (specific) training in the form of larger profits resulting from higher productivity, and training would be provided whenever the return – discounted at an appropriate rate – was as least as large as the cost. *Long-run competitive equilibrium requires that the present value of the return exactly equals the cost*" (1993: 42, emphasis added). Firms may be better off making these investments than not making them, but the equilibrium assumption doesn't allow for any sustained economic profits. Under this equilibrium assumption, the firm's investments in human capital would only be helping the firm to maintain competitive parity.

Resource-based Theory

The resource-based view of the firm is a common, perhaps dominant, framework within both Strategic Management and Strategic HR for examining persistent performance differentials between competing firms. As such, it is not constrained by the same equilibrium assumptions as human capital theory. In fact, its two primary assumptions about resources are that: 1) resources are heterogeneously distributed among firms, and 2) resources are less than perfectly mobile. From a resource-based approach, firms are willing to make investments in human capital, particularly firm-specific human capital, because the tacit, complex, and even causally ambiguous nature of this intangible asset makes imitation by competitors difficult (Reed & DeFillippi, 1990; Lippman & Rumelt, 1982; Rumelt, 1984). Investments in the knowledge and skills of employees are thought to be increasingly important in this knowledge-based economy. At a minimum, these investments are thought to be necessary to maintain competitive parity, and if the human capital is firm specific, its idiosyncratic and likely tacit nature has the potential to

be a more enduring source of competitive advantage than more tangible investments. The tacit knowledge, likely developed through experience or on-the-job training, may involve knowledge of individual skills, team operation, or other organizational know how. This tacitness is attractive to the firm as it makes imitability by competitors difficult. Also, firm specific human capital, which may or may not include tacit knowledge, will also be attractive to the firm from a resource-based perspective. Employees with this human capital may have been specially trained for difficult and unusual tasks, and will therefore be more productive following training, or they may have developed this firm-specific human capital over time as they became more efficient after learning to work in a team environment or after learning the unique structures and processes within their organization.

Makadok (2003) notes that there are two "distinct but related research streams" within the RBV and related areas, which are labeled "competence-based perspectives" (p.1045). In the first stream the focus is on ways in which the firm can maintain or extend *existing* sources of competitive advantage (Barney, 1991; Dierickx & Cool, 1989). Here, Barney's (1991) familiar VRIN[11] framework states that firm resources characterized by value, rarity, inimitability, and non-substitutability will be sources of sustainable competitive advantage. From this view, firms should look to their current stock of human capital to see if it can be deployed in strategies that will result in advantages with VRIN characteristics, Firms may search current employees for those with valuable and previously untapped abilities that could be employed in strategies difficult for competitors to imitate. Or firms may search for ways to combine existing employees

[11] Later amended to VRIO (first described in Barney 1995; see Barney 1997, ch.5 for more detailed explanation). **N**on-substitutability remains relevant, but moves under the heading of **I**nimitability (1997: 151). VRIN becomes VRI, and the "O" for organization is added to emphasize that in order for *potential* competitive advantage to be realized when resources have these desirable characteristics, the firm must also be **o**rganized in a way that fully exploits the resources. Examples of relevant Organizational attributes include the firm's formal reporting structure and its compensation policies.

in new ways, and in combination with other firm assets, that will result in superior performance that is difficult for competitors to analyze or imitate. From the contribution made by Dierickx and Cool (1989) to this perspective, we know that factor markets for certain resources, including firm-specific human capital resources, are incomplete and potential sources of advantage. Firms may examine current human capital asset stocks to see where they might build on existing strengths, generating stocks of these assets that could be deployed to profitable strategies that are difficult for competitors to imitate, due to factors including the asset mass efficiencies that will develop and the time compression diseconomies competitors will suffer as they attempt to rush imitation.

In the second resource-, or competence-, related stream described by Makadok (2003) the focus is on the generation of *new* competitive advantage and rents (Barney, 1986; Makadok, 2001). From this view, investing in human capital is attractive for firms if there is some factor market friction that allows them to either invest in and develop human capital internally, or "pick" employees in the external labor market, at a cost less than the full value. Market frictions present during the firm's investments in training and internally developing firm-specific human capital make this attractive from a resource-based perspective. From Barney's (1986) perspective, new competitive advantages generated from resources purchased in strategic factor markets will generally only arise if the firm has some superior ability in judging the future value of resources due to asymmetric information, or if the firm is lucky. Makadok (2003) relaxes Barney's (1986) strict profit maximization assumption and then models the interaction of firms both becoming more competent in predicting the future value of resources and reducing the agency problem of manager shirking. Makadok (2003) states that managers will under invest in resources of uncertain value, and that there is complementarity with regards to lessening this

underinvestment when firms can *both* improve accuracy of expectations (perhaps, Makadok (2003) notes, through investing in organizational mechanisms for gathering and interpreting information) *and* lessen agency problems.

Underinvestment in Human Capital due to Information Limitations

Human capital theory offers reasons for expecting human capital investments to be productive, and the resource-based theory explains why investments may be methods of both generating new competitive advantages and maintaining existing ones. There are Information-based reasons for expecting firms to underinvest in human capital. And, if underinvestment exists, then, as with any other asset in which there is underinvestment, the firm has not invested in this asset to the point where marginal cost equals marginal revenue. Therefore, the firm would realize positive abnormal returns on additional investments in this asset.

A first reason to expect underinvestment is that the exact increases in human capital resulting from training, experience, or formal education may be difficult to measure with accuracy, making optimization by management difficult. We can measure the dollars spent on training or education or perhaps an increase in productivity, but do these measures fully capture the increased knowledge, know-how and skills of the employee following training? We rely on proxies such as wage increases, tenure, or time and money spent on training and education, since the actual return is often immeasurable. In addition to a lack of devices or even physical ability to measure this investment, it's also difficult to know with precision how long an employee will remain with the firm, or what the rate of depreciation is for this (human) capital investment.

Such uncertainty is likely to yield underinvestment. Because of these difficulties in measuring the asset (increased value of human capital), and the uncertainty surrounding its productive life with the firm, Generally Accepted Accounting Principles (GAAP) require firms

to treat these expenditures as "expenses," despite their investment characteristics. These expenditures are fully "expensed" in the year they occur, lowering the firm's reported earnings.[12] The simple act of classifying these expenditures as "expenses" affects the perceptions and investment decisions of managers. As they begin to think of these expenditures as expenses, then, assuming they also believe the value of these human capital expenditures to be independent of other firm resources (it's not), managers are likely to begin treating this expense as they would any other, minimizing it for a given level of output.

In addition to the direct effect that the GAAP expensing requirement may have on a manager's mindset, it will also lower reported earnings in the current period. As investors have received depressed and inaccurate earnings information that they are unable to clarify, at least in the near term, they will be dissatisfied and will pressure management to improve performance. This pressure, along with management's inability to provide investors with complete information (since they themselves have imperfect measures for the results of their investments in human capital) may lead managers to become myopic in their investment behavior. This nearsighted investment behavior will lead managers to minimize current expenses (like training), even if it means sacrificing future assets and income.

Also, the Generally Accepted Accounting Principles are generally silent with respect to reporting requirements for both a firm's annual investments in human capital, and its accumulated stock of human capital. Firms are not required to separately disclose these investments (classified as "expenses"), and most do not. They expense training and education expenditures (as instructed by GAAP), but in external financial documents these annual

[12] A few research studies have noted the possibility that the larger first year tax deduction might be attractive to some firms, or that this large expense is rather discretionary in nature (the expenditure can be postponed or accelerated), allowing managers to smooth earnings (Hirschey & Weygandt, 1985: 328; Coff & Flamholtz, 1993-1994: 38).

expenditures are likely to remain aggregated (and unobservable to outsiders) under more general cost or expense headings.

These GAAP forces leading to expensing and aggregating of human capital expenditures also work to depress the firm's market valuation and increase its subsequent cost of capital. Initially, when lower than expected earnings are announced following the "expensing" of training or other human capital expenditures, managers may be pressured and there could be some negative impact on stock price. When the effects of this expensing begin showing on annual reports, total assets will be distorted and low, causing analysts to revise the company valuation downward. With this lower valuation and stock price, the firm's cost of capital will increase, further exacerbating the situation by making it increasingly difficult to make the appropriate investments in human capital.

Underinvestment due to Rational Explanations

The above explanations for underinvestment suggest that, at times, managers may be making investment decisions that are short-sighted or not rational. This wouldn't necessarily be the case when managers and investors have equally incomplete information regarding the extent and benefits resulting from training activities. But, in cases with asymmetric levels of information and underinvestment, managers are either myopic in their behavior, or agency considerations exist and managers are putting their own welfare (and job security) ahead of the firm's long-term financial success.

Additional, rational, explanations exist that would also explain this underinvestment. For instance, time inconsistency problems may exist. Managers may face a dilemma when, in the present period it may be profit-maximizing to assure current or potential employees of continued training and development in future periods. Employees then make commitments to the firm. In

future periods, the rational (though perhaps not ethical) decision may be to renege on those past assurances of continued training and development opportunities.

Finally, reluctance among *employees* may yield underinvestment. Although managers are aware of the future benefits of training activities, they may be unable to convince employees to participate in training that develops human capital specific to that particular firm. As Heli Wang and co-authors (Wang, 2002; Wang & Barney, 2006; Wang, He & Mahoney 2009) have quite insightfully observed, employees may be reluctant to develop firm-specific human capital, as this puts the employee in a vulnerable position *ex post*, particularly in an undiversified firm. The value of their human capital is closely tied to machinery and products that may change in value and employees are unable to diversify their firm-specific human capital across multiple firms. Wang (2002) finds that employees will be less reluctant to make these specific commitments in firms that have an appropriate level of corporate diversification.

The challenges for managers in these situations include (1) finding ways in the current period to make credible commitments to current or potential employees of continued future training opportunities, and (2) balancing the potential costs of diversification, and also economic and relational incentives to employees that encourage them to make specific commitments, against the future benefits the firm can expect from the increases in human capital resulting from training.

Specificity-appropriation

I've presented human capital theory to explain why training and other human capital investments might be considered productive and whether the firm or employee would be likely to pay for and receive the benefits from this investment. This productivity described in human capital theory did not consider costs, competition, or allow in equilibrium for the possibility of

economic profits by the firm. I then introduced resource-based explanations for why investments in human capital may be methods of both generating new competitive advantages and maintaining existing ones. To the extent that competitive advantages will eventually result in economic profits, the resource-based view has traditionally assumed that rents generated are retained by the firm. When the resource-based view discusses whether a competitive advantage is "sustainable" or whether a generated rent is "appropriated" it is generally referring to whether the firm is successful in these efforts relative to its customers or competitors. I include analysis of the Information-based issues (asymmetric and/or incomplete), as the context of my dissertation involves capital market valuations of an intangible asset – the information-related issues are ever present and support my first hypothesis below. Last, as the resource-based view traditionally assumes rents stay within the firm, and will therefore be visible in financial measures of performance, I include discussion below explaining whether these overall rents the firm initially generates, sometimes referred to as "organizational rents" or "nexus rents" (Coff, 1999), are more likely to be retained by the firm, as opposed to employees, in this situation.

To the extent that firms with high investments in human capital also have human capital that is more firm specific in nature, I would expect these firms to also be more successful in appropriating a portion of the quasi rents from these investments. This human capital may be more specific because it is generated through on-the-job training, or because firms of this type are more likely to support high performance, or high-commitment, work practices and other policies to increase retention and reduce turnover of valuable employees. These knowledge-intensive firms compete in unique ways when providing value to customers. Tacit and other firm-specific knowledge become increasingly important sources of competitive advantage as firms move away from direct price competition. It will be in the firm's best interest to train, and

to retain, these employees. As firm-specific human capital is developed, in part, through on-the-job experience, I would expect then that firms with high overall levels of human capital would also have human capital that was, on average, more specific in nature. While there is merit in the Appropriability literature including Coff (1999) and others that, when human capital is more firm-specific, the employee may, depending upon bargaining power, be able to appropriate some portion of the quasi rents, this statement can be deceptive. The employee's ability to appropriate as specificity increases may, again depending upon bargaining power, increase on a percentage basis, but the total dollars of quasi rent available for division between firm and employee will be greater when human capital is firm specific. Human capital theory explains that for perfectly general human capital employees are expected to receive their full marginal product and the firm only normal market returns (no quasi rents). This theory also explains that for firm-specific human capital there is likely to be some division of the quasi rent between the firm and employee. If the endpoints are marked at one end by a no quasi rent situation, and at the other end by a situation where there is some indeterminate division of a positive level of quasi rents, it is likely that the appropriation of quasi rents increases for each party as specificity increases (depending upon bargaining power).

I maintain that human capital investments are typically productive, a potential source of competitive advantage and rents, and an asset in which firms on average underinvest, due to issues related to information reporting, time inconsistency, and employees being rationally reluctant to make firm-specific commitments. As this underinvestment implies that at least some employees have not invested to the point where marginal cost equals marginal benefit, firms will earn abnormal returns by increasing human capital investments (and decreasing the under-investment problem). These firms with high levels of human capital investment and high returns

("organizational rents" or "nexus rents") will also be able to appropriate a higher percentage of the rents subject to possible appropriation by internal stakeholders (employees). I thus expect:

Hypothesis 1*: A signal of firms' above industry average investments in human capital leads to a positive stock price reaction, ceteris paribus.*

Complementarity Section (leading to a general proposition regarding complementarity)

Economists often measure complementarity using cross (price) elasticity of demand (Mansfield, 1979: 119).[13] Two items are said to be complements if a decrease in the price of one results in an increase in the quantity demanded of the other (holding income and other prices constant). This definition can be expanded to include more than two items. This demand-based definition of complementarity is useful for explaining market structure, and related definitions may be useful for examining consumer behavior, but it is less helpful when trying to understand firm investment decisions and strategies.

Moving a step closer to understanding firm investments and strategies, the concept of economies of scope was developed (Panzar & Willig, 1977; see also Teece, 1980) in an attempt to explain the extent of a firm's diversification. A cost function is used to determine whether technological or indivisibility-based operating synergies exist between two or more activities that would supposedly[14] provide a rationale for integrating these multiple activities within the firm (diversifying) as opposed to obtaining the necessary services through market transactions. Economies of scope exist when the cost of jointly producing two (or more) goods within a single firm is less than if they were produced separately in different firms. These cost functions capture

[13] See also Samuelson (1974) for historical review of complementarity definitions in economics.

[14] Economies of scope, alone, only provide a rationale for the co-location of activities (Teece, 1980; Williamson, 1975). When significant transaction costs are also present, then a rationale exists for the internalization of these co-located activities within a single firm (diversification).

a type of synergy resulting from co-location or integration of activities that allows the firm to minimize its costs for a given level of output. This synergy described by economies of scope is similar, but not equivalent, to the definition of complementarity commonly subscribed to in management research.

Milgrom and Roberts (1990, 1992) provide the definition of complementarity common in current management research. These papers note that the standard definition of complementarity in economics is market oriented – two inputs in a production process are said to be complements if a decrease in the price of one causes an increase in the demand for the other. In order to be able to employ the concept of complementarity usefully to examine the choices of levels of various internal activities as well as levels of input purchases, Milgrom and Roberts introduce "an alternative, more inclusive, definition: Several activities are mutually complementary if doing more of any one activity increases (or at least does not decrease) the marginal profitability of each other activity in the group." (1992: 108). This definition has similarities to the technological complementarities described by both Panzar and Willig (1977) and Teece (1980). Milgrom and Roberts' (1990, 1992) view of complementarity differs from the technological complementarity described in this economy of scope literature, though, in that with complementarities described in reference to economies of scope output is fixed and the objective is a minimization of costs. Economies of scope complementarities due to indivisibilities are more distant than technological complementarities are from Milgrom and Roberts' (1990, 1992) definition. With indivisibilities, benefits to co-location or internalization arise due to a lumpiness and inability to market the excess capacity of a resource or activity, not from any synergy between activities or resources resulting in either sub-additivity (economies of scope), or super-

modularity (Milgrom and Roberts' (1990, 1992) definition). Also, with indivisibilities, the benefits do not necessarily go in both directions.

Early research applying this newer version of complementarity to issues of interest in management would include Milgrom and Roberts' (1990, 1995) own work, which examines complementarities between inputs and activities (including marketing, production, engineering, and organizational) relating to firm strategy in a modern manufacturing environment. Milgrom and Roberts (1990, 1995) find that pairwise complementarities exist, but that the greatest benefit comes from having the appropriate bundle or cluster of these important activities.

Resource-based research examines the role of complementarities in both generating and appropriating rents. According to Mahoney and Pandian, "the existence and maintenance of rents depend upon a lack of competition in either acquiring or developing complementary resources" (1992: 364). Lippman and Rumelt have a generally consistent view, stating "absent complementarities, the only gains to trade in the asset market arise from asymmetric information" (2003: 1080). Complementarities are necessary as a firm attempts to generate rents in the factor market through superior "resource picking" (Makadok, 2001) as this superior picking will be the result of capability development in evaluating market opportunities (Barney, 1986). These capabilities will involve bundles of internally-developed, idiosyncratic activities that are complementary in nature. An idiosyncratic relationship between a firm's existing complementary resources "idiosyncratic bilateral synergy" (Mahoney & Pandian, 1992) will be present in internally-developed capabilities that generate rents, and these idiosyncratic complementarities will also allow rents when acquiring resources in the external market, as these external resources will have different values to each bidding firm.

The economic language of complementarity evokes the older concept of fit in strategic management. Fit is a central concept of strategic management (Chandler, 1962; Ghemawat, 2002; Miles & Snow, 1994; Porter, 1996; Rumelt, 1974). Fit, also known as matching or alignment, occurs when the internal organization, or structure, of the firm matches the resources and capabilities, or strategy, chosen to compete in the marketplace. High performing firms have developed resources and capabilities consistent with opportunities and constraints imposed by the environment, and have developed organizational structures to utilize those resources. The existence of resources is not sufficient to secure competitive advantage; they must be deployed in complementary ways with other resources and organizational elements to create capabilities for long run competitive advantage (Amit & Schoemaker, 1993; Grant, 1991).

Caves summarizes: "Strategy gives rise to organizational choices and to decisions about acquiring and divesting assets that are selected for the efficient pursuit of this maximization plan. This normative formulation is backstopped by an impressive amount of behavioral evidence ranging from the historical studies of Chandler to a variety of statistical studies affirming the positive value of choosing a strategy that is correctly matched to the attributes of the firm's market and making organizational choices that best serve the elected strategy" (1984: 128).

While management research on complementary assets has generally focused on a few, key, strategic assets and their effects on R&D (Helfat, 1997) or a firm's ability to appropriate returns from innovative efforts (Teece, 1986; Tripsas, 1997), and the fit literature has emphasized the alignment of *all* firm activities with strategy, the concepts have much in common. In fact, depending upon the specific perspective of fit being considered (Venkatraman, 1989), the distinction between complementarity and fit may be seen as a matter of degree, not type. Complementary asset research can accommodate more than two variables, and as the

number of variables increases, the line between complementarity and some definitions of fit become blurred. Milgrom and Roberts (1995) demonstrate this alignment between the two concepts in their article "Complementarity and Fit," and predict increased supermodularity, or benefits of complementarity, when the entire "cluster" of activities under consideration moves together in a "systematic, coherent fashion in response to environmental changes" (1995: 185).

Whether justified by complementarity or by fit, I expect that resources deployed to complement human capital investments by the firm will explain a significant proportion of the variance in returns.

Proposition: *Resources deployed to complement human capital investments will increase the returns to human capital investments.*

Research & Development

Research and development expenditures generate earnings in future periods, and are also valued in the stock market (Griliches, 1981; Sougiannis, 1994; Hirschey & Weygandt, 1985). The innovative output of R&D includes patents, valuable trade secrets, new products, and process innovations that help to lower the cost and/or improve the quality of existing products or services. In addition, the know-how of R&D employees and the R&D capabilities the firm may develop as a result of these investments are valuable and inimitable resources.

High R&D intensity is often taken as an indication of the importance of knowledge and technology in a firm or industry (Cohen, Nelson, & Walsh, 2000; Caves, 1996). In a more technological, knowledge-intensive environment, the R&D function may be increasingly relied upon for functions including new product development and also process innovations in manufacturing. Training and other HR practices aimed at developing human capital may be a significant complement to knowledge gained through R&D, as employees at all levels will need

to be capable of interacting with advanced technology and conducting advanced operating procedures. They may further need to interact with customers and suppliers that are more sophisticated and demanding than the customers and suppliers found at low technology, low R&D firms.

Since the training and education of employees throughout the firm will be increasingly important in a firm with high R&D intensity, I expect:

Hypothesis 2: *The higher the firms' R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*

Physical Capital

High physical capital intensity could indicate that a firm has simply substituted away from labor and is now employing more automated equipment and procedures that require fewer and less-skilled employees. But it may also mean that the firm is investing in computers and other technology intended to improve the information-processing capabilities and productivity of employees, and not replace them. Furthermore, even in a firm where high physical capital intensity indicates a substitution away from labor, the remaining employees, particularly non-production employees, may require an increase in training and education. In the 21st century, a substitution away from labor often results in a computerized, highly automated environment where employees will need to learn new computer programs and may find themselves trouble-shooting and repairing the automated equipment that now handles much of the production. If the high physical capital intensity indicates that the firm is either attempting to facilitate the information-processing capabilities of its employees, or that the firm is now operating a more automated but also more high-tech environment, then, as this physical capital intensity increases

and the employees are operating in an environment where their knowledge and skills are increasingly relied upon, I would expect:

Hypothesis 3: *The higher the firms' physical capital intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*

Interaction of Physical Capital and R&D

If high physical capital intensity exists in a firm with low R&D intensity, this may indicate a firm emphasizing low cost production that is less concerned about either new product development, or process innovations to improve quality. In this environment, a highly-trained and knowledgeable employee would not likely be as valued and would not be able to put their abilities to as productive use. If, on the other hand, the firm had a high physical capital intensity that indicated an emphasis on information processing capabilities and high-tech production technologies, then a highly capable and well-trained R&D department would become increasingly important. Also, employees in other departments throughout the firm would be better able to make productive use of any investments that had been made in their training or education. I therefore expect that:

Hypothesis 4: *The higher the interaction of physical capital intensity and R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*

Advertising / Differentiation

The objectives of marketing-related expenditures are to satisfy the customer's needs, and contribute to the business-level objective of attaining a competitive advantage (Bagozzi, 1986). Efforts to improve customer perceptions and satisfaction (adoption of a market "orientation") may be seen as investments in the drivers that increase customer utility, an increase in which

increases the probability customers will purchase a firm's product or service, thereby increasing the customer's value to the firm (Rust, Lemon, & Zeithaml, 2004: 112; Srivastava, Shervani, & Fahey, 1998).

Many of these marketing-related expenditures generate intangible assets of lasting value to the firm (Mizik & Jacobson, 2008; Graham & Frankenberger, 2000). In fact, Srivastava, Shervani, and Fahey define marketing as being concerned "with the task of developing and managing market-based assets" (1998: 2). Expenditures benefit the firm's overall reputation, brand values, relationships and networks with suppliers and customers, and the know-how and capabilities required for analyzing and responding to market information (Doyle, 2000: 320; Srivastava, Shervani, & Fahey, 1998). These intangible, market-based assets are for the most part (mis-)classified as "expenses" on the firm's income statement, despite their investment characteristics and impact on the firm's market value (Doyle, 2000).

The firm's brand asset can further be divided into several components, the most prominent of which is its *differentiation* (Mizik & Jacobson, 2008). Differentiation is a primary motivation behind a firm's making substantial advertising and marketing-related expenditures. In fact, Differentiation and Low Cost form the basis of Porter's three (1980) or four (1985) generic business-level strategies. Mizik and Jacobson (2008) measure the value of differentiation and find it to be unaccounted for by financial markets, with abnormal stock returns occurring in the period following increased differentiation.

Market-based assets arising from successful differentiation are valuable to the firm because, as the firm is successful either in communicating the objective attributes of its products, or in generating a perceived differentiation in the mind of the consumer, it is able to move away from direct price competition (Caves & Williamson, 1985). Also, product differentiation may

create a long-run barrier to entry (Carlton & Perloff, 2005: 80). Successfully differentiating a product or developing a brand requires significant sunk cost expenditures over a period of time (Ghemawat, 1991; Sutton, 1991). If consumers face switching costs and if potential entrants face higher marketing costs, then this barrier to entry (a first-mover advantage if no other firms have entered the market) may persist (Lieberman & Montgomery, 1988; Sutton, 1991; Carlton & Perloff, 2005).

Also, the firm's reputation and its brands "signal" information to the consumer about quality or reliability of products and services. These signals are valuable when consumers are faced with uncertainty and incomplete information concerning a potential purchase. If a particular brand of product is unknown to a consumer, and the consumer is unable to gather information about the product or the reputation of the company selling the product, they may decide to avoid this uncertain situation by purchasing a well-known brand that has signaled consistent information over time.

Differentiation requires employees skilled and trained in collecting and analyzing market information regarding consumer tastes and preferences, trends, or changes in technology. Employees throughout the firm will also need training to develop the skills and knowledge necessary to design and efficiently manufacture products that will, by definition, have unique characteristics and are likely to be more technologically-advanced than the more standardized products of competitors following a cost leadership strategy (Porter, 1980: 35). Employees in a firm striving to differentiate will also need training to increase responsiveness to changing tastes, and to any service-related issues of customers. Also, this same attention to speed of response and quality of service for suppliers, vendors and other stakeholders will require that employees build skills, nurture relationships and develop valuable tacit knowledge and know-how over a

period of time. Training will even be necessary to break down "silos" within the firm and develop practices and routines of close interaction and communication between departments. This training, perhaps including multi-skill training and job rotations, will be necessary to benefit the working relationships between a variety of departments and functions within the firm, including R&D, Marketing, and Production (Hutt, 1995).

Efforts to differentiate and develop brands and reputation have the potential to generate value for the firm. In addition, as marketing efforts intensify, the training requirements of employees in the Marketing department, and throughout the firm, will increase. As a firm increases its efforts to pursue a differentiation strategy (Porter, 1985), several differentiation "drivers" related to employee knowledge and abilities become more important. Drivers related to product features, quality and performance will be affected by employee responsiveness, their technical training, and the specific relationships that have been developed with customers, and between functional departments within the firm, over time (1985: 124-127).

In addition, to the extent that firms adopting a market "orientation" can be more closely associated with pursuing a Differentiation strategy than a Low Cost strategy, these firms will benefit if they are also investing in training and educating their employees. A market orientation is marked by a prioritization of service and responsiveness to customer wants and needs. To be responsive, Kohli and Jaworski (1990) state that firms will need to generate market intelligence related to present and future customer needs, disseminate this intelligence across departments, and then have an organization-wide responsiveness to this information. A market orientation is said to "maximize customer satisfaction" (Baker & Sinkula, 1999: 412), and be characterized by a culture that most effectively and efficiently create behaviors in providing superior value for buyers (Slater & Narver, 1995). These characteristics would seem to be more consistent with a

Differentiation strategy than a Low Cost strategy. Baker and Sinkula (1999) also found a positive empirical relationship between a market orientation and a "learning orientation." While a learning orientation does not necessarily indicate high levels of human capital investments, the multiple processes involved in organizational learning may require training (Slater & Narver, 1995). Baker and Sinkula also discuss the need for an entrepreneurial culture within the firm and a facilitative leadership that "encourages individual learning" (1999: 69). Again, it appears that as a market orientation is associated with a Differentiation strategy, it will be complemented by an environment that promotes learning and investments in human capital.

Marketing-related expenditures made to differentiate a firm and its brands from competitors and develop market-based intangible assets have the potential to benefit the firm in the ways described. Further, these efforts of the firm to distance itself from competitors based on the development of distinctive (whether real or perceived) and technologically-advanced products and services will be complemented by skilled and knowledgeable employees. And, since the increased effort towards customer responsiveness will place greater demands on the information-processing, communication, and relationship-development capacities of employees, this will also be complemented by investments in training and education.

I therefore expect that:

Hypothesis 5: *The higher the firms' advertising intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*

Interaction of Advertising and R&D

Firms investing in either R&D or in Advertising may be attempting to differentiate themselves along different dimensions. Firms emphasizing R&D may focus on cutting-edge technology and objective product attributes, while those focusing on Advertising and other

Marketing activities may emphasize a more customer-oriented strategy and building a brand and strengthening the customers' perception of quality, differentiated products and services. The R&D vs. Marketing route to differentiation is sometimes thought of as an either-or proposition, with either engineering or sales running the ship, a silos mentality, and competition for resources within the firm (Maltz, Souder & Kumar, 2001). But this need not be the case. For firms able to overcome these obstacles there is likely to be a complementarity between these two types of investments. Firms investing in R&D and focusing on technological excellence in products and services are likely to have a higher success rate in new product introductions if they work closely with the marketing department and take into consideration consumer preferences and other research developed through complementary marketing activities. Also, as a firm investing in R&D is successful in developing new technologies and products, this success will only be complemented by advertising and marketing activities designed to inform consumers and persuade them of the value of these new technologies and products. This possible complementary relationship between R&D and Marketing activities (as opposed to the silo mentality and competition for resources) is more likely in a firm with substantial training activities, as these complementarities may be stressed in training sessions and as training such as cross-functional training will help break down the silos and lead to increased communication and closer working relationships between departments.

I therefore expect that:

Hypothesis 6: *The higher the interaction of advertising intensity and R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.* .

Existing Human Capital

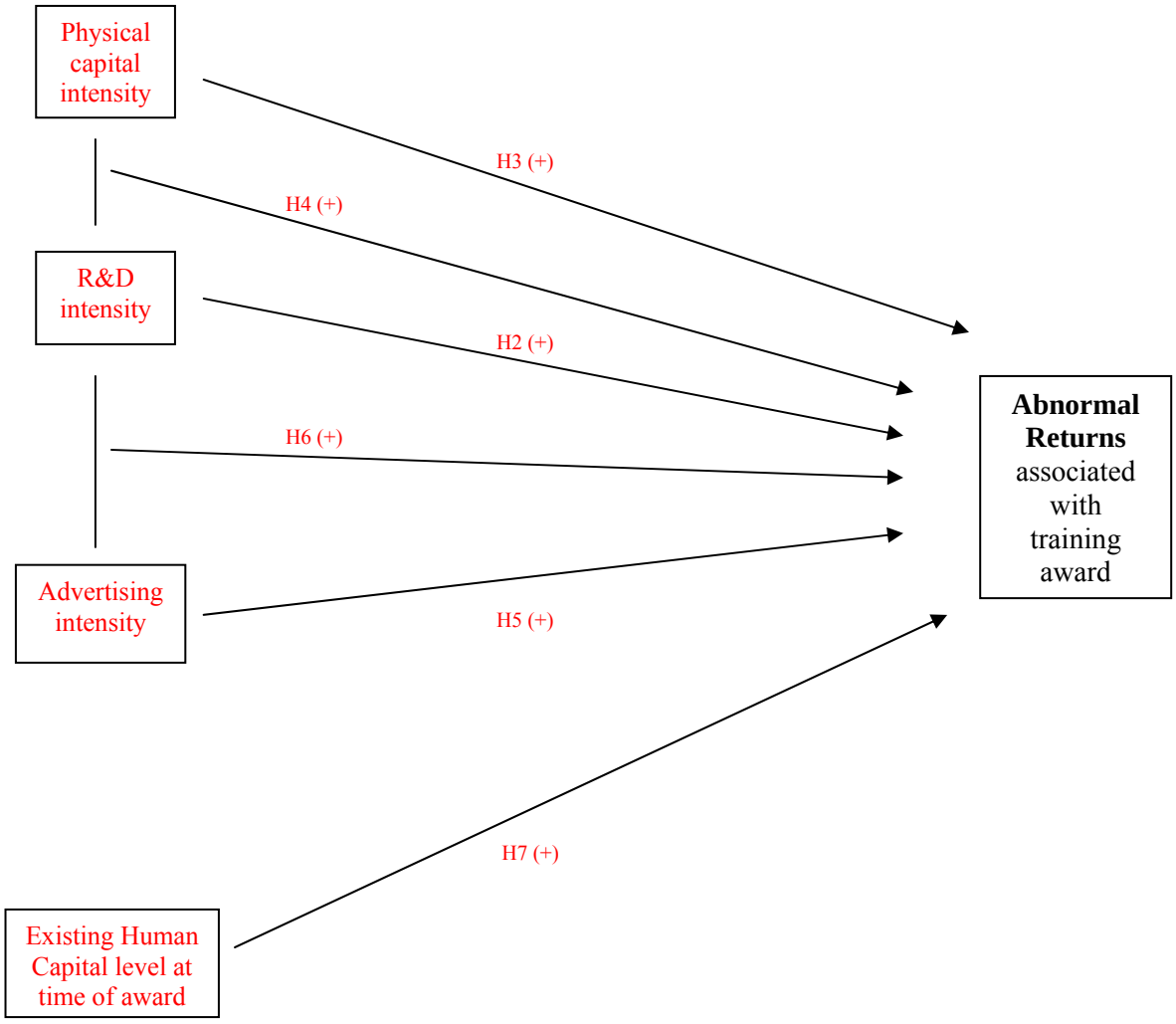
Performance variation in response to training investments may also be explained by the *existing* human capital possessed by a firm's employees. The new training may be complementary with both the general and specific components of an employee's existing human capital, in part because the existing human capital provides absorptive capacity that allows the employee to more efficiently learn from new training (Cohen & Levinthal, 1990; Becker, 1993; Mowery & Oxley, 1995). Additional explanations for the positive relationship between training and general human capital include that firm investments in general human capital serve to safe-guard previous investments in firm-specific human capital (Hansson, 2002), and that the firm makes general human capital investments in an effort to increase employee psychic commitment (Galunic & Anderson, 2000). In each of these last two explanations, the intent is to reduce the turnover of skilled employees in which the firm has made previous investments.

I therefore expect that:

Hypothesis 7: *The higher the firms' per employee wages the greater the positive stock price reaction to the signal of above-average investments in human capital.*

I summarize my hypotheses with the following figure and table.

Figure 1: Theoretical framework and hypotheses



Hypothesis 1 is not included in Figure 1, since the dependent variable in H1 is not exactly the same as in the other hypotheses. In H1, a firm's returns are compared to *its own* expected returns. In H2-7, the returns of *different* firms are compared.

Table 1: Summary of hypotheses

H1	*A signal of firms' above industry average investments in human capital leads to a positive stock price reaction ceteris paribus.*
H2	*The higher the firms' R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*
H3	*The higher the firms' physical capital intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*
H4	*The higher the interaction of physical capital intensity and R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*
H5	*The higher the firms' advertising intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*
H6	*The higher the interaction of advertising intensity and R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.*
H7	*The higher the firms' per employee wages the greater the positive stock price reaction to the signal of above-average investments in human capital.*

These hypotheses will be tested after the data are described in the next chapter.

CHAPTER 4: RESEARCH METHODOLOGY

Research Design

To test my hypotheses, I begin by conducting an event study. The results of this study provide a test of hypothesis 1, and I use the Cumulative Average Abnormal Returns from the event study as a dependent variable when testing hypotheses 2 – 7. The events I examine are announcements of firms being awarded and ranked as one of *Training* magazine's "Training Top 125" – an annual award recognizing firms for their excellence in training and developing employees and human capital management. As discussed in chapter 3, training and education are the two primary methods by which firms invest in and develop human capital in their employees. Conceptually, the use of this training award list provides an indication of firms recognized through a comprehensive quantitative and qualitative methodology for their efforts to develop human capital.

Firms wishing to be considered for this award pay a nominal application fee of less than $200 and then complete a comprehensive survey containing more than 40 questions. The evaluation of completed questionnaires is 75% quantitative, with firms being analyzed along the following dimensions: (1) Training Program / Scope (including hours of training, number of trainers, training budget, best practices, and outstanding initiative) (25% of quantitative score); (2) Tuition Reimbursement (10% of quantitative score); (3) Training Infrastructure and Delivery (20% of quantitative score); (4) Evaluation / Metrics (25% of quantitative score); and (5) Human Resources (including competency maps, compensation tied to training, employee satisfaction surveys, length of service and turnover, job openings filled by internal candidates, and percentage of new hires referred by employees) (20% of quantitative score). These results are tabulated for *Training* magazine by an independent outside organization.

The remaining 25% of the evaluation is qualitative and is determined by the editors of *Training* magazine (based on survey answers and follow-up interviews). Factors they consider include the results and progress of training programs, innovation, success factors, whether training is strategically linked to business goals, corporate commitment to training, potential of best practices to be applicable companywide and to other organizations and industries, and the ingenuity of outstanding initiatives and their potential to become best practices.

The "Training Top 125" list has been published annually by *Training* magazine since 2001.[15] The continuation and expansion of this award since that time is a testament to the growing interest among firms in being considered for the award, and to interest among subscribers[16] of *Training* magazine in reading about the particular investments and practices of winning firms.

The print edition of *Training* magazine is published 6 to 7 times annually, with the "Training Top 125" edition being released in February of March each year. The award is formally given to each of the winning firms at a gala award ceremony during the training industry's annual "Training Conference & Expo" 3-day conference. Release of information to the public occurs in the following steps: (1) a few weeks prior to the award ceremony, *Training* magazine contacts winning firms to request they attend the ceremony. At this point, firms know they are on the list but do not know their ranking; (2) on the night of the gala award ceremony, firms and the award audience learn the rankings, and each firm receives a newly-printed copy of the "Training Top 125" issue of *Training* magazine; (3) approximately 3 days following the award ceremony, all 40-45,000 print subscribers are mailed a copy of the publication; (4) a day

[15] In its inaugural year of 2001, the award recognized and ranked the top 50 firms. From 2002 – 2006, the top 100 firms were recognized. And, since 2007 *Training* magazine has awarded and ranked 125 firms.

[16] 40-45,000 print subscribers, and an additional 70,000 who receive information through email.

or two following this mailing, an additional 70,000 emails are sent out containing award information.[17]

With an assumption of a (semi-strong) efficient financial market (Fama, 1970), a "signal" should only cause an abnormal return to occur if it provides new and unanticipated information. The training award signal I use in this dissertation has informational value that can lead to abnormal returns for multiple reasons. There is a lack of information in financial markets regarding training and education expenditures that exists in part due to the accounting profession's requirement of "expensing" as opposed to capitalizing these expenditures. To the extent that managers are aware of their training efforts, they may be loath to report these "expenses" and depress current earnings. There are no public announcements or explicit accounting line items that easily record human capital. Also, difficulties in measuring the underlying changes in human capital often mean that the financial markets will not be able to identify new information quickly or easily. Last, this signal also has relative value. Because of the extensive nature of *Training* magazine's questionnaire, we can consider their 1-125 rankings as an ordinal ranking. All else equal, these lists do allow us to say that higher firms on the list are being recognized for even greater training efforts and human capital management policies than lower firms on a list. Perhaps more importantly, we can assume that these recognized companies are likely to have better human capital than those not on the list. Hence a hard-to-measure construct of the firm, human capital, is (imperfectly) measured in absolute and competitive terms through stock market abnormal returns on or around the announcement of the award.

[17] Much of this information is based on a February 9, 2010 phone interview with the Editor-in-Chief of *Training* magazine.

Daily stock market information is collected from the Center for Research in Security Prices (CRSP) at the University of Chicago. Additional variables are collected or constructed from COMPUSTAT, Mergent Online, company websites and additional online sources.

Results at multiple event windows are provided (see Tables 2 and 3). Those results at 20- and 15-day event windows are used when considering the statistical significance of hypothesis 1. The estimation window will be a 200 trading day window preceding the event window.

The specific event day each year will be the first trading day following the announcement of awards at *Training* magazine's annual gala award ceremony. These gala ceremonies are held in the evening after the U.S. financial markets have completed trading for the day.

Sample

I limit my observations to firms receiving "Training Top 125" awards during the 2005-2008 time period. By 2005, the award was in its fifth year of publication and had developed a measure of recognition and credibility. I end with 2008, as there were minor changes to the award instituted in 2009 that involved top 10 firms not being eligible for award the following year. As such, the 2005-2008 time period is chosen because it provides the broadest, most consistent, and most reliable sample for study. Also, I consider only publicly-traded firms. My final sample consists of 219 events involving 99 business units (parent firm, or a division or subsidiary) of 95 parent corporations. These firms are from a variety of industries in both the manufacturing and service sectors.

Variables and Measures

Dependent Variable

My dependent variables (for H1, and H2-H7) are taken from the measures of Abnormal Returns generated during event study analysis.

In line with the two research questions of the paper, DV1 operationalizes the existence of market reaction to the signal, while the DV2-7 captures the variance of the market reaction to the signal. These financial performance measures represent unusual and unexpected financial returns, on a risk-adjusted basis, to the owners of the firm. This is akin to the economic profit or rent terminology commonly used in strategic management.[18]

Independent Variables

R&D Intensity

I measure R&D intensity as R&D investment divided by sales (RDINT). The measures for R&D expenditures and Sales are obtained from Compustat. The measure for annual R&D expenditures provided by Compustat is labeled "Research and Development Expense" (XRD). The Compustat measure for sales I use is labeled "Sales/Turnover (net)" (SALE). My measure of R&D intensity (RDINT) is then XRD / SALE.

Advertising Intensity / Marketing-related

I measure Advertising Intensity as advertising expenditures divided by sales (ADINT). The measures for advertising expenditures and sales are obtained from Compustat. The Advertising variable in Compustat is labeled "Advertising Expense" (XAD). The Compustat

[18] In theory, assuming certain market inefficiencies, distinctions can be made between the concepts of "abnormal returns" and "economic profit." In practice, these market-based (abnormal returns) and accounting-based (economic profits) measures of financial performance are often used interchangeably.

measure for sales is labeled "Sales/Turnover (net)" (SALE). My measure of Advertising Intensity (ADINT) is then XAD / SALE.

Physical Capital Intensity

I measure PC intensity as a firm's property, plant and equipment expenditures divided by sales (PCINT). The measure for a firm's property, plant, and equipment expenditures is obtained from Compustat and is labeled "Property, Plant and Equipment – Total (Net)" (PPENT). The Compustat measure for sales is labeled "Sales/Turnover (net)" (SALE). My measure of Physical capital intensity (PCINT) is then PPENT / SALE.

Existing Human Capital (at time of award)

I use a voluntarily-reported Compustat measure "Staff Expense – Total" (XLR)[19] to generate a rough proxy for the firm's existing level of human capital. This Compustat item has been used as a basis for constructing various labor stock (Rosett, 2001) and human capital indicators (Lajili & Zeghal, 2006). I divide "Staff Expense - Total" (XLR) by a firm's sales (SALE). For a given industry, this serves as a useful indication of whether a firm is employing unskilled labor, or skilled and educated employees. As this is only an indirect, composite measure of the general and firm-specific human capital possessed by a firm's employees, and because it contains little information with regards to the firm's attitude and its desire to institute policies and practices that lead to a committed, high-performing workforce, the existence of this Compustat item does *not* eliminate the signal provided by the *Training Top 125* award. Also, this is an annual measure that would not fully reflect increased wages of employees that may result following new training programs. My measure of the intensity of existing human capital

[19] Formerly labeled "Labor and Related costs" in Compustat.

employed by a firm at the time of award, which I will label "Labor Intensity" (LRINT), is then XLR / SALE.

Control Variables

All regression estimations (see Models 2-7 in Tables 5, 6) include 4 control variables. These controls are designed to capture variance in abnormal returns related to factors other than those derived from the theoretical framework and hypotheses outlined in Chapter 3. These controls are for firm size, whether the award was for the entire corporation or a subsidiary/ division, whether the firm won an award in the previous year, and Industry. Larger firms may be more closely scrutinized and have greater coverage by analysts and others in the financial markets. It may be more likely, then, that investors will fully appreciate the training information contained in the awards of large firms. Accordingly, I include *Size* as a control variable and measure it as the natural log of a firm's total assets. I expect Size to be positively related to abnormal returns.

Although in most cases the training awards are awarded to an entire corporation, in some instances it is only a division or subsidiary that has applied for consideration. In these instances, I would expect the effect of training information on stock price to be diluted, as only a portion of a parent corporation is providing new training information to financial markets while all other divisions of the firm are not. I include a control variable (*CorpLevel*) that is a dummy that equals 1 if the training award was for an entire corporation and 0 if the award was only for a division/subsidiary of a corporation. I expect *CorpLevel* to be positively associated with abnormal returns.

I also expect that previous awards won by a firm may be associated with abnormal returns. Firms that have previously won training awards have already provided some training

information to financial markets. Subsequent awards are expected to provide less information and be less of a surprise to investors. Accordingly, I include a control variable for whether or not a firm has won an award in the previous year (*RLastYr*). I measure *RLastYr* with a dummy variable that equals 1 if the firm won an award in the previous year and 0 if it did not. I expect *RLastYr* to be negatively associated with abnormal returns.

Last, I include a control variable for a firm's industry. Industry may have an association with abnormal returns, as firms in different industries may typically have better (or worse) procedures for measuring and reporting training activities to financial markets on a regular basis, meaning that awards would provide less (or more) *new* training information. Also, analysts or investors may consider training to be more crucial in some industries than others. I therefore include a control variable for industry (*Industry*), measured with 2-digit SIC codes.

Methodology for testing Hypothesis 1: Event Study

Following Brown and Warner (1985), I perform the following four steps in conducting an event study: I identify the event, model the normal (expected) returns, estimate the abnormal returns, and then analyze summary measures of the abnormal returns (see also Hannon & Milkovich, 1996: 414).

1. *Identification of event:* the announcement that a firm has received a *Training Top 125* award for its excellence in training and human capital management.
2. *Expected Returns*:

   $E(R_{it}) = \alpha + \beta_i R_{mt} + \varepsilon_{it}$

   Where $E(R_{it})$ is the expected return of firm i on date t, α is the intercept, β_i is the beta of firm i, R_{mt} is the market return on date t, and ε_{it} is the error term for firm i on event date t.

3. *Abnormal Returns*:

$AR_{it} = R_{it} - \alpha - \beta_i R_{mt}$

Where AR_{it} is the abnormal return for firm i on date t, R_{it} is the actual return for firm i on date t, α is the intercept, β_i is the beta of firm i, and R_{mt} is the market return on date t.

4. *Significance of Abnormal Returns*

Calculated using *Eventus* software. The null hypothesis is that the event has no impact on either the mean or variance of returns.

After conducting the event study to determine whether or not abnormal returns *exist*, following McWilliams and Siegel (1997), I attempt to explain the *variation* in these abnormal returns. To do this task, I conduct the following regression analysis.

Methodology for testing Hypotheses 2-7: Regression Analysis

My current model suggests the following regression

$$AR_{it} = \beta_0 + \beta_1 R\&D_{it} + \beta_2 PC_{it} + \beta_3 R\&D_{it} * PC_{it} + \beta_4 AI_{it} + \beta_5 AI_{it} * R\&D_{it} + \beta_6 ESHC_{it} + \beta_7 Size_{it} + \beta_8 CorpLevel_{it} + \beta_9 RlastYr_{it} + \beta_{10} Industry\ Dummies + \varepsilon$$

Where the abnormal returns (AR) for a given firm in a given year are influenced by that firm's R&D intensity (R&D), its physical capital intensity (PC), the interaction of its R&D and PC, its advertising intensity (AI), the interaction of its AI and R&D, its existing stock of human capital at the time of award (ESHC), along with controls for: firm size (*Size*)(measured by log of total assets), whether the award was for the entire corporation or a division/subsidiary (*CorpLevel*), whether the firm was ranked and received an award in the previous year (*RLastYr*), and *Industry*

(controlled for using 2-digit SIC codes). These coefficients indicate, for a firm receiving the award, the *effect* on Abnormal Returns of increased levels of each variable.

Due to gaps in the reporting of data uncovered during the collection of independent variables, testing hypotheses 2-7 with one comprehensive model was not feasible. I therefore tested each hypothesis in a separate regression (Models 2-7), using a consistent set of control variables across all models. Results will be reported in Tables 5 and 6. In Appendix Table 7, I report the composition of observations in each sample; each is distinctly different. (The Appendix follows all chapters and references in the dissertation.)

Each of Models 2-7 (which provide tests of H2-H7, respectively) is tested twice, once using measures of financial performance (abnormal returns) obtained from event window 2 (20-day) of the event study (see Table 5), and once using financial performance measures obtained from event window 3 (15-day) of the event study (see Table 6). I provide the results of both tests of each Model, as these multiple tests, if consistent with one other, provide a robustness check for any supported hypotheses.

Descriptive statistics for all variables can be found in Table 4.

CHAPTER 5: RESEARCH RESULTS AND DISCUSSION

Chapter Introduction

In this chapter I report the results of the empirical tests described in Chapter 4, and discuss the evidence these results provide with regards to the theory and hypotheses developed in Chapter 3. I first report descriptive statistics of both parametric and non-parametric tests conducted as part of the initial event study of this dissertation. After reporting these event study results and the evidence they provide with regards to *whether* an award for excellence in human capital management will be associated with subsequent abnormal returns in stock price (RQ1 and H1), I then report the results of regression analyses conducted in an attempt to explain the *variance* in these abnormal returns (RQ2 and H2-H7).

The overall findings of all empirical tests show first that there is significant and robust support for the hypothesis (H1) that firms do benefit *financially* from their investments in training and human capital management. Using multiple parametric and non-parametric tests, and considering event windows of lengths ranging from (-20, +1) to (-10, +1), I find consistent support for this hypothesis at the 5%, 1%, and .1% levels of statistical significance. Findings of regression analyses testing hypotheses 2-7 provide more limited support for the notion that complementarity between a firm's human capital investments and its other strategic investments explains *variance* in this increased financial performance. For example, hypotheses regarding the main effects of both R&D and Physical Capital were not supported, but the interaction of R&D and Physical Capital was statistically significant in its ability to explain *the extent* to which firms benefit financially from their investments in training and human capital management. Also, with regards to Advertising, its interaction with R&D expenditures was not significant, but

its main effect was positive and provided a statistically significant explanation regarding variance in firm performance.

Results – Event Study

In conducting the event study to test hypothesis 1, I initially examined six different event windows of lengths in days ranging from (-30, +2) to (-2, +1). I examined these multiple windows to test H1, and also to more precisely identify patterns I expected to find in the leakage of award information in the days preceding the official announcements. The results (see Tables 2 and 3) confirmed my expectation that some amount of information regarding which firms will be receiving an award begins to leak out (and be traded upon) in approximately the last 10 to 20 trading days prior to the official announcement of these human capital awards (see the 2nd-4th, and particularly the 2nd and 3rd, windows in Tables 2 and 3). The longer 30-day window generally has less-significant results, as a given magnitude of change in stock price is diluted over more days, while the shorter 2 and 5 day windows fail to fully capture stock price changes that began prior to these windows. As discussed in the previous chapter, the information regarding awards is likely to diffuse slowly for a few weeks before the actual event date.

I conducted multiple parametric and non-parametric tests in order to measure the statistical significance of any abnormal returns that might occur at these various event windows. The three parametric tests conducted were the Patell (1976) test, the Portfolio Time Series test (Brown & Warner, 1980), and the Standardized Cross-Sectional test (Boehmer, Musumeci & Poulsen, 1991). Differences between these tests and their assumptions include that the Patell test (also sometimes referred to as a standardized abnormal return test) assumes cross-sectional independence of returns. The Portfolio Time Series test (also referred to as a "crude dependence adjustment" (CDA) test) (Brown & Warner, 1980), while avoiding the issue of possible cross-

sectional correlation of security returns, has the limitation of not taking account of unequal return variances across securities. The Standardized Cross-Sectional and Patell tests are similar aside from their differing cross-sectional variance adjustments. All three tests are regularly used in event studies. I will specifically discuss in this section only the p-values associated with the Patell test, but an examination of Table 2 clearly reveals that the results, particularly at the 20 and 15-day windows, are robust and consistent across all three parametric tests.

At the first event window listed in Table 2 (-30, +2) there is a mean cumulative abnormal return of 1.13%, meaning that the average firm in the event study has a total abnormal return over the 30 (actually 33)[20] days of the event window of 1.13%. For the Patell test, this results in a Z statistic of 0.767 with a p-value of 0.2216. So, the abnormal returns at this window are positive but not statistically significant. At the second event window listed in Table 2 (-20, +1), the mean cumulative abnormal return of firms receiving an award is 2.01%. Over this 20-day window firms will, on average, see a 2.01% increase in their stock price (and so also in their market capitalization). The Patell Z statistic here is 3.411 with a p-value of 0.0003, meaning that these abnormal returns of 2.01% provide strong statistical support for H1 at this window. At the third event window listed in Table 2 (-15, +1), there are mean cumulative abnormal returns of 1.67% (Patell Z statistic = 3.010, p= 0.0013). As with the results for the previously-discussed 20-day window, the results for this 15-day event window also provide strong statistical support for H1. At the fourth event window in Table 2 (-10, +1) the mean cumulative abnormal return is 1.05% (Patell Z statistic = 1.986, p = 0.0235). The results at this window provide support for H1 at the 5% level of significance. At the fifth window listed in Table 2 (-5, +1) the mean

[20] For purposes of convenience and clarity I refer to the six event windows as being 30-day, 20-day, 15-day, 10-day, 5-day, and 2-day in length. Technically, the 30-day window is actually 33 days (add day of event, and the two days after event), and each of the other five windows are two days longer than stated (So, the 20-day window is actually 22 days, the 15-day window is actually 17 days, etc).

cumulative abnormal returns are 0.30% and the Patell Z statistic is 0.083 with a p-value of 0.4668. These positive abnormal returns of 0.30% do not provide statistically significant support for H1. At the sixth and last event window listed in Table 2 (-2, +1) the mean cumulative abnormal returns are 0.17% and the Patell Z statistic is 0.216 with a p-value of 0.4146. At this last window, the positive abnormal returns of 0.17% do not provide statistically significant support for H1.

Results of the non-parametric tests reported in Table 3 display a pattern of support for hypothesis 1 similar to that described above for the parametric tests, and indicates a robustness to the overall findings related to H1 that firms *do* benefit *financially* from their investments in training and human capital management. The non-parametric tests I conduct are a Generalized Sign test and a Rank test. As the results in Table 3 for these two tests are similar at 5 of the 6 windows (the exception being the 30-day window), I will limit myself here to an examination of the results for the Generalized Sign test. At the 30-day window there are 120 firms with positive abnormal returns, and 102 firms with negative abnormal returns. When, in the Generalized Sign test, these figures of 120 and 102 are compared to expectations based upon a 200-day estimation window, the result is a Z statistic of 1.694 with a p-value of 0.0452. This indicates support for H1 at this window at the 5% level of statistical significance. At the 20-day event window, Table 3 shows that 119 firms have positive abnormal returns and 103 firms have negative abnormal returns. This results in a Z statistic in the Generalized Sign test of 1.559 with a p-value of 0.0595, an indication of support for H1 at the 10% (nearly 5%) level of statistical significance. At the 15-day window there are 121 firms with positive abnormal returns and 101 firms with negative abnormal returns, resulting in a Z statistic for the Generalized Sign test of 1.828 with a p-value of 0.0338 ($p<5\%$). At the 10-day window there are 112 firms with positive abnormal

returns and 110 firms with negative abnormal returns, resulting in a Z statistic for the Generalized Sign test of 0.619 with a p-value of 0.2679. At this 10-day window, neither non-parametric test (Generalized Sign, Rank) provides statistically significant support for H1. At the 5-day window there are 111 firms with positive abnormal returns and also 111 firms with negative abnormal returns, resulting in a Generalized Sign Z statistic of 0.485 with a p-value of 0.3139. This does not provide statistically significant support for H1. Last, at the 2-day window there are 114 firms with positive abnormal returns and 108 firms with negative abnormal returns, resulting in a Generalized Sign Z statistic of 0.888 with a p-value of 0.1874. Although the sign is as expected, this p-value does not provide support for H1 at a generally-accepted level of statistical significance.

In summary, at multiple event windows (the 15- and 20-day windows) and using both non-parametric and parametric methods, there is strong support for hypothesis 1 that firms benefit financially from human capital training.

Results – Regression Analyses

After completing the event study analysis in an effort to determine *whether* firms benefit, financially, from their investments in training and educating employees and developing related human capital management practices and policies, I then conduct regression analyses in an effort to better understand factors affecting *the extent* to which firms may benefit from investing in the human capital of their employees. I take the abnormal returns associated with the event of firms receiving an award for their "excellence in training and human capital management" and use these abnormal returns as dependent variables in subsequent regression analyses. These regression analyses allow me to test several hypotheses (H2-H7) related to the possible importance of complementary assets in explaining the *variance* in firm financial performance

associated with above-average investments in human capital (indicated by the human capital award).

As the event study results in Tables 2 and 3 indicate, measures of financial performance were obtained for event windows of lengths ranging from (-30, +2) to (-2, +1). Although event studies in the Finance literature often make use of event windows in the range of 1-3 days, the use of event windows ranging from 5 to 60 days are well-supported within Management literature event studies (Chauvin & Guthrie, 1994; Hannon & Milkovich, 1996; Brown & Warner, 1980). As I discussed earlier in the *Research Design* section of Chapter 4, although I do have the precise dates that award information is officially released in each year of my study, I also have reason to expect some leakage of information in the few weeks preceding each event. Therefore, my results in Table 2, particularly for event windows ranging from (-20, +1) to (-10, +1), are consistent with my prior expectations regarding the length of time information leaked prior to the official announcements.

I use the abnormal returns obtained from event windows 2 (-20, +1) and 3 (-15, +1) as dependent variables in my regression analyses. For each of the regressions (Models 2-7) listed in Tables 5 (window 2 (-20, +1)) and 6 (window 3 (-15, +1)), a positive and significant coefficient for the independent variable is taken as an indication of support for the hypothesis in question. As each hypothesis (H2-H7) is tested twice, using abnormal returns from both the 20-day and 15-day event windows (see Tables 5 and 6, respectively), I will discuss the significance of two separate coefficients for each hypothesis.

Due to data limitations, a single comprehensive regression model was not possible. For example, it was often the case in Compustat data that firms reporting R&D expenditures did not also report advertising expenditures. Therefore, each of hypotheses 2-7 is tested separately using

abnormal returns from both the 20 and 15-day windows as dependent variables (see Tables 5 and 6, respectively). (These were the two windows consistently and positively significant.) Model 2 at each window provides a test of hypothesis 2, Model 3 at each window provides a test of hypothesis 3, and so forth.

Overall, these regression analyses provide partial support for the notion that complementarity between a firm's human capital expenditures and its other strategic investments (primarily those related to R&D, Advertising, and Physical Capital) explains variance in financial returns to human capital investments. Hypotheses related to the main effects of both R&D and Advertising were not supported, but the interaction of R&D and Advertising was positive and statistically significant at both the 20 and 15-day windows (see Tables 5 and 6, respectively). With regards to Advertising, its interaction with R&D expenditures was not significant, but its main effect was positive and statistically significant at both windows.

I now begin a more detailed examination of the coefficients in Models 2-7 and their implications regarding the support of each hypothesis. Again, in each model a positive and significant coefficient indicates support for the relevant hypothesis.

Hypothesis 2

The coefficient for R&D intensity in the version of Model 2 using abnormal returns from event window 2 (-20, +1) (see Table 5) provides a test of hypothesis 2. This coefficient is -0.103 (p-value = 0.678), and therefore does not provide positive and statistically significant support for H2. In the version of Model 2 using abnormal returns from window 3 (-15, +1) (see Table 6), the coefficient for R&D intensity is -0.005, again does not provide positive and significant support for H2 (p-value = 0.981).

Hypothesis 3

The coefficient for physical capital intensity in the version of Model 3 using abnormal returns from event window 2 (-20, +1) (see Table 5) provides a test of hypothesis 3. This coefficient is 0.0431, in the predicted direction, but not providing support for H3 at a generally-accepted level of statistical significance (p-value = 0.177). In the version of Model 3 using abnormal returns from window 3 (-15, +1) (see Table 6), the coefficient for physical capital intensity is 0.0003, again positive, but not providing significant support for H3 (p-value = 0.989).

Hypothesis 4

The coefficient for the interaction of R&D intensity and physical capital intensity in the version of Model 4 using abnormal returns from event window 2 (-20, +1) (see Table 5) provides a test of hypothesis 4. This coefficient is 3.405, in the predicted direction and supporting H4 at the 5% level of statistical significance (p-value = 0.038). In the version of Model 4 using abnormal returns from window 3 (-15, +1) (see Table 6), the coefficient for the interaction of R&D intensity and physical capital intensity is 3.221, in the predicted direction and supporting H4 at the 1% level of statistical significance (p-value = 0.007).

A Model 4a is provided in Tables 5 and 6 to identify the main effects of R&D while controlling for Physical Capital intensity (and vice versa), allowing an accurate comparison of the direct effects of either R&D or Physical Capital intensity in Model 4a with the interaction term in Model 4. Also, Model 4a uses the same sample as Model 4, while Models 2 and 3 do not.

Hypothesis 5

The coefficient for advertising intensity in the version of Model 5 using abnormal returns from event window 2 (-20, +1) (see Table 5) provides a test of hypothesis 5. This coefficient is 0.917, in the predicted direction and providing support for H5 at the 1% level of statistical significance (p-value = 0.004). In the version of Model 5 using abnormal returns from window 3 (-15, +1) (see Table 6), the coefficient for advertising intensity is 0.764, again positive, and providing support for H5 at the 5% level of statistical significance (p-value = 0.033).

Hypothesis 6

The coefficient for the interaction of advertising intensity and R&D intensity in the version of Model 6 using abnormal returns from event window 2 (-20, +1) (see Table 5) provides a test of hypothesis 6. This coefficient is 13.41, in the predicted direction but not supporting H6 at a generally accepted level of statistical significance (p-value = 0.210). In the version of Model 6 using abnormal returns from window 3 (-15, +1) (see Table 6), the coefficient for the interaction of advertising intensity and R&D intensity is 1.487, again positive, but also not providing support for H6 at a generally accepted level of statistical significance (p-value = 0.898).

A Model 6a is provided in Tables 5 and 6 to identify the main effects of R&D while controlling for Advertising intensity (and vice versa), allowing an accurate comparison of the direct effects of either R&D or Advertising intensity in Model 6a with the interaction term in Model 6. Also, Model 6a uses the same sample as Model 6, while Models 2 and 5 do not.

Hypothesis 7

The coefficient for Labor intensity [my measure for the "existing stock of human capital" (ESHC) in H7] in the version of Model 7 using abnormal returns from event window 2 (-20, +1) (see Table 5) provides a test of hypothesis 7. This coefficient is -0.561, *opposite* the predicted direction and statistically significant at the 10% level (p-value = 0.063). In the version of Model 7 using abnormal returns from window 3 (-15, +1) (see Table 6), the coefficient for Labor intensity is -0.351, again *opposite* the predicted direction, but in this case not statistically significant (p-value = 0.132).

Discussion

Hypothesis 1

Event study results provide a clear, consistent (at the 20- and 15-day windows) finding to the first research question of this dissertation: *do firms benefit, financially, from investments in training and human capital management?* The data support an answer of "Yes." At multiple event windows and using multiple parametric and non-parametric tests, the results corroborate this interpretation. Training awards provide signals to financial markets[21] of firms' above industry average investments in training and their overall perspective and commitment to developing the human capital of their employees. Accepting that financial markets react (semi-strong) efficiently[22] to this new information, the present value of anticipated future benefits to the firm resulting from training investments are calculated and imputed at the time of each event into each firm's stock price and market capitalization. The net change in stock price attributed to

[21] These awards also provide information to job markets, to customers, and to various other current and potential stakeholders.

[22] Perhaps imperfectly, but in an unbiased manner.

the award and the new information it provides is "the abnormal return." When the abnormal return is multiplied by the number of shares outstanding for a given firm, the result is the net change in market capitalization and the total present value, according to market analysts, of the investments in training and human capital management for which the firm won an award.

The regression analyses results provide limited support for the general proposition, tested in hypotheses 2-7, that complementarity between a firm's human capital investments and its other strategic assets and investments helps explain *variance* in returns to training and human capital investments.

Hypothesis 2

Model 2 in Tables 5 and 6 does not support the hypothesis that *the higher the firms' R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital (H2).* In fact, the coefficients for R&D intensity in both Tables 5 and 6, although not statistically significant, have signs that do *not* conform to the expected direction of effects. It is possible that the theory here may be more complex than expected, or at least more complex than what is specified in Model 2. Model 2 includes measures for R&D intensity and all control variables, but I am not able to include measures for each of the other strategic assets of my study. For example, in Model 2 I implicitly assume that the marginal effect of R&D intensity on human capital is the same across different levels of Physical Capital (Physical Capital variable not included in Model 2).

It may also be the case that issues related to the measurement and recording of both R&D and training expenditures may be at play. It may be that, in more knowledge-intensive firms where a greater percentage of employees are employed in R&D, training activities within R&D departments are more likely to be inaccurately recorded as R&D expenditures. This may occur

out of convenience, or be due to a lack of well-specified policies regarding the recording and reporting of training expenditures and other human capital investments.

Hypothesis 3

Although Model 3 in Tables 5 and 6 provides little statistical support for the main effect of Physical Capital intensity (H3), at least the signs conform to the expected direction of effect (positive). Significant negative coefficients for the main effect of Physical Capital would have indicated support for a capital-labor substitution hypothesis. As much of a firm's technology is embodied in its physical capital, and in fact a substantial portion of annual (physical) capital expenditures often consist of computers and related technologies, these coefficients are at least in the expected direction and do not contradict my expectation of a positive association between increased physical/technological investments and the higher-than-average human capital investments of firms in my sample. Perhaps more fine-grained measures of physical capital might uncover subsets of firms for which statistically significant positive relationships *do* exist.

Hypothesis 4

Model 4 provides statistically significant support for the hypothesis that *the higher the interaction of Physical Capital intensity and R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.* In the presence of high human capital investments (all firms in my sample) there is a positive interaction between Physical Capital intensity and R&D intensity. This supports H4 and my general proposition regarding complementarity, and it also provides an interesting contrast to the results, or lack of results, in Models 2 and 3. The main effects of both R&D intensity (Model 2) and Physical Capital intensity were each not significant, but in Model 4 their positive interaction supports the hypothesis of complementarity between these two variables in this environment of high human

capital investments (all firms in sample). It appears that the marginal effect of R&D intensity *changes* across different levels of Physical Capital intensity, and vice versa.

Hypothesis 5

Although Model 2-4 results begin to paint a picture that main effects for independent variables (the "strategic assets", in addition to human capital, considered in my study) will not be significant, but their interactions will, in the case of Advertising intensity, the main effect is positive and statistically significant in Model 5 (see Tables 5 and 6). The above-average human capital investments of firms in my sample appears to support the financial returns to advertising investments, but advertising does not appear to be as closely related to R&D activities as was the case described above with regards to the Physical Capital and R&D relationship (see Model 2-4 discussion above).

Hypothesis 6

As I mentioned in the Model 5/ H5 discussion above, the coefficient for the main effect of Advertising intensity was positive and statistically significant. When I examined the interaction of Advertising intensity and R&D intensity in Model 6, though, results were not significant. The signs for the interaction term did happen to conform to the expected direction of effects in both Tables 5 and 6, but offered little statistical support for the hypothesis that *the higher the interaction of advertising intensity and R&D intensity the greater the positive stock price reaction to the signal of above-average investments in human capital.* These two activities within the firm would not appear to be closely dependent upon each other within a firm. A more important factor may be that they are sometimes considered alternative avenues through which a firm may build its brands and reputation over time. Firms may either emphasize a more

technological and product-oriented strategy, or differentiate themselves through their advertising efforts.

Hypothesis 7

In Model 7, I examine the possible relationship between the existing level of skills and abilities (or human capital) of employees at the time of award and the new training initiatives and investments that led to the award. I hypothesized in H7 that *the higher the firms' per employee wages the greater the positive stock price reaction to the signal of above-average investments in human capital.* My argument in support of this hypothesis being that the pre-existing level of skills and abilities at the time of any new training initiatives would provide an absorptive capacity that would facilitate more efficient training and greater financial returns. The coefficients for Labor Intensity (my measure of pre-existing level of skills and abilities) in Model 7 do not support this hypothesis. In fact, in both Tables 5 and 6 the sign does not conform to the expected direction of effects, and in Table 5 this negative relationship is statistically significant at the 10% level. It may be that my attempt to capture the pre-existing level of human capital by simply using "Labor Intensity," a Compustat measure of a firm's total wages and staff expenditures, does not fully or accurately enough capture existing human capital.

Among the control variables, most were consistently insignificant. The only one that was significant was the Corporate Level, and its sign oscillated between positive and negative. A relatively small number of observations won the award at a divisional rather than a corporate level, and so the occasional significance may reflect small numbers.

In the final chapter I discuss findings in more detail and draw implications for future research.

Table 2: Parametric event study results at various event windows

Event Window #	Event Window	Mean CAR	Patell Z	p-value	Portfolio Time Series (CDA)	p-value	StdCsect Z	p-value
1	(-30, +2)	1.13%	0.767	0.2216	1.483+	0.0691	0.674	0.2501
2	**(-20, +1)**	2.01%	3.411***	0.0003	3.234***	0.0006	2.729**	0.0032
3	**(-15, +1)**	1.67%	3.010**	0.0013	3.064**	0.0011	2.244*	0.0124
4	**(-10, +1)**	1.05%	1.986*	0.0235	2.296**	0.0108	1.537+	0.0622
5	(-5, +1)	0.30%	0.083	0.4668	0.856	0.1961	0.080	0.4682
6	(-2, +1)	0.17%	0.216	0.4146	0.629	0.2648	0.216	0.4144
Significance levels: + p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001. N = 222								

Table 3: Non-parametric event study results at various event windows

Event Window #	**Event Window**	**Positive:** **Negative**	**Generalized Sign** **Z**	**p-value**	**Rank Test Z**	**p-value**
1	(-30, +2)	120: 102*	1.694*	0.0452	0.060	0.4761
2	**(-20, +1)**	119: 103+	1.559+	0.0595	2.024*	0.0221
3	**(-15, +1)**	121: 101*	1.828*	0.0338	1.821*	0.0350
4	(-10, +1)	112: 110	0.619	0.2679	0.878	0.1904
5	(-5, +1)	111: 111	0.485	0.3139	0.397	0.3460
6	(-2, +1)	114: 108	0.888	0.1874	0.725	0.2346
Significance levels: + $p < 0.10$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. N = 222						

Table 4: Descriptive Statistics

	Variables	Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	DV: CAR2	0.02	0.1	-0.31	0.56	1								
						222								
(2)	DV: CAR3	0.02	0.09	-0.2	0.55	0.8861	1							
						0								
						222	222							
(3)	RDint	0.07	0.08	0	0.66	-0.025	-0.0001	1						
						0.8078	0.9995							
						97	97	97						
(4)	PCint	0.31	0.33	0.01	1.86	0.0423	0.0013	0.042	1					
						0.5411	0.9847	0.6896						
						211	211	93	211					
(5)	ADint	0.03	0.03	0	0.16	-0.0234	0.0101	-0.0783	0.0274	1				
						0.8121	0.9179	0.6051	0.7802					
						106	106	46	106	106				
(6)	LRint	0.25	0.13	0.04	0.66	-0.1976	-0.1843	-0.1724	0.0676	-0.2428	1			
						0.1118	0.1385	0.7116	0.5956	0.232				
						66	66	7	64	26	66			
(7)	Firm Size	9.73	1.96	4.94	14.74	-0.0052	-0.0555	0.3087	0.0244	-0.4039	-0.4191	1		
						0.9386	0.4138	0.0021	0.725	0	0.0005			
						219	219	97	211	106	66	219		
(8)	CorpLevel	0.84	0.37	0	1	0.0847	0.0746	0.06	-0.0378	-0.2229	0.0586	0.0204	1	
						0.2084	0.2684	0.5597	0.5855	0.0216	0.6399	0.7641		
						222	222	97	211	106	66	219	222	
(9)	Rlastyr	0.75	0.44	0	1	-0.0833	-0.024	0.1426	-0.187	0.0125	0.1391	0.0852	0.1384	1
						0.2163	0.7219	0.1636	0.0065	0.899	0.2652	0.2091	0.0393	
						222	222	97	211	106	66	219	222	222

Correlations are followed by p-values and number of observations.

Table 5: Regression Results (20-day window)

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Independent Variables									
R&D Intensity		-0.103		-0.0896	-0.618†		-0.518**	-0.821*	
		(0.678)		(0.719)	(0.061)		(0.009)	(0.013)	
Physical Capital Intensity			0.0431	0.0477	-0.382				
			(0.177)	(0.641)	(0.148)				
R&D Intensity * Physical Capital Intensity					3.405*				
					(0.038)				
Advertising Intensity						0.917**	0.583	0.0842	
						(0.004)	(0.756)	(0.965)	
Advertising Intensity * R&D Intensity								13.41	
								(0.210)	
Labor Intensity									-0.561†
									(0.063)
Control Variables									
Firm Size	-0.00314	0.00250	-0.00596	-0.000339	-0.00200	-0.00264	0.0155	0.00967	-0.0195
	(0.640)	(0.659)	(0.415)	(0.955)	(0.725)	(0.764)	(0.145)	(0.279)	(0.306)
CorpLevel	0.0290†	-0.0104	0.0292†	-0.00393	0.00697	0.0425	-0.118*	-0.112**	0.0820*
	(0.054)	(0.725)	(0.052)	(0.902)	(0.802)	(0.578)	(0.011)	(0.002)	(0.026)
RlastYr	0.00216	0.0111	0.00419	0.00809	0.00719	0.00948	0.0130	0.0136	-0.0583
	(0.891)	(0.603)	(0.802)	(0.700)	(0.745)	(0.629)	(0.748)	(0.744)	(0.106)
2-digit SIC codes[23]	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.00703	-0.0370	-0.0916	-0.0986	0.639	-0.0725	0.00196	0.0474	0.344
	(0.888)	(0.537)	(0.238)	(0.620)	(0.178)	(0.359)	(0.981)	(0.628)	(0.123)
Observations	219	97	211	93	93	106	46	46	66
R^2	0.300	0.182	0.315	0.207	0.250	0.480	0.384	0.397	0.542

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1

[23] 2-digit SIC code industry controls are fully enumerated in appendix Table 8.

Table 6: Regression Results (15-day window)

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model6a	Model 6	Model 7
Independent Variables									
R&D Intensity		-0.00503		0.0273	-0.472†		-0.202	-0.235	
		(0.981)		(0.900)	(0.056)		(0.307)	(0.463)	
Physical Capital Intensity			0.000307	0.0126	-0.394*				
			(0.989)	(0.885)	(0.035)				
R&D Intensity * Physical Capital Intensity					3.221**				
					(0.007)				
Advertising Intensity						0.764*	-1.258	-1.313	
						(0.033)	(0.515)	(0.559)	
Advertising Intensity * R&D Intensity								1.487	
								(0.898)	
Labor Intensity									-0.351
									(0.132)
Control Variables									
Firm Size	-0.00675	-0.00152	-0.00906	-0.00530	-0.00687	-0.00547	0.00878	0.00813	-0.0246
	(0.260)	(0.762)	(0.168)	(0.325)	(0.186)	(0.388)	(0.352)	(0.423)	(0.177)
CorpLevel	0.00910	0.00293	0.00955	0.00635	0.0167	0.0164	-0.0239	-0.0233	0.0300
	(0.388)	(0.897)	(0.355)	(0.782)	(0.417)	(0.652)	(0.510)	(0.554)	(0.223)
RlastYr	0.00633	0.00462	0.00641	0.00163	0.000791	0.0144	0.0100	0.0101	-0.0617†
	(0.681)	(0.827)	(0.693)	(0.939)	(0.970)	(0.412)	(0.803)	(0.806)	(0.096)
2-digit SIC codes[24]	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.0680	-0.0232	0.0546	-0.0135	0.684*	-0.00211	0.0776	0.0826	0.306
	(0.124)	(0.647)	(0.382)	(0.936)	(0.041)	(0.968)	(0.327)	(0.443)	(0.138)
Observations	219	97	211	93	93	106	46	46	66
R^2	0.211	0.176	0.225	0.202	0.240	0.331	0.299	0.300	0.397

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1

[24] 2-digit SIC code industry controls are fully enumerated in appendix Table 9.

CHAPTER 6: CONCLUSION

In this dissertation, I examined the relationship between a firm's investments in training and its subsequent financial performance. These investments in training and related human capital management practices are one of the primary methods by which firms develop the human capital of their employees. Making these investments and developing a knowledgeable, capable well-trained workforce is often assumed to be an increasingly important prerequisite for survival and effectively competing in today's knowledge-based economy. Yet despite the economic importance to firms of engaging in these training and related activities aimed at developing the human capital of their employees, little management research has attempted to directly examine the relationship between these activities and firm-level measures of financial performance.

Due, at least in part, to the intangible nature of human capital and the variety of measurement difficulties this creates, secondary data sources providing measures of firm expenditures in this area have generally been unavailable to researchers. Accounting conventions do not permit firms to record these expenditures as "investments," and, in fact, firms are not required to make *any* separate disclosure of these expenditures in public financial statements. The result is that most firms do not disclose this information.

Even where this information is available, measuring the association with financial measures of firm performance remains difficult. The relationship within the firm between training and various performance measures is often complex, and is sometimes causally ambiguous. Also, for annual accounting-based measures of financial performance, isolating the effect of training from the large number of other activities performed by the firm throughout the year is quite difficult.

The result has been that management researchers have often found it necessary to use either self-reported or non-financial measures of performance. I believe the interpretation of results related to non-financial measures of performance is a potential concern, as studies utilizing these measures sometimes suggest, or will allow the reader to infer, a positive association with improved financial performance when there isn't *necessarily* any relationship at all between these two types of performance measures (non-financial and financial). Under assumptions of perfect competition, investments in training will generate only normal returns. In other words, "future productivity [a non-financial measure] can be improved only at a cost" (Becker, 1993: 31). Discussions in resource-based literature of "imperfect" (Barney, 1986) or "incomplete" (Dierickx & Cool, 1989) strategic factor markets also emphasize that the full cost of resources used to implement product market strategies needs to be considered before a determination can be made as to whether a successfully-implemented product market strategy has actually improved a firm's profitability. Aside from luck, improved economic performance is said to result through either closer analysis, and more accurate evaluation, of the resources and capabilities a firm already controls (Barney, 1986), or through choosing appropriate time paths of 'flow" variables necessary to build the required "stocks" of strategic assets that will determine competitive position and potential profitability (Dierickx & Cool, 1989: 1510). Whether strategic factor markets (including those related to training) are "imperfect" or "incomplete," there do not appear to be any *general* "rules for riches" (Rumelt, Schendel & Teece, 1991: 12; Barney & Arikan, 2001: 171). So, while we might often expect to observe (at least within a range) a general rule that increased expenditures on a given factor of production may result in increased non-financial (i.e. productivity) measures of performance, the same relationship between these expenditures and *financial* measures of performance is not a general rule. And, as

the relationship between training expenditures and financial performance is not a given, the relationship between productivity gains generated by these training expenditures and financial performance is also not a given. Or, at least this relationship has yet to be well established empirically in the literature. The exact nature of the relationship between training activities (and the strategic factors or assets they may help develop) and firm-level measures of financial performance remains an interesting, important and seldom-examined topic, and therefore an appropriate focus of this dissertation.

In my first research question, I ask "whether firms benefit, financially, from their investments in training and human capital management." I use event study methodology and conduct several parametric and non-parametric tests to determine whether firms receiving an award for their "excellence in training and human capital management" have significant abnormal stock returns. After completing the event study, I then use the abnormal return measures for each firm in subsequent regression analysis related to my second research question, that is "what are the firm-level factors that affect the extent to which firms benefit?"

Research Implications

I use an event study to test whether there is a market reaction to a firm receiving an award for its "excellence in training and human capital management." Due to the specific questions and methodology used by *Training* magazine in determining winning firms, I am able to attribute these awards as being related to those HR activities *specific* to the training of employees. Further, as these awards include information regarding newer training initiatives of firms, I maintain that a substantial portion of any abnormal market reaction to these awards will reflect the market's estimation of the asset value (in excess of training costs) of the human capital developed through this training. In addition, the financial markets consider the expected value

that this new information will have in other markets and to various additional internal and external stakeholders. Presumably these include the labor market, where an award may help build a reputation and allow a firm to more efficiently attract, hire and retain qualified workers. Current and potential suppliers are likely to become more confident that any integrated operations will run more efficiently when a potential buyer has well-trained employees. Customers may gain additional confidence that they are buying quality products, perhaps allowing the firm to command a price premium for its products.

The specific characteristics of this training award allowed me to conduct an event study with significant potential implications for research. First, this study is one of the few to obtain a firm-level *financial* measure of performance attributable to a firm's excellence in training. Being a financial measure, these abnormal returns provide a more direct measure of the returns to training than many productivity and other non-financial measures. Also, the event study allows me to separate performance resulting from training from performance resulting from the many other activities a firm performs throughout the year more precisely than would be possible using annual accounting-based measures of financial performance.

In addition to the benefits of using an event study in this context, I believe that this particular event study contributes to research in that it is better able to capture within its performance measure the financial markets reaction to expected changes in human capital within the firm than prior human resource-related event studies. Most prior event studies from within the HR literature have emphasized the benefits of having the correct "bundle" of human resource activities or of being named to one of the various "best employer" awards, but have not attempted to isolate the benefits of training or developing human capital. Studies in this area usually examine the effect of these awards on the value of a firm's labor market reputation. In

fact, some have held constant "the effects of the actual HRM practices that cause the formation of the firm's reputation" (Chauvin & Guthrie, 1994: 546) in order to focus on the reputation. I have taken a different perspective. While there are multiple mechanisms, including labor market reputation, by which training awards can impact financial performance, at least some portion of the abnormal returns results from the financial markets' evaluation of the future benefits within the firm as a direct result of training. To research in Strategy and Strategic HR, my findings lend support to the empirical human capital research that uses non-financial measures of performance. And, methodologically, I provide some evidence that certain awards may impact firm value for reasons beyond reputation – if the awards contain information new to the financial markets, then changes in valuation will also reflect net benefits expected to occur within the firm (in excess of costs) as a result of the activities within the firm that lead to the award.

Managerial Implications

The findings in this dissertation also have important implications for managers. First is the corroboration that, yes, training matters. Managers can be reassured that these activities *do* have value within the firm, and also in labor and other markets, and that financial markets recognize this value (once they are aware of the investments). Top management may want to consider better insulating mid-level managers who are making many of the decisions regarding training expenditures from the pressures that result from being forced to "expense" training activities that are clearly an investment for the firm. As human capital is an intangible asset that financial markets will generally have less than complete information about, managers concerned about accurate valuation may consider attempting to more accurately record and more fully report this information. However, this should be done with caution, since detailed reporting of training activities and the development of intangible assets within the firm will also make this

information available to competitors. I see participation in a credible training award contest as a prudent middle ground. Firms can release the necessary detailed information to the awarding organization under a confidentiality agreement, and, if they are successful in receiving an award, some portion of any undervaluation may be corrected when the financial markets receive this information.

Limitations

This dissertation makes important contributions to theory and empirical work in Strategy and Strategic Human Resource Management, and in addition has important managerial implications, but it does have its limitations.

At least in part due to a variety of measurement issues, *perfect* measures of a firm's investments in human capital and the resulting effects on performance are often unattainable. I take a novel approach within the Strategy literature to measuring human capital by using an event study methodology where the "event" is an award firms receive that is *specific* to its investments in training and related human capital activities.[25] But my measure, as with any other, does have limitations. First is my use of a training award as a measure or proxy for the human capital itself. The human capital itself is a difficult-to-observe construct. So, in my study, as in most others, the measure of human capital is at least a step removed from actually measuring the changes in an employee's knowledge, know-how, skills, and abilities. Also, I do not claim that financial markets are directly evaluating and reacting to any precise numerical figures (regarding either training expenditures or firm rankings within the award list) released at the time of award.

[25] As opposed to extant HR-related event studies primarily in the HR and Strategic HR literatures that often focus more on the performance of the overall bundle of HR activities and the more general positive perception of a firm's HR this provides the public and investors (i.e., " Top 100 places to work," "Best firms for working mothers," etc.). Although these studies are extremely valuable in their own right, I believe this study is the first within Strategy using an event that comes close to isolating those portions of HR activities directly related to the development and management of human capital.

I take a more conservative position in merely asserting that, in this world of incomplete information regarding training and human capital investments, this award provides new information to the financial (and other) markets that increased training has recently occurred, and that the award-winning firms are committed to developing the human capital of their employees.

My performance measure, the abnormal returns obtained from my event study requires an acceptance of the (semi-strong form) efficient market hypothesis, which states that all publicly-available information regarding firms will be fully and immediately imputed into the firm's valuation and its stock price. This hypothesis does not state that the market reaction based on expected changes in the discounted value of a firm's future cash flows will be perfect in every individual instance, but it does require the reader to accept that these bumps in stock price that occur over narrow "event windows' will be unbiased in their valuation of new information.

The need to use multiple samples in my regression hypotheses testing H2-H7 (see Models 2-7 in Tables 5, 6) might also be considered a limitation. In Appendix Table 7, I report the composition of observations in each sample; there is little overlap. When collecting independent variables to examine possible complementarity between a firm's human capital and its other strategic assets, it became apparent that gaps existed in the public reporting (in Compustat) of these variables. For instance, although my full sample contains 219 observations (instances of a firm winning an award in a given year), in only 97 of those observations did the firm in question report its R&D expenditures for that year. A comprehensive model including all independent and control variables would have resulted in a sample of only 2 firms. So, in order to preserve the number of observations used to test each hypothesis, it was necessary to create 6 separate sub-samples (see Models 2-7 in Tables 5, 6) based on the availability (Compustat reporting) of each independent variable. This necessitates more caution when directly

comparing results across the various models, but a comparison of descriptive statistics across samples reveals few obvious differences, aside from the number of observations in each sample. Also, the interpretations of each individual model remain informative and provide valuable insights regarding the overall research questions of my study.

A few measures I have yet to consider might also be considered limitations. In the initial coding of these data, great care was taken to code variables obtained from firm financial statements (through Compustat) so that data for the fiscal year ending just prior to the award would be aligned with the subsequent award year, since awards were announced in either February of March, just after the end of most firms' fiscal years. So, Intel's balance sheet data for, say, 2006, was directly aligned with their March, 2007 training award. This simplified regressions and eliminated the need for lag variables. But, I perhaps might have considered additional leading or lag measures between the abnormal stock market returns I observed and various other accounting-based measures of financial performance. For one, this might strengthen my position that it was the training and human capital improving performance, and not the other way around. Also, if these abnormal returns persisted over the next few years it would add support to the efficient market hypothesis assumptions necessary when conducting an event study.

Future Research

Given that I have used training awards to provide an indication of a firm's past investments in training and developing human capital, future research may want to use more direct, and fine-grained, measures of these investments. The event study methodology used in this dissertation served well in establishing *whether* there is a financial relationship between training (awards) and financial performance, but the coarseness of data used in subsequent

regression analysis may have contributed to my more limited success in establishing the factors that account for the *variation* in returns to training expenditures. A survey instrument may have the limitation of self-reported financial measures, but will allow me to obtain more-detailed information on training and other human capital development activities. Also, a survey would enable me to obtain measures of the *specificity* of the human capital, and various forms of physical capital, within the firm. I expect that my proposition regarding the complementarity of human capital with the firm's other strategic investments would have more consistent support if measures of specificity were included in regression analysis. Hence, a survey-based approach might be a valuable complement to my dissertation research.

In addition to obtaining more fine-grained measures of human capital investments from the firm's perspective, a survey would allow me, at the same time, to also examine these same investments from the employee's perspective. Future work here will be grounded in Transaction Cost Economics reasoning. As Williamson illustrates in his Simple Contracting Schema (1985: 33), there is a set of possible contracts between buyers (firms) and suppliers (including employees), determined by the presence or absence of specific investments between these two parties, and also by the presence or absence of safeguards to protect these parties from potential opportunistic behavior of the other party in the contract. At one extreme, there are only general investments, and therefore no safeguards are necessary to induce either party to contract, since neither is vulnerable to opportunistic behavior. These investments could easily be redeployed to other uses or sold in the market. At the other extreme, specific investments have been made between these two parties, and safeguards have been provided to protect the parties from the potential opportunistic behavior of their trading partner and induce them to contract. At a third point, the specific investments have been made, but no safeguards against opportunistic behavior

have been offered. This situation is "apt to be unstable contractually" (1985: 34). Why would a supplier (a potential new employee, for example) enter into a contractual relationship that would require them to make specific investments when no safeguards are offered? Williamson (1985) states that, in the absence of safeguards, a significant price premium would need to be offered to induce the supplier to enter contract in a situation where, ex post, they would be subject to opportunistic behavior. The projected breakeven supply price is great (the wage rate required by workers at the third point exceeds the extreme). The third point is considered an inefficient, out-of-equilibrium situation that is not expected to persist.

I intend to show that a price premium is not the only solution that induces the other party to a contract (the employee) to enter contract in the face of specific investments and a lack of safeguards. I propose that other "in kind" benefits, of which training and education are important, may induce parties to contract in place of safeguards and price premiums. If the combination of safeguards and compensation received by the employee does not appear to reflect their increased human capital and specific commitments to the firm, why might this be so? Why would an employee with foresight allow themselves to be put in this situation? If a situation such as this exists and appears to be stable and profitable for the firm, then I would examine whether perhaps there were other, non-pecuniary benefits the firm was providing the employees that were not easily visible in financial statements. And, for the firm that attempted to maintain an employment relationship where the firm had not provided either increased compensation or economic safeguards for the employee's specific commitments, what might the behavioral and performance consequences be for the firm?

Finally, at the end of this dissertation and the commencement of this research program, I hope the work increases our understanding of the financial value to firms of investing in the

training and human capital of their employees and the factors affecting the extent of these financial returns. I hope I have highlighted the importance of cost considerations and the non-obvious relationship between non-financial and financial measures of performance resulting from training. Despite these cost considerations, training expenditures (and the strategic factors and assets they help develop) are valued by the financial markets. Firms that train their employees are more likely to develop the idiosyncratic skills and capabilities difficult for competitors to imitate. In addition, current and potential employees value this commitment from the firm, perhaps benefiting the firm with regards to discretionary employee effort, and making job market activities, such as recruitment and selection, more efficient. In short, training matters.

REFERENCES

Aaker, D. (1989). Managing assets and skills: The key to a sustainable competitive advantage. *California Management Review*, **31**(2): 91-106.

Allyn, M.R. & S. Yun (2005). Computers and human capital potentiation. *Journal of Business & Economic Studies*, **11**(2): 34-49.

Amit, R. & P.J.H. Schoemaker (1993). Strategic assets and organizational rent. *Strategic Management Journal*, **14**(1): 33-46.

Bagozzi, R.P. (1986). *Principles of Marketing Management*. Chicago, IL: Science Research Associates.

Bailey, E.E. & C.E. Helfat (2003). External management succession, human capital, and firm performance: An integrative analysis. *Managerial and Decision Economics,* **24**(4): 347-369.

Baker, W.E. & J.M. Sinkula (1999). The synergistic effect of market orientation and learning orientation on organizational performance. *Journal of the Academy of Marketing Science*, **27**(4): 411-427.

Barney, J.B. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management Science*, **32**(10): 1231-1241.

Barney, J.B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, **17**(1): 99-120.

Barney, J.B. (1995). Looking inside for competitive advantage. *Academy of Management Executive,* **9**(4): 49-61.

Barney, J.B. (1997). *Gaining and Sustaining Competitive Advantage*. Reading, MA: Addison-Wesley.

Barney, J.B. & A.M. Arikan (2001). The resource-based view: Origins and implications. In M. Hitt, R. Freeman, & J. Harrison (Eds.), *The Blackwell Handbook of Strategic Management* (pp. 124-188). Malden, MA: Blackwell Publishing.

Becker, B.E., M.A. Huselid, P.S. Pickus & M.F. Spratt (1997). HR as a source of shareholder value: Research and recommendations. *Human Resource Management*, **36**(1): 39-47.

Becker, G.S. (1962a). Investment in human capital: A theoretical analysis. *Journal of Political Economy*, **70**(5, Part 2: Investment in Human Beings): 9-49.

Becker, G.S. (1962b). Irrational behavior and economic theory. *Journal of Political Economy*, **70**(1): 1-13.

Becker, G.S. (1964). *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education.* New York: Columbia University Press for the National Bureau of Economic Research.

Becker, G.S. (1993). *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (3rd ed.). Chicago, IL: The University of Chicago Press.

Boehmer E.J., J. Musumeci & A. Poulsen (1991). Event-study methodology under conditions of event-induced variance. *Journal of Financial Economics,* **30**(2): 253-272.

Bowman, C. & J. Swart (2007). Whose human capital? The challenge of value capture when capital is embedded. *Journal of Management Studies,* **44**(4): 488-505.

Bresnahan, T.F. (1999). Computerisation and wage dispersion: An analytical reinterpretation. *The Economic Journal*, **109**(456): F390-F415.

Bresnahan, T.F., E. Brynjolfsson & L.M. Hitt (2002). Information technology, workplace organization, and the demand for skilled labor: Firm-level evidence. *Quarterly Journal of Economics,* **117**(1): 339-376.

Brown, S.J. & J.B. Warner (1980). Measuring security price performance. *Journal of Financial Economics*, **8**(3): 205-258.

Brown, S.J. & J.B. Warner (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics*, **14**(1): 3-31.

Brynjolfsson, E. & L.M. Hitt (2000). Beyond computation: Information technology, organizational transformation and business performance. *The Journal of Economic Perspectives*, **14**(4): 23-48.

Carlton, D. & J. Perloff (2005). *Modern Industrial Organization* (4th ed.). Boston, MA: Pearson, Addison Wesley.

Carmeli, A. & A. Tishler (2004). The relationships between intangible organizational elements and organizational performance. *Strategic Management Journal,* **25**(13): 1257-1278.

Castanias, R.P. & C.E. Helfat (1991). Managerial resources and rents. *Journal of Management*, **17**(1): 155-171.

Castanias, R.P. & C.E. Helfat (1992). Managerial and windfall rents in the market for corporate control. *Journal of Economic Behavior and Organization*, **18**(2): 153-184.

Caves, R.E. (1984). Economic analysis and the quest for competitive advantage. *American Economic Review*, **74**(2): 127-132.

Caves, R.E. (1996). *Multinational Enterprise and Economic Analysis* (2nd ed.). Cambridge: Cambridge University Press.

Caves, R.E. & P.J. Williamson (1985). What is product differentiation, really? *The Journal of Industrial Economics*, **34**(2): 113-132.

Chadwick, C. (2006). Organizational performance implications of the human resource make or buy decision (working paper, October 2006 draft).

Chandler, A.D. (1962). *Strategy and Structure*. Cambridge, MA: The MIT Press.

Chauvin, K. & J. Guthrie (1994). Labor market reputation and the value of the firm. *Managerial and Decision Economics*, **15**(6): 543-552.

Coff, R.W. (1997). Human assets and management dilemmas: Coping with hazards on the road to resource-based theory. *Academy of Management Review,* **22**(2): 374-402.

Coff, R.W. (1999). When competitive advantage doesn't lead to higher performance: The resource-based view and stakeholder bargaining power. *Organization Science*, **10**(2): 119-133.

Coff, R.W. (2003a). Bidding wars over R&D-intensive firms: Knowledge, opportunism, and the market for corporate control. *Academy of Management Journal*, **46**(1): 74-85.

Coff, R.W. (2003b). The emergent knowledge-based theory of competitive advantage: An evolutionary approach to integrating economics and management. *Managerial and Decision Economics*, **24**(4): 245-251.

Coff, R.W. (2010). The coevolution of rent appropriation and capability development. *Strategic Management Journal*, **31**(7): 711-733.

Coff, R.W. & E.G. Flamholtz (1993-1994): Corporate investments in human capital: How financial accounting standards undermine public policy. *Stanford Law & Policy Review*, **5**(1/2): 31-40.

Cohen, W.M. & D.A. Levinthal (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, **35**(1): 128-152.

Cohen, W.M., R.R. Nelson & J.P. Walsh (2000). Protecting their intellectual assets: Appropriability conditions and why U.S. manufacturing firms patent (or not). *NBER Working Paper 7552.*

Cooper, A.C., F.J. Gimeno-Gascon, & C.Y. Woo (1994). Initial human and financial capital as predictors of new venture performance. *Journal of Business Venturing*, **9**(5): 371-395.

Delery, J.E. & D.H. Doty (1996). Modes of theorizing in strategic human resource management: tests of universalistic, contingency, and configurational performance predictions. *Academy of Management Journal*, **39**(4): 802-835.

Dierickx, I. & K. Cool (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science*, **35**(12): 1504-1511.

Doyle, P. (2000). Value-based marketing. *Journal of Strategic Marketing*, **8**(4): 299-311.

Fabiani, S., F. Schivardi & S. Trento (2005). ICT adoption in Italian manufacturing: Firm-level evidence. *Industrial and Corporate Change*, **14**(2): 225-249.

Fama, E.F. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, **25**(2): 383-417.

Farjoun, M. (1994). Beyond industry boundaries: Human expertise, diversification and resource-related industry groups. *Organization Science*, **5**(2): 185-199.

Farjoun, M. (1998). The independent and joint effects of the skill and physical bases of relatedness in diversification. *Strategic Management Journal*, **19**(7): 611-630.

Flamholtz, E.G. (1985). *Human Resource Accounting: Advances in Concepts, Methods, and Applications* (2nd ed). San Francisco, CA: Jossey-Bass Publishers.

Galunic, D.C. & E. Anderson (2000). From security to mobility: Generalized investments in human capital and agent commitment. *Organization Science,* **11**(1): 1-20.

Ghemawat, P. (1991). *Commitment: The Dynamic of Strategy*. New York: The Free Press.

Ghemawat, P. (2002). Competition and business strategy in historical perspective. *The Business History Review*, **76**(1): 37-74.

Gimeno, J., T.B. Folta, A.C. Cooper & C.Y. Woo (1997). Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly,* **42**(4): 750-783.

Giuri, P., S. Torrisi & N. Zinovyeva (2008). ICT, skills, and organizational change: Evidence from Italian manufacturing firms. *Industrial and Corporate Change,* **17**(1): 29-64.

Graham Jr., R.C. & K.D. Frankenberger (2000). The contribution of changes in advertising expenditures to earnings and market values. *Journal of Business Research*, **50**(2): 149-155.

Grant, R.M. (1991). The resource-based theory of competitive advantage: Implications for strategy formulation. *California Management Review*, **33**(3): 114-135.

Grant, R.M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, **17**(Winter Special Issue): 109-122.

Griliches, Z. (1981). Market value, R&D, and patents. *Economic Letters,* **17**(2): 183-187.

Hall, R. (1992). The strategic analysis of intangible resources. *Strategic Management Journal*, **13**(2): 135-144.

Hall, R. (1993). A framework linking intangible resources and capabilities to sustainable competitive advantage. *Strategic Management Journal*, **14**(8): 607-618.

Hannon, J.M. & G.T. Milkovich (1996). The effect of human resource reputation signals on share prices: An event study. *Human Resource Management*, **35**(3): 405-424.

Hansson, B. (2002). Marketable human capital investments: An empirical study of employer-provided training. Stockholm University, School of Business Working Paper, 2002-02-11.

Hansson, B. (2007). Company-based determinants of training and the impact of training on company performance. *Personnel Review*, **36**(2): 311-331.

Hansson, B. (2009). Employers' perspectives on the roles of human capital development and management in creating value. *OECD Education Working Papers, No. 18, OECD publishing*.

Harris, D. & C. Helfat (1997). Specificity of CEO human capital and compensation. *Strategic Management Journal,* **18**(11): 895-920.

Hart, O. (1995). *Firms, Contracts, and Financial Structure*. Oxford, UK: Clarendon Press.

Hashimoto, M. (1981). Firm-specific human capital as a shared investment. *American Economic Review,* **71**(3): 475-482.

Hatch, N.W. & J.H. Dyer (2004). Human capital and learning as a source of sustainable competitive advantage. *Strategic Management Journal*, **25**(12): 1155-1178.

Helfat, C.E. (1997). Know-how and asset complementarity and dynamic capability accumulation: The case of R&D. *Strategic Management Journal*, **18**(5): 339-360.

Helfat, C.E. & M.A. Peteraf (2003). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal*, **24**(10): 997-1010.

Hirschey, M. & J. Weygandt (1985). Amortization policy for advertising and research and development expenditures. *Journal of Accounting Research*, **23**(1): 326-335.

Hitt, M.A., L. Bierman, K. Shimizu & R. Kochhar (2001). Direct and moderating effects of human capital on strategy and performance in professional service firms: A resource-based perspective. *Academy of Management Journal*, **44**(1): 13-28.

Hitt, M.A., R. Hoskisson, J. Harrison & T. Summers (1994). Human capital and strategic competitiveness in the 1990's. *Journal of Management Development*, **13**(1): 35-46.

Huselid, M. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal*, **38**(3): 635-672.

Hutt, M.D. (1995). Cross-functional working relationships in marketing. *Journal of the Academy of Marketing Science*, **23**(4): 351-357.

Klein, B., R. Crawford & A. Alchian (1978). Vertical integration, appropriable rents, and the competitive contracting process. *Journal of Law and Economics*, **21**(2): 297-326.

Kohli, A.K. & B.J. Jaworski (1990). Market orientation: The construct, research propositions, and managerial implications. *The Journal of Marketing*, **54**(2): 1-18.

Kor, Y.Y. & H. Leblebici (2005). How do interdependencies among human-capital deployment, development, and diversification strategies affect firms' financial performance? *Strategic Management Journal*, **26**(10): 967-985.

Lajili, K. & D. Zeghal (2006). Market performance impacts of human capital disclosures. *Journal of Accounting and Public Policy*, **25**(2): 171-194.

Lieberman, M. & D. Montgomery (1988). First-mover advantages. *Strategic Management Journal*, **9**(S1): 41-58.

Lippman, S.A. & R.P. Rumelt (1982). Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *Bell Journal of Economics*, **13**(2): 418-438.

Lippman, S.A. & R.P. Rumelt (2003). A bargaining perspective on resource advantage. *Strategic Management Journal*, **24**(11): 1069-1086.

Lynch, L.M. & S.E. Black (1998). Beyond the incidence of employer-provided training. *Industrial and Labor Relations Review*, **52**(1): 64-81.

MacDuffie, J.P. (1995). Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *Industrial and Labor Relations Review*, **48**(2): 197-221.

Mahoney, J.T. & J.R. Pandian (1992). The resource-based view within the conversation of strategic management. *Strategic Management Journal*, **13**(5): 363-380.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal*, **22**(5): 387-401.

Makadok, R. (2003). Doing the right thing and knowing the right thing to do: Why the whole is greater than the sum of the parts. *Strategic Management Journal*, **24**(10): 1043-1055.

Maltz, E., W.E. Souder & A. Kumar (2001). Influencing R&D/marketing integration and the use of market information by R&D managers: Intended and unintended effects of managerial actions. *Journal of Business Research*, **52**(1): 69-82.

Mansfield, E. (1979). *Microeconomics: Theory and Applications* (3rd ed.). New York: W. W. Norton and Company.

Marvel, M.R. & G.T. Lumpkin (2007). Technology entrepreneurs' human capital and its effects on innovation radicalness. *Entrepreneurship Theory and Practice,* **31**(6): 807-828.

McWilliams, A. & D. Siegel (1997). Event studies in management research: Theoretical and empirical issues. *Academy of Management Journal*, **40**(3): 626-657.

Miles, R.E. & C.C. Snow (1994). *Fit, Failure, and the Hall of Fame: How Companies Succeed or Fail*. New York: The Free Press.

Milgrom, P. & J. Roberts (1990). The economics of modern manufacturing: Technology, strategy, and organization. *American Economic Review*, **80**(3): 511-528.

Milgrom, P. & J. Roberts (1992). *Economics, Organization and Management*. Englewood Cliffs, NJ: Prentice Hall.

Milgrom, P. & J. Roberts (1995). Complementarities and fit: Strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics*, **19**(2/3): 179-208.

Mizik, N. & R. Jacobson (2008). The financial value impact of perceptual brand attributes. *Journal of Marketing Research*, **45**(1): 15-32.

Mowery, D. & J. Oxley (1995). Inward technology transfer and competitiveness: The role of national innovation systems. *Cambridge Journal of Economics*, **19**(1): 67-93.

Nelson, R.R. & S.G. Winter (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.

Panzar, J.C. & R.D. Willig (1977). Economies of scale in multi-output production. *Quarterly Journal of Economics,* **91**(3): 481-493.

Patell, J. (1976). Corporate forecasts of earnings per share and stock price behavior: Empirical tests. *Journal of Accounting Research,* **14**(2): 246-276.

Penrose, E.T. (1959). *The Theory of the Growth of the Firm*. New York: John Wiley & Sons.

Porter, M.E. (1979). How competitive forces shape strategy. *Harvard Business Review*, **57**(2): 137-145.

Porter, M.E. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: The Free Press.

Porter, M.E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: The Free Press.

Porter, M.E. (1996). What is strategy? *Harvard Business Review*, **74**(6): 61-78.

Reed, R. & R.J. DeFillippi (1990). Causal ambiguity, barriers to imitation, and sustainable competitive advantage. *Academy of Management Review,* **15**(1): 88-102.

Rosett, J.G. (2001). Equity risk and the labor stock: The case of union contracts. *Journal of Accounting Research*, **39**(2): 337-364.

Rumelt, R. (1974). *Strategy, Structure, and Economic Performance*. Cambridge, MA: Harvard University Press.

Rumelt, R. (1984). Towards a strategic theory of the firm. In R. Lamb (Ed.), *Competitive Strategic Management* (pp. 556-570). Englewood Cliffs, NJ: Prentice-Hall.

Rumelt, R., D. Schendel & D. Teece (1991). Strategic management and economics. *Strategic Management Journal*, **12**(S2): 5-29.

Rust, R.T., K.N. Lemon & V.A. Zeithaml (2004). Return on marketing: Using customer equity to focus marketing strategy. *Journal of Marketing*, **68**(1): 109-127.

Samuelson, P. (1974). Complementarity: An essay on the 40th anniversary of the Hicks-Allen revolution in demand theory. *Journal of Economic Literature*, **12**(4): 1255-1289.

Schultz, T. (1960). Capital formation by education. *Journal of Political Economy*, **68**(6): 571-583.

Schultz, T. (1961). Investment in human capital. *American Economic Review*, **51**(1): 1-17.

Sirmon, D.G., M.A. Hitt & R.D. Ireland (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review*, **32**(1): 273-292.

Slater, S.F. & J.C. Narver (1995). Market orientation and the learning organization. *The Journal of Marketing*, **59**(3): 63-74.

Snell, S.A., M.A. Shadur & P.M. Wright (2001). Human resources strategy: The era of our ways. In M. Hitt, R. Freeman, & J. Harrison (Eds.), *The Blackwell Handbook of Strategic Management* (pp. 627-649). Malden, MA: Blackwell Publishing.

Sougiannis, T. (1994). The accounting based valuation of corporate R&D. *The Accounting Review*, **69**(1): 44-68.

Srivastava, R.K., T.A. Shervani & L. Fahey (1998). Market-based assets and shareholder value: A framework for analysis. *The Journal of Marketing*, **62**(1): 2-18.

Stickney, C.P. & R.L. Weil (2003). *Financial Accounting: An Introduction to Concepts, Methods, and Uses* (10th ed.). Mason, OH: South-Western.

Sutton, J. (1991). *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration*. Cambridge, MA: The MIT Press.

Teece, D.J. (1980). Economies of scope and the scope of the enterprise. *Journal of Economic Behavior and Organization*, **1**(3): 223-247.

Teece, D.J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy,* **15**(6): 285-305.

Tripsas, M. (1997). Unraveling the process of creative destruction: Complementary assets and incumbent survival in the typesetter industry. *Strategic Management Journal,* **18**(Summer Special Issue): 119-142.

Venkatraman, N. (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of Management Review,* **14**(3): 423-444.

Wang, H.C. (2002). A stakeholder theory of corporate diversification. Unpublished doctoral dissertation, The Ohio State University.

Wang, H.C. & J.B. Barney (2006). Employee incentives to make firm-specific investments: Implications for resource-based theories of corporate diversification. *Academy of Management Review*, **31**(2): 466-476.

Wang, H.C., J. He & J.T. Mahoney (2009). Firm-specific knowledge resources and competitive advantage: The roles of economic- and relationship-based employee governance mechanisms. *Strategic Management Journal*, **30**(12): 1265-1285.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, **5**(2): 171-180.

Wernerfelt, B. (1989). From critical resources to corporate strategy. *Journal of General Management*, **14**(3): 4-12.

Williamson, O.E. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: The Free Press.

Williamson, O.E. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: The Free Press.

Winter, S.G. (1987). Knowledge and competence as strategic assets. In D. J. Teece (Ed.), *The Competitive Challenge* (pp. 159-184). Cambridge, MA: Ballinger Publishing Company.

Wright, P.M. & S.A. Snell (1991). Toward an integrative view of strategic human resource management. *Human Resource Management Review*, **1**(3): 203-225.

Youndt, M.A., S.A. Snell, J.W. Dean & D.P. Lepak (1996). Human resource management, manufacturing strategy, and firm performance. *Academy of Management Journal*, **39**(4): 836-866.

Appendix Table 7: Observations in each model

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
1-800-Flowers.com	2006	77	X		X			X			
1-800-Flowers.com	2007	18	X		X			X			
1-800-Flowers.com	2008	36	X		X			X			
A.G. Edwards & Sons, Inc.	2005	27	X		X						X
A.G. Edwards & Sons, Inc.	2006	26	X		X						X
A.G. Edwards & Sons, Inc.	2007	69	X		X						X
ADP, Inc.	2008	20	X	X	X	X	X				
Aetna Inc	2005	42	X		X						
Aetna Inc	2006	36	X		X						
Aetna Inc	2007	23	X		X						X
Aetna Inc	2008	13	X		X						X
Aflac, Inc.	2005	51	X		X			X			
Aflac, Inc.	2006	54	X		X			X			
Aflac, Inc.	2007	46	X		X			X			
Aflac, Inc.	2008	33	X		X			X			
Allstate Insurance Company	2005	48	X		X						
Allstate Insurance Company	2006	30	X		X						
Allstate Insurance Company	2007	31	X		X						
Allstate Insurance Company	2008	27	X		X						
ALLTEL	2005	77	X		X			X			
ALLTEL	2006	72	X		X			X			
ALLTEL	2007	37	X		X			X			
American Express (also American Express Operations Training)	2006	31	X		X						X

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
American Express (also American Express Operations Training)	2007	91	X		X						X
Ameriprise Financial Minneapolis MN Finance/Banking	2008	119	X		X						
Applied Materials, Inc.	2005	47	X	X	X	X	X				
Applied Materials, Inc.	2006	38	X	X	X	X	X				
Applied Materials, Inc.	2007	60	X	X	X	X	X				
Applied Materials, Inc.	2008	88	X	X	X	X	X				
BB&T Corporation	2005	34	X		X			X			X
BB&T Corporation	2006	19	X		X			X			X
BB&T Corporation	2007	40	X		X			X			X
BB&T Corporation	2008	18	X		X			X			X
Best Buy	2005	65	X		X			X			
Best Buy	2007	105	X		X			X			
Best Buy	2008	44	X		X			X			
BMO Financial Group	2005	16	X		X						X
BMO Financial Group	2006	14	X		X						X
BMO Financial Group	2007	22	X		X						X
Capital One Financial Corp.	2005	18	X		X						X
Capital One Financial Corp.	2006	18	X		X						X
Capital One Financial Corp.	2007	54	X		X						X
Capital One Financial Corp.	2008	15	X		X						X
CarMax, Inc.	2008	47	X	X	X	X	X	X	X	X	
Caterpillar, Inc.	2007	121	X	X	X	X	X				X
Caterpillar, Inc.	2008	84	X	X	X	X	X				X
Cendant Mortgage	2005	40	X		X			X			
Cerner Corp.	2005	81	X	X	X	X	X				
Cerner Corp.	2006	48	X	X	X	X	X				

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Cerner Corp.	2007	13	X	X	X	X	X				
Cerner Corp.	2008	21	X	X	X	X	X				
Choice Hotels International	2006	86	X	X	X	X	X	X	X	X	
Choice Hotels International	2007	92	X	X	X	X	X	X	X	X	
Choice Hotels International	2008	102	X	X	X	X	X	X	X	X	
Commerce Bancorp, Inc.	2008	50	X		X			X			X
CompuCredit Corporation	2008	70	X		X						X
Constellation Energy Group	2007	116	X		X						
Convergys Corporation	2007	110	X	X	X	X	X				
Convergys Corporation	2008	80	X	X	X	X	X				
DaVita, Inc.	2005	95	X	X	X	X	X				
DaVita, Inc.	2006	60	X	X	X	X	X				
DaVita, Inc.	2007	59	X	X	X	X	X				
DaVita, Inc.	2008	77	X	X	X	X	X				
Delta Air Lines, Inc.	2008	69	X		X			X			X
EMC Corp.	2005	69	X	X	X	X	X	X	X	X	
EMC Corp.	2006	37	X	X	X	X	X	X	X	X	
EMC Corp.	2007	3	X	X	X	X	X	X	X	X	
EMC Corp.	2008	2	X	X	X	X	X	X	X	X	
Equity Residential	2005	62	X	X							
Equity Residential	2006	52	X	X							
Equity Residential	2007	62	X	X							
Equity Residential	2008	83	X	X							
Four Seasons Hotels, Ltd.	2007	35	X	X	X	X	X				
General Mills, Inc.	2005	11	X	X	X	X	X	X	X	X	
General Mills, Inc.	2006	10	X	X	X	X	X	X	X	X	
General Mills, Inc.	2007	5	X	X	X	X	X	X	X	X	
General Mills, Inc.	2008	7	X	X	X	X	X	X	X	X	
Healthways, Inc.	2007	98	X		X						
Healthways, Inc.	2008	89	X		X						

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
HSBC North America	2005	35	X		X						X
HSBC North America	2006	44	X		X						X
HSBC North America	2007	36	X		X						X
HSBC North America	2008	42	X		X						X
IKON Office Solutions, Inc.	2005	64	X		X			X			
IKON Office Solutions, Inc.	2006	66	X		X			X			
IKON Office Solutions, Inc.	2007	93	X		X			X			
IKON Office Solutions, Inc.	2008	91	X		X			X			
Intel Corp.	2005	17	X	X	X	X	X	X	X	X	
Intel Corp.	2006	16	X	X	X	X	X	X	X	X	
Intel Corp.	2007	70	X	X	X	X	X	X	X	X	
inVentiv Commercial Services	2005	63	X		X						
inVentiv Commercial Services	2006	63	X		X						
inVentiv Commercial Services	2007	20	X		X						
inVentiv Commercial Services	2008	17	X		X						
J.B. Hunt Transport Services, Inc.	2005	91	X		X						X
J.B. Hunt Transport Services, Inc.	2006	79	X		X						X
J.B. Hunt Transport Services, Inc.	2007	73	X		X						X
J.B. Hunt Transport Services, Inc.	2008	81	X		X						X
Johnson Controls, Inc.	2005	24	X	X	X	X	X				
Johnson Controls, Inc.	2006	41	X	X	X	X	X				

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Johnson Controls, Inc.	2007	84	X	X	X	X	X				
KLA-Tencor	2005	5	X	X	X	X	X	X	X	X	
KLA-Tencor	2006	9	X	X	X	X	X	X	X	X	
KLA-Tencor	2007	21	X	X	X	X	X	X	X	X	
Lockheed Martin	2005	8	X	X	X	X	X				
Lockheed Martin	2006	5	X	X	X	X	X				
Lockheed Martin	2007	11	X	X	X	X	X				
Lockheed Martin	2008	12	X	X	X	X	X				
American Power Conversion	2006	90	X	X	X	X	X	X	X	X	
Loews Hotels	2007	75	X		X						
Loews Hotels	2008	59	X		X						
Marriott International, Inc.	2008	75	X	X	X	X	X				
MasterCard Worldwide	2007	108	X		X						
MasterCard Worldwide	2008	79	X		X						
McDonald's USA, LLC	2007	41	X		X			X			X
McDonald's USA, LLC	2008	37	X		X			X			X
MetLife	2007	123	X								X
Microchip Technology Incorporated	2008	93	X	X	X	X	X				
Microsoft Corp.	2005	38	X	X	X	X	X	X	X	X	
Microsoft Corp.	2006	23	X	X	X	X	X	X	X	X	
Microsoft Corp.	2007	19	X	X	X	X	X	X	X	X	
Microsoft Corp.	2008	9	X	X	X	X	X	X	X	X	
Mohawk Industries, Inc.	2007	64	X		X			X			
Mohawk Industries, Inc.	2008	19	X		X			X			
Nationwide Insurance	2008	74	X								
Northwest Airlines, Inc (Eagan, MN Transportation/Utilities)	2008	110	X		X			X			X
Orkin	2005	57	X		X			X			
Orkin	2006	74	X		X			X			
Orkin	2007	113	X		X			X			

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Orkin	2008	92	X		X			X			
PAETEC Communications, Inc.	2007	97	X		X						
PAETEC Communications, Inc.	2008	66	X		X						
Paychex, Inc.	2005	20	X		X						X
Paychex, Inc.	2006	21	X		X						X
Paychex, Inc.	2007	34	X		X						X
Paychex, Inc.	2008	30	X		X						X
Pinnacle Entertainment, Inc.	2008	60	X		X			X			
Principal Financial Group	2007	89	X		X						
Principal Financial Group	2008	68	X		X						
QUALCOMM	2005	25	X	X	X	X	X				
QUALCOMM	2006	56	X	X	X	X	X				
QUALCOMM	2007	90	X	X	X	X	X				
QUALCOMM	2008	101	X	X	X	X	X				
sanofi-aventis pharmaceuticals	2007	112	X	X	X	X	X				X
sanofi-aventis pharmaceuticals	2008	104	X	X	X	X	X				X
Satyam Computer Services Limited	2007	15	X	X	X	X	X	X	X	X	
Satyam Computer Services Limited	2008	11	X	X	X	X	X	X	X	X	
Scotiabank	2005	71	X		X						X
Scotiabank	2006	47	X		X						X
Scotiabank	2007	12	X		X						X
Scotiabank	2008	14	X		X						X
Starbucks Coffee Company	2005	93	X	X	X	X	X	X	X	X	
Starbucks Coffee Company	2006	91	X	X	X	X	X	X	X	X	

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Starbucks Coffee Company	2007	55	X	X	X	X	X	X	X	X	
Steelcase, Inc.	2005	43	X	X	X	X	X				
Steelcase, Inc.	2006	42	X	X	X	X	X				
Steelcase, Inc.	2007	49	X	X	X	X	X				
Steelcase, Inc.	2008	41	X	X	X	X	X				
Tandus	2008	53	X		X						
The Home Depot	2006	59	X	X	X	X	X	X	X	X	
The Home Depot	2007	43	X	X	X	X	X	X	X	X	
The Home Depot	2008	64	X	X	X	X	X	X	X	X	
PNC Financial Services Group	2005	67	X		X			X			X
PNC Financial Services Group	2006	69	X		X			X			X
PNC Financial Services Group	2007	68	X		X			X			X
PNC Financial Services Group	2008	48	X		X			X			X
The Reynolds & Reynolds Co.	2005	29	X	X	X	X	X				
The Reynolds & Reynolds Co.	2006	24	X	X	X	X	X				
Unisys Corporation Managed Services	2007	106	X	X	X	X	X	X	X	X	
UPS	2007	67	X		X						X
UPS	2008	49	X		X						X
Wachovia	2005	22	X		X			X			X
Wachovia	2006	22	X		X			X			X
Wachovia	2007	48	X		X			X			X
Wachovia	2008	31	X		X			X			X
Wells Fargo & Co.	2005	30	X		X			X			X
Wells Fargo & Co.	2006	25	X		X			X			X
Wells Fargo & Co.	2007	38	X		X			X			X
Wells Fargo & Co.	2008	22	X		X			X			X

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Windstream Communications	2007	58	X		X			X			
Windstream Communications	2008	52	X		X			X			
AstraZeneca	2006	62	X	X	X	X	X				X
Bausch & Lomb	2005	39	X	X	X	X	X	X	X	X	
Shaw Industries	2005	96	X		X						
Shaw Industries	2006	92	X		X						
Boston Scientific	2005	83	X	X	X	X	X				
Caesars Entertainment	2005	88	X	X	X	X	X	X	X	X	
Callaway Golf Company	2005	61	X	X	X	X	X	X	X	X	
Bankers Life and Casualty	2005	99	X								X
Guidant Corporation	2005	78	X	X	X	X	X				
Hewlett-Packard Co.	2006	85	X	X	X	X	X	X	X	X	
IBM	2005	1	X	X	X	X	X	X	X	X	
IBM	2006	2	X	X	X	X	X	X	X	X	
Merck Manufacturing Division	2006	96	X	X	X	X	X				
PETCO Animal Supplies, Inc.	2005	68	X	X	X	X	X	X	X	X	
PETCO Animal Supplies, Inc.	2006	88	X	X	X	X	X	X	X	X	
Pfizer	2005	3	X	X	X	X	X	X	X	X	
Pfizer	2006	8	X	X	X	X	X	X	X	X	
Prudential Financial, Inc.	2005	33	X								
Scientific-Atlanta, Inc.	2005	74	X	X	X	X	X				
Sprint	2005	4	X		X			X			
Thomson West	2005	70	X	X	X	X	X	X	X	X	X
Thomson West	2006	75	X	X	X	X	X	X	X	X	X
United Technologies Corp.	2005	72	X	X	X	X	X				
Advance Auto Parts	2005	55	X	X	X	X	X	X	X	X	
Advance Auto Parts	2006	82	X	X	X	X	X	X	X	X	
Fedex Express	2006	83	X		X			X			X

Table 7 (continued)

Firm	Award Year	Award Ranking	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
International Truck and Engine Corp.	2005	90	X	X	X	X	X				
Nextel Communications	2005	45	X		X			X			
Regions Financial Corporation	2005	66	X		X			X			X
Regions Financial Corporation	2006	46	X		X			X			X
Verizon Communications, Inc.	2005	73	X		X			X			
Verizon Communications, Inc.	2006	84	X		X			X			
Pitney Bowes Global Mainstream Solutions	2006	94	X	X	X	X	X				
Century 21 Real Estate	2005	85	X		X			X			
Century 21 Real Estate	2006	97	X		X			X			
Cendant Mobility	2005	84	X		X			X			
Cendant Mobility	2006	65	X		X			X			
Cendant Real Estate	2006	70	X		X			X			
			219	**97**	**211**	**93**	**93**	**106**	**46**	**46**	**66**

Appendix Table 8: alternate version of Table 5, with all industry controls (2-digit SIC codes) enumerated

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Independent Variables									
R&D Intensity		-0.103		-0.0896	-0.618†		-0.518**	-0.821*	
		(0.678)		(0.719)	(0.061)		(0.009)	(0.013)	
Physical Capital Intensity			0.0431	0.0477	-0.382				
			(0.177)	(0.641)	(0.148)				
R&D Intensity * Physical Capital Intensity					3.405*				
					(0.038)				
Advertising Intensity						0.917**	0.583	0.0842	
						(0.004)	(0.756)	(0.965)	
Advertising Intensity * R&D Intensity								13.41	
								(0.210)	
Labor Intensity									-0.561†
									(0.063)
Control Variables									
Firm Size	-0.00314	0.00250	-0.00596	-0.000339	-0.00200	-0.00264	0.0155	0.00967	-0.0195
	(0.640)	(0.659)	(0.415)	(0.955)	(0.725)	(0.764)	(0.145)	(0.279)	(0.306)
CorpLevel	0.0290†	-0.0104	0.0292†	-0.00393	0.00697	0.0425	-0.118*	-0.112**	0.0820*
	(0.054)	(0.725)	(0.052)	(0.902)	(0.802)	(0.578)	(0.011)	(0.002)	(0.026)
RlastYr	0.00216	0.0111	0.00419	0.00809	0.00719	0.00948	0.0130	0.0136	-0.0583
	(0.891)	(0.603)	(0.802)	(0.700)	(0.745)	(0.629)	(0.748)	(0.744)	(0.106)
SIC_2DN==20	-0.0108	0.00980	0.103†	0.0838	-0.545	0.00270	-0.0704	-0.0475	
	(0.618)	(0.641)	(0.059)	(0.582)	(0.161)	(0.925)	(0.152)	(0.201)	
SIC_2DN==22	0.147***		0.259***			0.198***			
	(0.000)		(0.000)			(0.000)			
SIC_2DN==25	5.04e-05	0.0232	0.114*	0.0987	-0.566				
	(0.997)	(0.273)	(0.035)	(0.546)	(0.173)				
SIC_2DN==27	-0.0337†	-0.0370	0.0816	0.0428	-0.619	0.0302	-0.173†	-0.158†	
	(0.077)	(0.296)	(0.165)	(0.812)	(0.146)	(0.760)	(0.094)	(0.061)	
SIC_2DN==28	-0.00247	0.0247	0.111†	0.0953	-0.586	0.0228	0.0126	-0.0321	-0.117
	(0.952)	(0.618)	(0.068)	(0.540)	(0.156)	(0.651)	(0.837)	(0.468)	(0.169)
SIC_2DN==35	0.0260	0.0529	0.143*	0.129	-0.528	0.0399	-0.00890	0.0262	-0.00335
	(0.400)	(0.118)	(0.019)	(0.436)	(0.197)	(0.318)	(0.943)	(0.796)	(0.970)
SIC_2DN==36	0.0174	0.0554	0.129*	0.124	-0.552	-0.0165	-0.0334	-0.0617	
	(0.540)	(0.192)	(0.017)	(0.425)	(0.176)	(0.675)	(0.560)	(0.223)	

Table 8 (continued)

SIC_2DN==37	0.00883	0.0243	0.129*	0.106	-0.569				
	(0.761)	(0.410)	(0.038)	(0.536)	(0.177)				
SIC_2DN==38	0.0158	0.0609	0.128*	0.131	-0.544	0.0896***	0.116	0.162	
	(0.450)	(0.141)	(0.019)	(0.444)	(0.195)	(0.000)	(0.369)	(0.133)	
SIC_2DN==39		0.0406†	0.109*	0.110	-0.563				
		(0.090)	(0.033)	(0.504)	(0.179)				
SIC_2DN==42	0.0739**		0.179***						0.0821
	(0.005)		(0.001)						(0.166)
SIC_2DN==45	0.336***		0.441***			0.394***			0.283**
	(0.000)		(0.000)			(0.000)			(0.001)
SIC_2DN==48	0.00706		0.0953*			0.0407			
	(0.754)		(0.034)			(0.274)			
SIC_2DN==49	0.0776***		0.184***						
	(0.000)		(0.000)						
SIC_2DN==50	-0.0747***		0.0426			-0.0205			
	(0.000)		(0.438)			(0.379)			
SIC_2DN==51	0.0648***		0.177**						
	(0.000)		(0.003)						
SIC_2DN==52	0.0842**	0.101***	0.198***	0.174	-0.420	0.128**	0.0206	0.0384	
	(0.001)	(0.000)	(0.000)	(0.230)	(0.250)	(0.004)	(0.841)	(0.647)	
SIC_2DN==55	0.0835**	0.117**	0.195**	0.188	-0.472	0.123**	0.0723	0.0755	
	(0.008)	(0.005)	(0.002)	(0.248)	(0.246)	(0.005)	(0.401)	(0.326)	
SIC_2DN==57	-0.0361*		0.0839			0.00140			
	(0.034)		(0.140)			(0.964)			
SIC_2DN==58	-0.0436*	-0.0304	0.0551	0.0372	-0.571	-0.00739	-0.0775	-0.0749	-0.105
	(0.034)	(0.166)	(0.204)	(0.800)	(0.131)	(0.791)	(0.399)	(0.351)	(0.206)
SIC_2DN==59	0.0223	-0.0253	0.132†	0.0411	-0.616	-0.0171	-0.0610	-0.0585	
	(0.694)	(0.173)	(0.096)	(0.794)	(0.130)	(0.432)	(0.230)	(0.186)	
SIC_2DN==60	0.0205		0.145*			0.0865			0.0365
	(0.630)		(0.036)			(0.119)			(0.727)
SIC_2DN==61	0.111		0.235*						0.0232
	(0.277)		(0.040)						(0.862)
SIC_2DN==62	-0.00512		0.111						0.122
	(0.909)		(0.114)						(0.168)
SIC_2DN==63	0.00421		0.125†			0.0209			-0.107
	(0.902)		(0.051)			(0.617)			(0.345)
SIC_2DN==67	-0.0155	0.0156	0.0521	0.0572	-0.646	-0.126***	-0.0994	-0.0490	
	(0.595)	(0.601)	(0.328)	(0.735)	(0.139)	(0.000)	(0.517)	(0.764)	
SIC_2DN==70	0.0631	0.101	0.175	0.169	-0.475				
	(0.540)	(0.322)	(0.148)	(0.371)	(0.237)				

Table 8 (continued)

SIC_2DN==73	-0.0215	0.00774	0.0934†	0.0824	-0.587	0.0210	-0.0505	-0.0352	
	(0.207)	(0.778)	(0.087)	(0.617)	(0.160)	(0.709)	(0.656)	(0.706)	
SIC_2DN==75	0.0315		0.133*			0.0172			
	(0.347)		(0.017)			(0.864)			
SIC_2DN==79	-0.0455*					-0.000515	-0.0590	-0.0496	
	(0.012)					(0.989)	(0.548)	(0.562)	
SIC_2DN==80	0.00349	0.0397*	0.116*	0.112	-0.537				
	(0.751)	(0.018)	(0.028)	(0.473)	(0.180)				
SIC_2DN==87	0.0181		0.133*						0.0478
	(0.177)		(0.014)						(0.266)
SIC_2DN==99	0.0369		0.165*						
	(0.370)		(0.026)						
Constant	0.00703	-0.0370	-0.0916	-0.0986	0.639	-0.0725	0.00196	0.0474	0.344
	(0.888)	(0.537)	(0.238)	(0.620)	(0.178)	(0.359)	(0.981)	(0.628)	(0.123)
Observations	219	97	211	93	93	106	46	46	66
R-squared	0.300	0.182	0.315	0.207	0.250	0.480	0.384	0.397	0.542

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1

Appendix Table 9: alternate version of Table 6, with all industry controls (2-digit SIC codes) enumerated

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model6a	Model 6	Model 7
Independent Variables									
R&D Intensity		-0.00503		0.0273	-0.472†		-0.202	-0.235	
		(0.981)		(0.900)	(0.056)		(0.307)	(0.463)	
Physical Capital Intensity			0.000307	0.0126	-0.394*				
			(0.989)	(0.885)	(0.035)				
R&D Intensity * Physical Capital Intensity					3.221**				
					(0.007)				
Advertising Intensity						0.764*	-1.258	-1.313	
						(0.033)	(0.515)	(0.559)	
Advertising Intensity * R&D Intensity								1.487	
								(0.898)	
Labor Intensity									-0.351
									(0.132)
Control Variables									
Firm Size	-0.00675	-0.00152	-0.00906	-0.00530	-0.00687	-0.00547	0.00878	0.00813	-0.0246
	(0.260)	(0.762)	(0.168)	(0.325)	(0.186)	(0.388)	(0.352)	(0.423)	(0.177)
CorpLevel	0.00910	0.00293	0.00955	0.00635	0.0167	0.0164	-0.0239	-0.0233	0.0300
	(0.388)	(0.897)	(0.355)	(0.782)	(0.417)	(0.652)	(0.510)	(0.554)	(0.223)
RlastYr	0.00633	0.00462	0.00641	0.00163	0.000791	0.0144	0.0100	0.0101	-0.0617†
	(0.681)	(0.827)	(0.693)	(0.939)	(0.970)	(0.412)	(0.803)	(0.806)	(0.096)
SIC_2DN==20	-0.0259	0.0219	0.00951	0.0451	-0.550*	-0.0175	-0.100†	-0.0977*	
	(0.179)	(0.292)	(0.818)	(0.733)	(0.046)	(0.411)	(0.059)	(0.041)	
SIC_2DN==22	0.111***		0.145***			0.153***			
	(0.000)		(0.000)			(0.000)			
SIC_2DN==25	-0.000479	0.0526**	0.0323	0.0724	-0.556†				
	(0.968)	(0.004)	(0.417)	(0.607)	(0.057)				
SIC_2DN==27	-0.0729***	-0.0242	-0.0404	-0.00408	-0.630*	-0.0241	-0.195†	-0.193†	
	(0.000)	(0.371)	(0.307)	(0.978)	(0.037)	(0.662)	(0.069)	(0.060)	
SIC_2DN==28	-0.0274	0.0145	0.0103	0.0352	-0.609*	-0.00381	-0.00707	-0.0120	-0.0352
	(0.525)	(0.750)	(0.843)	(0.790)	(0.039)	(0.953)	(0.886)	(0.834)	(0.603)
SIC_2DN==35	0.0159	0.0628*	0.0516	0.0844	-0.538†	0.0377	-0.115	-0.111	0.0833
	(0.480)	(0.012)	(0.233)	(0.550)	(0.066)	(0.240)	(0.400)	(0.370)	(0.243)
SIC_2DN==36	0.0273	0.0778*	0.0617	0.0942	-0.545†	0.000822	-0.0421	-0.0453	
	(0.233)	(0.012)	(0.154)	(0.502)	(0.065)	(0.975)	(0.417)	(0.465)	

Table 9 (continued)

SIC_2DN==37	-0.00296	0.0423*	0.0332	0.0678	-0.571†				
	(0.893)	(0.046)	(0.456)	(0.639)	(0.056)				
SIC_2DN==38	-0.00892	0.0462	0.0235	0.0597	-0.578†	0.0621**	-0.0498	-0.0446	
	(0.732)	(0.238)	(0.602)	(0.684)	(0.055)	(0.010)	(0.719)	(0.717)	
SIC_2DN==39		0.0648**	0.0281	0.0766	-0.560†				
		(0.002)	(0.467)	(0.592)	(0.059)				
SIC_2DN==42	0.0358**		0.0681†						0.116*
	(0.010)		(0.063)						(0.018)
SIC_2DN==45	0.149***		0.186***			0.195**			0.175**
	(0.000)		(0.000)			(0.002)			(0.001)
SIC_2DN==48	0.00277		0.0376			0.0200			
	(0.899)		(0.267)			(0.535)			
SIC_2DN==49	0.0519**		0.0878**						
	(0.004)		(0.009)						
SIC_2DN==50	-0.0396***		-0.00780			0.00409			
	(0.000)		(0.850)			(0.862)			
SIC_2DN==51	0.000840		0.0290						
	(0.922)		(0.465)						
SIC_2DN==52	0.0751**	0.117***	0.113**	0.143	-0.418	0.108**	-0.0537	-0.0517	
	(0.001)	(0.000)	(0.007)	(0.251)	(0.104)	(0.002)	(0.631)	(0.621)	
SIC_2DN==55	0.0542	0.112*	0.0850	0.128	-0.496†	0.0867†	-0.0208	-0.0205	
	(0.157)	(0.011)	(0.109)	(0.366)	(0.083)	(0.079)	(0.816)	(0.817)	
SIC_2DN==57	-0.0293*		0.00525			0.000135			
	(0.047)		(0.899)			(0.996)			
SIC_2DN==58	-0.0455**	0.00679	-0.0119	0.0239	-0.552*	-0.0171	-0.141	-0.140	-0.0135
	(0.001)	(0.744)	(0.720)	(0.852)	(0.039)	(0.450)	(0.151)	(0.149)	(0.829)
SIC_2DN==59	0.0250	-0.00952	0.0519	0.00103	-0.620*	-0.00644	-0.112*	-0.112*	
	(0.687)	(0.543)	(0.482)	(0.994)	(0.031)	(0.864)	(0.044)	(0.042)	
SIC_2DN==60	0.0191		0.0605			0.0681			0.137
	(0.607)		(0.256)			(0.110)			(0.151)
SIC_2DN==61	0.108		0.146						0.144
	(0.266)		(0.151)						(0.218)
SIC_2DN==62	-0.0154		0.0189						0.138†
	(0.679)		(0.722)						(0.070)
SIC_2DN==63	-0.0154		0.0190			-0.00597			0.000866
	(0.607)		(0.685)			(0.857)			(0.992)
SIC_2DN==67	-0.0314	0.0261	-0.0495	0.00245	-0.662*	-0.131***	0.0309	0.0365	
	(0.298)	(0.429)	(0.221)	(0.987)	(0.032)	(0.000)	(0.844)	(0.846)	
SIC_2DN==70	0.0336	0.0892	0.0650	0.104	-0.505†				
	(0.607)	(0.159)	(0.393)	(0.480)	(0.072)				

Table 9 (continued)

SIC_2DN==73	-0.0351*	0.0158	-0.00283	0.0336	-0.600*	-0.00337	-0.139	-0.137	
	(0.015)	(0.496)	(0.944)	(0.815)	(0.045)	(0.932)	(0.247)	(0.235)	
SIC_2DN==75	-0.00754		0.0300			-0.0264			
	(0.798)		(0.474)			(0.631)			
SIC_2DN==79	-0.0319†					0.00595	-0.150	-0.149	
	(0.096)					(0.857)	(0.174)	(0.165)	
SIC_2DN==80	-0.0732†	0.0169	-0.0424	0.0358	-0.578*				
	(0.061)	(0.284)	(0.430)	(0.791)	(0.042)				
SIC_2DN==87	0.00890		0.0415						0.109**
	(0.452)		(0.304)						(0.005)
SIC_2DN==99	0.0159		0.0574						
	(0.657)		(0.280)						
Constant	0.0680	-0.0232	0.0546	-0.0135	0.684*	-0.00211	0.0776	0.0826	0.306
	(0.124)	(0.647)	(0.382)	(0.936)	(0.041)	(0.968)	(0.327)	(0.443)	(0.138)
Observations	219	97	211	93	93	106	46	46	66
R-squared	0.211	0.176	0.225	0.202	0.240	0.331	0.299	0.300	0.397

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1

Appendix of Further Empirical Analysis: Robustness Checks for Regression Results

Missing data for independent variables needed to test H2-7 necessitated that each hypothesis be tested in a separate model. In each of these models (Models 2-7) a substantial number of observations are missing and the possibility exists that any significant results reported in Tables 5 and 6 may be the result of systematic differences between firms that do, and those that do not, report the relevant data. For example, in Model 4 in Table 5, in only 93 of 219 observations did firms report *both* their R&D and physical capital expenditures.

The majority of observations lost from Models 2-7 were lost due to missing data regarding firm R&D or advertising expenditures. Therefore, an initial robustness check was conducted in which a value of zero was substituted for all missing R&D and advertising data. The rationale for this substitution is that the firms that do not report either R&D or advertising expenditures do so because they have little or no expenditures to report in these areas. Substituting zeros for the missing data brings the total observations in each of Models 2-6 to between 211 and 219 of the total available 219 observations. Results of this initial robustness check are presented in Tables 10 and 11. In general, this action of substituting values of zero for missing R&D and advertising data eliminated all significant findings presented in Tables 5 and 6 for regression results using abnormal returns from both 20 and 15-day windows. I will now present a more detailed discussion of the coefficients in Tables 10 and 11 for Models 2-7 and their support, or lack of support, for hypotheses 2-7 respectively.

Hypothesis 2

The coefficient for R&D intensity in the version of Model 2 using abnormal returns from event window 2 (-20, +1) (see Table 10) provides a test of hypothesis 2. This coefficient is -0.120 (p-value = 0.588), and therefore does not provide positive and statistically significant

support for H2. In the version of Model 2 using abnormal returns from window 3 (-15, +1) (see Table 11), the coefficient for R&D intensity is 0.000815, again not providing positive and significant support for H2 (p-value = 0.996).

Hypothesis 3

The coefficient for physical capital intensity in the version of Model 3 using abnormal returns from event window 2 (-20, +1) (see Table 10) provides a test of hypothesis 3. This coefficient is 0.0431, in the predicted direction, but not providing support for H3 at a generally-accepted level of statistical significance (p-value = 0.177). In the version of Model 3 using abnormal returns from window 3 (-15, +1) (see Table 11), the coefficient for physical capital intensity is 0.000307, again positive, but not providing significant support for H3 (p-value = 0.989).

Hypothesis 4

The coefficient for the interaction of R&D intensity and physical capital intensity in the version of Model 4 using abnormal returns from event window 2 (-20, +1) (see Table 10) provides a test of hypothesis 4. This coefficient is 0.917, in the predicted direction but only providing marginal statistical support for H4 (p-value = 0.116). In the version of Model 4 using abnormal returns from window 3 (-15, +1) (see Table 11), the coefficient for the interaction of R&D intensity and physical capital intensity is 0.746, in the predicted direction but not supporting H4 at a generally accepted level of statistical significance (p-value = 0.176).

Hypothesis 5

The coefficient for advertising intensity in the version of Model 5 using abnormal returns from event window 2 (-20, +1) (see Table 10) provides a test of hypothesis 5. This coefficient is

0.144, in the predicted direction but not supporting H5 at a generally accepted level of statistical significance (p-value = 0.632). In the version of Model 5 using abnormal returns from window 3 (-15, +1) (see Table 11), the coefficient for advertising intensity is 0.0751, again positive, but not supporting H5 at a generally accepted level of statistical significance (p-value = 0.810).

Hypothesis 6

The coefficient for the interaction of advertising intensity and R&D intensity in the version of Model 6 using abnormal returns from event window 2 (-20, +1) (see Table 10) provides a test of hypothesis 6. This coefficient is -0.866, and therefore does not provide positive and statistically significant support for H6 (p-value = 0.874). In the version of Model 6 using abnormal returns from window 3 (-15, +1) (see Table 11), the coefficient for the interaction of advertising intensity and R&D intensity is 0.281, in the predicted direction but not providing support for H6 at a generally accepted level of statistical significance (p-value = 0.960).

Hypothesis 7

The coefficient for Labor intensity [my measure for the "existing stock of human capital" (ESHC) in H7] in the version of Model 7 using abnormal returns from event window 2 (-20, +1) (see Table 10) provides a test of hypothesis 7. This coefficient is -0.561, *opposite* the predicted direction and statistically significant at the 10% level (p-value = 0.063). In the version of Model 7 using abnormal returns from window 3 (-15, +1) (see Table 11), the coefficient for Labor intensity is -0.351, again *opposite* the predicted direction, but in this case not statistically significant (p-value = 0.132).

This initial robustness check of my regression results eliminates all of the findings I presented in Tables 5 and 6, particularly those related to the interaction of R&D intensity and PC intensity (Model 4), and also advertising intensity (Model 5). This elimination of my findings could be exposing a sample bias in my original regression analysis (see Tables 5 and 6) created by the missing data. But additional systematic differences among the observations (observations in each model for which zeros were, and were not, added) could also contribute to the lack of results in this initial robustness check

To control for possible systematic differences between observations for which zeros were, or were not, added in each model, I run an additional robustness check. Dummy variables are added to the initial robustness check to control for whether an observation had missing R&D or advertising data for which a zero was substituted. Results for this additional robustness check are presented in Tables 12 and 13.

While, in general, the results in this additional robustness check are similar to the initial robustness check and less significant than the original regression results presented in Tables 5 and 6, there are a few points worthy of mention. First is that, for Model 4 in Table 12, the addition of the dummy control variables increased the coefficient for the interaction term for R&D intensity and Physical capital intensity (for results at the 20-day window: see Tables 10 and 12). In the initial robustness check (see Table 10), the coefficient for the interaction term in Model 4 was 0.917 with a p-value of 0.116. But, with the additional of the dummy variables in the additional robustness check (see Tables 12 and 13), this coefficient increased to 0.993 (Table 12), with the p-value nearly reaching the 10% level of statistical significance (p-value = 0.106). Also of interest in the results for the additional robustness check with dummy variables presented in Table 12 is the observation that the coefficient for the R&D dummy is statistically significant

in five of the models. This provides substantial evidence that there are systematic differences between observations in a given model for which zeros have, and have not, been added that go beyond R&D and advertising reporting or investing behavior.

Appendix Table 10: Regression Results (20-day window) – [missing R&D and Advertising values have been replaced with 0]

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Independent Variables									
R&D Intensity		-0.120		-0.108	-0.286		-0.112	-0.104	
		(0.588)		(0.624)	(0.272)		(0.628)	(0.651)	
Physical Capital Intensity			0.0431	0.0444	0.0223				
			(0.177)	(0.163)	(0.478)				
R&D Intensity * Physical Capital Intensity					0.917				
					(0.116)				
Advertising Intensity						0.144	0.132	0.164	
						(0.632)	(0.659)	(0.668)	
Advertising Intensity * R&D Intensity								-0.866	
								(0.874)	
Labor Intensity									-0.561†
									(0.063)
Control Variables									
Firm Size	-0.00314	-0.00258	-0.00596	-0.00541	-0.00468	-0.00275	-0.00226	-0.00197	-0.0195
	(0.640)	(0.706)	(0.415)	(0.475)	(0.539)	(0.690)	(0.746)	(0.799)	(0.306)
CorpLevel	0.0290†	0.0312*	0.0292†	0.0312*	0.0351*	0.0289†	0.0309*	0.0309*	0.0820*
	(0.054)	(0.034)	(0.052)	(0.034)	(0.018)	(0.055)	(0.037)	(0.036)	(0.026)
RlastYr	0.00216	0.00298	0.00419	0.00505	0.00386	0.00163	0.00244	0.00259	-0.0583
	(0.891)	(0.853)	(0.802)	(0.768)	(0.821)	(0.916)	(0.878)	(0.874)	(0.106)
2-digit SIC codes	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.00703	0.00429	-0.0916	-0.101	-0.0714	-0.00355	-0.00524	-0.00779	0.344
	(0.888)	(0.932)	(0.238)	(0.226)	(0.389)	(0.950)	(0.926)	(0.901)	(0.123)
Observations	219	219	211	211	211	219	219	219	66
R-squared	0.300	0.301	0.315	0.316	0.320	0.301	0.302	0.302	0.542

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1

Appendix Table 11: Regression Results (15-day window) – [missing R&D and Advertising values have been replaced with 0]

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model6a	Model 6	Model 7
Independent Variables									
R&D Intensity		0.000815		0.0298	-0.115		0.00563	0.00310	
		(0.996)		(0.869)	(0.586)		(0.975)	(0.987)	
Physical Capital Intensity			0.000307	-4.69e-05	-0.0180				
			(0.989)	(0.998)	(0.404)				
R&D Intensity * Physical Capital Intensity					0.746				
					(0.176)				
Advertising Intensity						0.0751	0.0757	0.0655	
						(0.810)	(0.811)	(0.869)	
Advertising Intensity * R&D Intensity								0.281	
								(0.960)	
Labor Intensity									-0.351
									(0.132)
Control Variables									
Firm Size	-0.00675	-0.00675	-0.00906	-0.00921	-0.00862	-0.00655	-0.00657	-0.00667	-0.0246
	(0.260)	(0.285)	(0.168)	(0.190)	(0.222)	(0.285)	(0.305)	(0.351)	(0.177)
CorpLevel	0.00910	0.00909	0.00955	0.00899	0.0122	0.00900	0.00890	0.00889	0.0300
	(0.388)	(0.377)	(0.355)	(0.370)	(0.227)	(0.399)	(0.396)	(0.395)	(0.223)
RlastYr	0.00633	0.00633	0.00641	0.00618	0.00522	0.00606	0.00602	0.00598	-0.0617†
	(0.681)	(0.690)	(0.693)	(0.714)	(0.758)	(0.693)	(0.704)	(0.712)	(0.096)
2-digit SIC codes	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.0680	0.0680	0.0546	0.0570	0.0808	0.0625	0.0625	0.0634	0.306
	(0.124)	(0.138)	(0.382)	(0.407)	(0.237)	(0.222)	(0.229)	(0.282)	(0.138)
Observations	219	219	211	211	211	219	219	219	66
R-squared	0.211	0.211	0.225	0.225	0.228	0.212	0.212	0.212	0.397

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1

Appendix Table 12: Regression Results (20-day window) – [missing R&D, Advertising replaced with 0, *and* controls added]

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Independent Variables									
R&D Intensity		-0.0608		-0.0442	-0.232		-0.0618	-0.0637	
		(0.799)		(0.859)	(0.409)		(0.798)	(0.794)	
Physical Capital Intensity			0.0355	0.0364	0.0119				
			(0.277)	(0.280)	(0.718)				
R&D Intensity * Physical Capital Intensity					0.993				
					(0.106)				
Advertising Intensity						0.00865	0.0173	0.00997	
						(0.978)	(0.957)	(0.978)	
Advertising Intensity * R&D Intensity								0.221	
								(0.967)	
Labor Intensity									-0.683†
									(0.053)
Control Variables									
R&D Dummy (missing==1)	0.0410†	0.0394†	0.0325	0.0314	0.0347	0.0408†	0.0388†	0.0391†	0.196
	(0.079)	(0.099)	(0.204)	(0.230)	(0.185)	(0.063)	(0.081)	(0.074)	(0.236)
Adv Dummy (missing==1)	-1.50e-05	0.000607	-0.00572	-0.00511	-0.00491	0.000218	0.00108	0.00125	-0.0599
	(0.999)	(0.967)	(0.704)	(0.748)	(0.758)	(0.990)	(0.951)	(0.944)	(0.114)
Firm Size	-0.00184	-0.00160	-0.00483	-0.00464	-0.00374	-0.00182	-0.00157	-0.00163	-0.0131
	(0.789)	(0.819)	(0.530)	(0.561)	(0.642)	(0.794)	(0.827)	(0.835)	(0.534)
CorpLevel	0.0361*	0.0370*	0.0337*	0.0345*	0.0393*	0.0361*	0.0370*	0.0371*	0.0565
	(0.027)	(0.025)	(0.042)	(0.042)	(0.024)	(0.027)	(0.026)	(0.030)	(0.116)
RlastYr	0.000661	0.00118	0.00226	0.00272	0.00127	0.000656	0.00118	0.00114	-0.0572
	(0.966)	(0.941)	(0.892)	(0.875)	(0.941)	(0.966)	(0.941)	(0.944)	(0.127)
2-digit SIC codes	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.0235	0.0212	0.0531	0.0504	0.0447	0.0234	0.0210	0.0211	0.378
	(0.778)	(0.802)	(0.586)	(0.620)	(0.662)	(0.783)	(0.809)	(0.810)	(0.149)
Observations	219	219	211	211	211	219	219	219	66
R-squared	0.306	0.306	0.320	0.320	0.324	0.306	0.306	0.306	0.556

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1

Appendix Table 13: Regression Results (15-day window) – [missing R&D, Advertising replaced with 0, *and* controls added]

Variables	Model 1	Model 2	Model 3	Model 4a	Model 4	Model 5	Model 6a	Model 6	Model 7
Independent Variables									
R&D Intensity		0.0314		0.0799	-0.0671		0.0311	0.0253	
		(0.874)		(0.714)	(0.782)		(0.876)	(0.901)	
Physical Capital Intensity			-0.00429	-0.00594	-0.0252				
			(0.857)	(0.815)	(0.329)				
R&D Intensity * Physical Capital Intensity					0.778				
					(0.187)				
Advertising Intensity						0.00946	0.00509	-0.0171	
						(0.979)	(0.989)	(0.968)	
Advertising Intensity * R&D Intensity								0.668	
								(0.905)	
Labor Intensity									-0.438
									(0.116)
Control Variables									
R&D Dummy (missing==1)	0.0158	0.0166	0.00927	0.0113	0.0140	0.0155	0.0164	0.0173	0.104
	(0.609)	(0.603)	(0.780)	(0.742)	(0.688)	(0.604)	(0.599)	(0.585)	(0.427)
Adv Dummy (missing==1)	-0.00160	-0.00192	-0.00956	-0.0107	-0.0105	-0.00135	-0.00178	-0.00129	-0.0426
	(0.892)	(0.879)	(0.439)	(0.436)	(0.442)	(0.925)	(0.907)	(0.931)	(0.155)
Firm Size	-0.00625	-0.00638	-0.00894	-0.00929	-0.00858	-0.00624	-0.00637	-0.00656	-0.0201
	(0.312)	(0.323)	(0.197)	(0.204)	(0.244)	(0.322)	(0.335)	(0.365)	(0.321)
CorpLevel	0.0114	0.0110	0.00913	0.00776	0.0115	0.0114	0.0110	0.0112	0.0118
	(0.327)	(0.344)	(0.442)	(0.513)	(0.342)	(0.328)	(0.346)	(0.352)	(0.576)
RlastYr	0.00565	0.00538	0.00516	0.00434	0.00321	0.00564	0.00538	0.00526	-0.0608
	(0.711)	(0.733)	(0.748)	(0.797)	(0.850)	(0.712)	(0.734)	(0.744)	(0.109)
2-digit SIC codes	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.0985	0.0996	0.144	0.149	0.144	0.0983	0.0996	0.0999	0.416†
	(0.216)	(0.221)	(0.110)	(0.114)	(0.127)	(0.223)	(0.229)	(0.234)	(0.090)
Observations	219	219	211	211	211	219	219	219	66
R-squared	0.212	0.213	0.227	0.227	0.231	0.212	0.213	0.213	0.407

Robust *p*-value in parentheses; *** p<0.001, ** p<0.01, * p<0.05, † p<0.1