

Market Valuation of Intangible Resources: The Use of Strategic Human Capital

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Abstract

Economic theory posits that production factors that are both difficult to imitate and capable of creating organizational efficiencies can generate economic rents and sustain long-term competitive advantage. Using survey data for 106 firms, we measure four dimensions of strategic human capital and find that the market values strategic human capital that has the capability to create efficiencies in the organization and is also difficult for competitors to imitate. We discuss implications for the reporting of human capital in intellectual capital reports and offer suggestions for future research.

Keywords: Human capital, Strategic resources, Intellectual capital reports, Valuation, Performance measures

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Introduction

Corporate executives often state, “people are our most important asset.” An August 28, 2000 Business Week editorial proclaimed that “human capital is the *only* asset.” The International Federation of Accountants (IFAC, 1998) positions human capital as the foundation for the building of intellectual capital, which they conclude is becoming increasingly important to companies. Similarly, the Steering Committee of the Financial Accounting Standards Board (FASB, 2001, p. 22) states “the important assets of enterprises are increasingly intangible. There is general agreement among business observers and analysts that the big contributors to business success are a company’s people...” These statements highlight the increasing reliance and value managers place on human capital in order to compete in today’s global and rapidly changing economy (Lev, 2001).

An early stream of accounting research on human capital attempted to develop a measure of human capital to record as an asset in the financial statements (e.g., Flamholtz, 1985; Flamholtz, 1971; Lev & Schwartz, 1971). More recently, interest has shifted to investigating whether the market values human capital even though organizations do not formally measure and record human capital as an asset in their financial statements (e.g., Abdel-khalik, 2003; Ballester et al., 2002). Additionally, recent studies have found that human resource practices, such as workplace attitudes and fees resulting from football players’ contractual obligations are positively correlated with market values (Amir & Livne, 2005; Ballou et al., 2003). However, Lev (2001, p. 76) states, “Of the various intangible assets..., we have the least systematic information on human resources.”¹

One difference between human capital and other firm resources is that the firm does not own its employees (Coff, 1997). Since the employees can leave at any time, employee-related expenditures will not necessarily translate into firm value. As Coff (1997, p.374) states, “Merely having talented employees does not mean that a sustainable advantage exists.” Much of the past literature attempts to measure an

¹ Studies have also provided systematic evidence that certain intangible resources, such as research and development (R&D) expenditures and patents, are valued by the market (e.g., Lev, 2001; Lev & Sougiannis, 1996).

overall value for the workforce. In this paper, we discuss why the workforce can not be treated homogeneously and develop a hypothesis about which portion of the workforce is likely to add value to the firm. More specifically, we extend the previous literature by focusing on the value of the *strategic* human capital of the firm. Having a workforce (i.e., human capital) alone is not sufficient for a firm to earn a competitive advantage. Rather a firm must utilize the workforce as a strategic resource to sustain a competitive advantage. By using a theoretically driven measure of human capital, we are able to separate human capital into various components that should be valued differently by the market. This makes for a more powerful and insightful test.

Before continuing, we must first precisely define a strategic resource. Resources, or production factors,² that are both difficult to imitate and capable of creating organizational efficiencies are labeled *strategic* resources (Barney, 1991). Firms possess a stock of *capable* resources that create efficiencies and enhance effectiveness, with which they can deploy their strategy. Capable resources are necessary to establish a competitive advantage; however, they are not sufficient to sustain a long-term competitive advantage since competitors may be able to replicate the source of the competitive advantage. Capable resources generate *sustainable* organizational rents and help maintain long-term competitive advantage only when they are also difficult for competitors to imitate (Barney, 1991; Dierickx & Cool, 1989; Lippman & Rumelt, 1982; Lev & Schwartz, 1971; Becker, 1962). Three characteristics of human capital that make it difficult for competitors to imitate are: (1) firm-specific or idiosyncratic knowledge and skills, (2) causal ambiguity (tasks or processes that are not clearly defined or linked to firm performance) and (3) high levels (stock) of the resource (Amit & Schoemaker, 1993; Barney, 1991; Dierickx & Cool, 1989; Lippman & Rumelt, 1982; Williamson, 1979). Both attributes—difficult to imitate and capable of creating organizational efficiencies—are necessary for a firm to sustain its competitive advantage over the longer term, thus defining a strategic resource (Lev, 2001; Barney, 1991; Lippman & Rumelt, 1982).

² We use the terms “resources” from the resource-based strategy literature and “production factors” from the economics literature interchangeably. Resources include organizational routines, physical assets, and human capital. Production factors include land, labor, and capital goods. One element common to both is labor, or human capital, which is the focus of this paper.

Assuming that the market can obtain adequate information regarding a firm's strategic resources, they should be valued in the marketplace since they have the ability to generate sustainable economic rents. One potential type of strategic resource is human capital.³

Using survey and archival data for a sample of 106 firms, we find, after controlling for the book value of equity, earnings, and salary levels (as proxied by pension and retirement plan costs), a positive relation between market value and strategic human capital that is *both* capable of creating efficiencies and difficult to imitate. These findings are consistent with underlying economic theory. We also show that this finding is robust across alternative model specifications.

In addition, we find a positive relation between market value and the spread of human capital throughout the organization, suggesting that the market values human capital that is difficult to imitate. Finally, we find that the market negatively values human capital that has the capability to create organizational efficiencies. At first glance, a negative coefficient on this type of human capital seems somewhat surprising. The intuition behind this finding is that the market is treating investments in a mobile, *capable* resource that can be imitated by other firms similar to other expenses. Although the firm may gain a short-lived advantage from these investments, the market recognizes that this is not a sustainable condition since the human capital can be imitated by a competitor.

To explain further, we provide the following example. Consider the service counter help at McDonalds. Assume that these workers are capable of creating efficiencies for the organization; however, they are free to leave at any time. A rival firm, such as Burger King, may be able to either hire away McDonalds' employees or hire similar workers and train them in providing effective counter service. The market should treat the investment McDonalds makes in this type of worker as an expense since McDonalds is unable to generate sustainable competitive advantage using this strategy. On the other hand, assume that McDonalds' employees are not valued in the labor market because their training is wholly firm-specific, or the operational process of the employees' efforts is not transparent to Burger

³ Barney (1991) classifies strategic resources into three categories: physical capital, human capital, and organizational capital. We discuss this further in the sensitivity analysis section.

King, or the employees' capabilities are encompassed in a large stock of employees all working together. Since the employees are capable of creating organizational efficiencies *and* this value is difficult to imitate by competitors, McDonalds is able to sustain its competitive advantage and generate future rents. Now the market should positively value the investment McDonalds makes in its employees.

As unrecorded intangibles become more critical to firms' ability to succeed, it becomes even more important that we increase our understanding of the definition, measurement, and valuation of strategic human capital. This study increases our knowledge of human capital and makes both theoretical and practical contributions to the literatures on intangibles and intellectual capital as follows.

Theoretically, we demonstrate that strategic human capital possesses properties that we can characterize as being similar to an unrecognized asset. However, a specific type of human capital—that which is capable of creating efficiencies but able to be imitated by competitors—can be characterized as being similar to an expense. We are not proposing that human capital necessarily be recorded as an asset. Rather, we are saying that a firm's workforce is not homogeneous and should not be treated as such. Roslender and Fincham (2001) discuss how "what gets measured gets managed." One important contribution of this paper is to shift the focus of managers away from thinking about employees in terms of the amounts spent on salaries, training, and development, and to move toward thinking about the situations where employees add value to the firm.

From a practical perspective, this study contributes to the literature by informing managers about when investments in human capital are positively valued. This is particularly important in determining disclosures, such as those found in the intellectual capital statements that are prevalent in Europe (Lev & Zambon, 2003). As human capital becomes increasingly important to firms, it will be imperative for managers to demonstrate to stakeholders that their human capital is an investment in the firm and, accordingly, should be valued as such. Lev and Zambon (2003, p. 597-598) state, "... intangibles will continue to be vital to companies, and the challenge of how to manage, measure and visualize them has to be addressed in theoretical and practical terms." IFAC (1998) echoes this message, acknowledges that this area is wide-open, and asserts that managers will want to experiment with various measurements and

reporting practices for intellectual capital. Moreover, there is a growing movement for accounting harmonization across countries. Yet, the definition and accounting for intangibles, of which human capital is an increasingly important component, varies widely (Stolowy & Jeny-Cazavan, 2001). In summary, a better understanding of when human capital creates value helps in developing performance measures, providing better information for decision-making, valuing the firm, and being able to agree on a common definition and understanding of various intangible assets across firms and countries. This study suggests that information regarding the strategic human capital that a firm employs is useful information.

This study is organized as follows. The second section provides an overview of intellectual capital, the strategic human capital literature, and develops the hypothesis. Section three presents the research design, measurement of the variables and the sample. In section four, we present the analyses and discuss the results. Finally, we provide concluding comments and limitations of this research study in section five.

Human Capital and Market Valuation

Importance of human capital across firms

Albeit simplistic, the market value of the firm can be thought of as the sum of the tangible or physical capital and the intangible or intellectual capital controlled by the firm less liabilities. While the specifics of intellectual capital vary, there are various components that comprise it including human capital, structural capital, and customer capital (Mouritsen, 1998). Edwards (1997, p. 21) states that “whatever its composition, intellectual capital is essentially an intelligence-derived production input that companies combine with other production inputs—raw materials, producer goods and physical labor—to create goods and services for sale.”⁴ Human capital, which is the knowledge contained in the minds of the employees or “employee know-how” is an important component of intellectual capital (Edwards, 1997, p. 23).

⁴ For a thorough discussion of intellectual capital see Mouritsen et al. (2001).

While physical capital is usually recorded as an asset by the firm, intellectual capital is often not recorded due to the difficulty in reliably measuring the value of intangibles. Thus, the book value of common equity in the financial statements is often lower than the value that the stock market places on common equity, resulting in a market-to-book ratio greater than one. Over the past twenty years, there has been a steady increase in the aggregate market-to-book ratio of U.S. firms (see Figure 1, panel A). By the late 1990's the aggregate market-to-book ratio was over 4. After the U.S. stock market correction in 2000 and 2001, the average market-to-book ratio was just under 3. It is important to note that this gap exists across industries. Figure 1, panel B shows that while research and development (R&D) intensive industries have the highest market-to-book ratios, the average market-to-book ratio of firms in service, retail, and manufacturing industries has also been over 2 in recent years. It is apparent that factors other than stock market exuberance, such as unrecorded intangible assets or future growth opportunities, are causing the market value of equity to be greater than the book value of equity for all firms, not just high technology firms.

[Insert Figure 1]

The market-to-book ratios provide empirical evidence that there is unrecorded value across industries, which is likely due, at least in part, to intellectual capital. Existing literature and anecdotal evidence support the claim that human capital comprises part of the unrecorded value. While some types of intellectual capital (e.g., patents) may be more prevalent in specific industries, human capital is pervasive throughout most industries. Human capital is often the primary value-creating resource for service firms since it is usually the primary strategic interface between the firm and the customer. One of the fundamental tenets of the service-value-profit chain is that the employee is a key component of the production function necessary for firm success (Heskett et al., 1997). For example, in the airline industry there is evidence that the interaction between the consumer and the provider's employees significantly influences the consumer's satisfaction (Anderson et al., 2005). In R&D firms, employees are a critical component in creating more effective and efficient processes for the firm by designing, developing, and producing new products (Edwards, 1997). The importance of human capital to R&D intensive firms is

illustrated in the following passage from the 10-K of Donnelly Corporation, a firm in this study (1998, p. 13):

Continued emphasis on effective research and product development is a key part of the Company's strategy for future growth...The Company has a corporate applied research group, including several PhD's located at research facilities in...The Company believes its human resources are one of its fundamental strengths...The Company believes that this approach has increased productivity by emphasizing employee opportunity and participation aimed at continuous improvement. The Company believes this emphasis has resulted in enhanced long-term productivity, cost control and product quality and has helped the company attract and retain capable employees.

Human capital is also important to manufacturing firms, especially in today's age of advanced manufacturing technologies. Firms that compete on the basis of flexible manufacturing systems, just-in-time, total quality management, and lean production invest heavily in training costs (Snell & Dean, 1992). Public documents from Boeing, one of the firms in this study, illustrate the use of advanced manufacturing technologies and emphasis on training. They state in their 10-K (1998, p. 50):

The 777, the Next-Generation 737, the Joint Strike Fighter, and other recent commercial and government developmental programs included early commitment of resources for integrated product teams...and increased use of automated manufacturing processes. Although these measures have required significant current investments, substantial long-term benefits are anticipated...Major long-term productivity gains are being aggressively pursued, with substantial resources invested in education and training.

Based on the importance of human capital across a variety of industries, our study investigates whether the market values strategic human capital for a cross-section of firms.

Relevant background literature

Beginning in the 1960s a body of research focused on human resource accounting (HRA).⁵ These studies were primarily interested in how to measure and value human assets in order to record employees as an asset on the financial statements (see, e.g., the Stochastic Rewards Valuation Model developed by Flamholtz, 1971). Later research used the Stochastic Rewards Valuation Model to value members of a CPA firm (Carper & Posey, 1976) and to demonstrate how firms could value the human capital component of an acquisition (Flamholtz, 1987). One of the primary criticisms of HRA was that the focus

⁵ For a thorough discussion of HRA see Johanson et al. (1998).

was on “coming up with numbers rather than coming up with ways to make better management decisions” (Edwards, 1997, p. 22). Moreover, the interest in HRA in the U.S. seemed to wane due to unreliable measures. Now that companies compete in a global competitive market characterized as the information-age, interest in human capital is increasing.

Countering the criticism of HRA accounting, a recent stream of literature investigates the effective management of human capital within the firm. Research has shown that management control systems emphasize *ex ante* behavioral controls in an environment characterized by a heavy reliance on human capital (Widener, 2004). Moreover, firms must be careful to not stifle creativity when attempting to increase productivity in knowledge-intensive organizations (Chang & Birkett, 2004). Managers also are experimenting with processes to make their human capital more transparent to both internal and external stakeholders. Skandia issues a substantial report annually to their stakeholders describing their intellectual capital, of which human capital is a component (Skandia, 1998).

Academic research concludes that firms use narratives, visualization, and numbers in IC reports in order to make their intellectual capital more transparent (Mouritsen et al., 2001). Moreover, the act of constructing and classifying intellectual capital helps facilitate organizational understanding and learning of their knowledge processes (Leitner & Warden, 2004; Grojer, 2001; Mouritsen, 1998). In addition to constructing and classifying intellectual capital, Johanson et al. (2001) identify a total of seven sub-routines in management accounting⁶ that enable the firm to increase the value of its stock of knowledge and enhance organizational learning. One of the relevant take-aways, albeit implicit, from this literature, is that human capital is an important area to study. Both managers and researchers are concerned with appropriately managing human capital, engaging in organizational learning, and conveying the state of the resource to external stakeholders. In the conclusion, we discuss the implications of our study for this line of research.

⁶ They are recognition and measurement, reporting, evaluation, attention, motivation, commitment, and follow up (Johanson et al., 2001).

If firms are making the state of their human capital more transparent to external stakeholders, then the market should value it. A large body of literature has documented that structural capital, such as research and development expenditures and patent development costs, which are immediately expensed, are value relevant (e.g., Ballester et al., 2003; Green et al., 1996; Lev & Sougiannis, 1996). In addition, studies have found a positive association between market value and customer satisfaction, a type of customer capital (e.g., Ittner & Larcker, 1998). However, there is less known about human capital, most likely due to problems associated with obtaining data and constructing an appropriate measure of human capital (Abdel-khalik, 2003).

Studies have investigated the relation between value and human resource practices. For example, a study by Watson Wyatt, a consulting firm, shows that market values are positively correlated with their measure of an index of human capital that captures how organizations carry out their human resource practices (Watson Wyatt, 1999).⁷ Skandia asserts that their intellectual capital encompasses the entire workforce (Skandia, 1998). One relevant question is whether the market perceives this as well? Amir and Livne (2005) find a positive association between market value and transfer fees paid to buy players of a small sample of UK football clubs. However, it is difficult to generalize those results to the typical firm in which the workforce does not have a contractual obligation to remain with the firm. Using archival data on labor expense disclosed by a subset of US firms, Ballester et al. (2002) find that the market values a portion of a firm's labor costs. Ballester et al. (2002) do not identify what types of labor costs are valued. Finally, Abdel-Khalik (2003) investigates the valuation of human capital using archival data on executive compensation and firm-specific data to proxy for managerial skills and finds that the market values managerial skills. One limitation of this study is that it only investigates CEOs and other executive members of the board. Contrary to these results, Bontis (1998) does not find evidence of a direct relation between human capital and firm performance; rather, he finds that human capital is associated with both structural and customer capital, which are associated with performance.

⁷ Also see Becker and Huselid (1998) for a review of literature investigating the association between human resource practices and firm performance.

Our study differs from prior literature in three primary ways. First, we do not use self-reported measures of performance that are inherently noisy; rather, we are interested in understanding how the market views the various elements of strategic human capital. Second, we are not limited to archival executive compensation data that is only reported for the top executives in the organization nor are we limited to the study of only contractually obligated employees. Thus our results are more generalizable across workforces and firms. Third, prior studies treat the workforce homogeneously without regard to what types of human capital add value to the firm. For example, an imitable workforce should not allow the firm to earn profits in excess of its cost of capital since there is no foundation for the “establishment of competitive advantage over rivals” (Grant, 1991, p. 117). Although this is also the case for all strategic resources, it is particularly true for human capital as the firm does not own its employees (Coff, 1997). We draw on the strategic-based resource literature that theorizes that only human capital capable of providing efficiencies *and* that is difficult to imitate will sustain competitive advantage. Thus, we take the view that the market will only value a subset of a firm’s workforce (see discussion in the next subsection). This is consistent with Barney (1991, p. 102) who states “Of course, not all aspects of a firm’s physical capital, human capital, and organizational capital are strategically relevant resources.” Therefore, we contribute to the above literature stream by ascribing market value to several components of human capital, which should aid managers in determining which disclosures are relevant for investors and assist in understanding which types of human capital are investments that are valued by the market.

Valuation of human capital

Although human capital is not reported on the balance sheet, economists consider human capital to be valuable to the firm. Some economists (e.g., Alfred Marshall) even state that human capital is the most valuable type of capital (Lev & Schwartz, 1971). While human capital is the knowledge and/or skills possessed by the firm’s workforce (Lev, 2001; Becker, 1962), *strategic* human capital is the part of the workforce that helps the firm to sustain its competitive advantage (Lev, 2001; Barney & Wright, 1998; Amit & Schoemaker, 1993).

For a firm to sustain its competitive advantage, it is necessary that strategic resources (1) have the capability to create organizational efficiencies and (2) are difficult for competitors to imitate. Resources that have the capability to create organizational efficiencies are those that “enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness” (Barney, 1991, p. 106). Firms use human capital to create efficiencies, which decrease costs or enable the sale of goods for premium prices. In a service firm, emphasizing and exploiting relationships that exist between employees and their customers often allows a firm to be more effective in capitalizing on opportunities, while in manufacturing firms, employees often drive the effectiveness and efficiencies of advanced manufacturing techniques (Snell & Dean, 1992).

Even in the face of free entry and fully competitive behavior firms can realize persistent economic rents if there is uncertainty in the underlying resources, such as human capital (Lippman & Rumelt, 1982). This uncertainty, or lack of imitability, thus sustains the competitive advantage.⁸ Lippman and Rumelt (1982, p. 419) state

We find that uncertain imitability can lead to supernormal industry profits together with a lack of entry. Additionally, uncertain imitability provides a theoretical connection between the height of this apparent ‘entry barrier’ and the stable dispersion of interfirm profit rates. Finally while the standard view is that excess industry profits induce entry, this theory suggests that high profits, ceteris paribus, may well signal the presence of very successful and difficult to imitate competitors and thereby impede rational entry attempts.

In order for competitors to imitate a firm’s competitive advantage, the competitor must be able to acquire the underlying resources that the firm uses to implement its strategy. If, under similar conditions, circumstances, and costs, competitors can acquire resources that rival firms use to drive their competitive advantage, then the rival’s competitive advantage will be short lived (Grant, 1991). We measure three characteristics specified in the resource-based strategy literature that can cause the strategic use of human

⁸ The strategy-based resource literature has an interesting connection to the early measurement models proposed in HRA. For example, Carper and Posey (1976) model the likelihood of employee mobility when assessing the value of the CPA employees. Strategy-based resource is more encompassing since it considers imitability and not only mobility.

resources to be difficult to imitate: firm-specificity, causal ambiguity, and the mass or spread of the resource.⁹

Firm-specific knowledge and skills are difficult to transfer among firms (Amit & Schoemaker, 1993; Williamson, 1979), resulting in low imitability. Firm-specificity is created through investments in training designed to develop employees in operational methods, systems, and processes specific to the firm (Williamson, 1979; Becker, 1962). Because the skills and knowledge are firm-specific, human capital cannot earn returns in the labor market. Thus, investing in firm-specific human capital reduces some of the threat of voluntary turnover and facilitates the firm's long-term sustained competitive advantage (Coff, 1997; Becker, 1962).

Causal ambiguity exists when employees perform ill-defined tasks or when the link between factor inputs or effort and firm performance is not clear (Barney, 1991).¹⁰ The accumulation and use of these resources is not deterministic or continuous, instead it is stochastic and discontinuous (Dierickx & Cool, 1989). In other words, there may be uncertainty regarding how to control the human capital, how to accumulate the important variables in the process, and/or how the human capital process produces benefit. Causal ambiguity prohibits transparency, prevents competitors from imitating the source of competitive advantage, and limits factor mobility (Lippman & Rumelt, 1982).

Lastly, when talented and valuable human capital is spread throughout the organization, it is more difficult to imitate. Barney and Wright (1998) state "...the synergistic value from a large number of individuals who work together is quite costly if not impossible for competitors to imitate." Williamson

⁹ Another variable that may cause human capital to be difficult to imitate is the presence of stock options. Some argue that stock options are used to retain key employees. In fact, Ittner et al. (2003) find that firms in their sample rank retention as the most important objective of option grants. But, the empirical evidence in Ittner et al. (2003) suggests that the importance of the retention objective is only for new employee option grants and not for ongoing option grants. This suggests that options do not necessarily bind an employee to a particular firm; rather options may initially attract a new employee. Many firms use options as a compensation tool, so any firm could use options to attract a new employee. Therefore, we do not include stock options as an imitability variable. Instead we rely on the strategy and economics literature, which provides us with three characteristics of imitability that we measure through a survey instrument.

¹⁰ It is important to note that this does not imply that the employees are not performing appropriately or performing services that are not required nor expected. It simply means that the value-added component of their work is not very transparent. For example, consider a manager who makes good, value-added decisions. The thought process is invisible and hard to detect by a superior or by an outsider. Documenting that decision-making process in order to make it transparent could be quite difficult.

(1979) argues that frequent transactions between people lead to idiosyncratic, transaction-specific skills that cannot be specified. Therefore, the human capital is immobile because replication of its value is uncertain (Lippman & Rumelt, 1982). Dierickx and Cool (1989, p. 1507) describe it as “asset mass efficiencies.” In other words, building a sufficient mass of resources enhances sustained competitive advantage since it is more difficult for competitors to replicate synergies within a large mass of resources than it is to replicate within a low level of a resource.¹¹

In summary, the economics literature and the resource-based view of strategy literature assume that firms hold and control unique strategic resources or production factors that help establish a competitive advantage, earn economic rents, and provide the firm with the basis for sustaining that competitive advantage. A firm establishes competitive advantage by competing with resources that increase organizational efficiency and effectiveness and by acquiring resources that are difficult for competitors to imitate. By themselves, neither characteristic is sufficient to sustain long-term competitive advantage and to generate economic rents. A firm sustains its competitive advantage when the same resource both creates efficiencies and cannot be easily imitated (Barney, 1991). Thus, both characteristics are necessary to generate economic rents (Lippman & Rumelt, 1982). In summary, *strategic* human capital is the part of the workforce that helps the firm sustain its competitive advantage and must possess the following attributes:

1. Have the capability to create strategic organizational efficiencies, *AND*
2. Be difficult to imitate as achieved by one of the following:
 - a. Have firm-specific attributes, *or*
 - b. Possess causal ambiguity, *or*
 - c. Be part of a large mass of stock (i.e., frequency or spread)

In this study, we investigate whether the market positively values the component characteristics of strategic human capital and their joint effect. Based on the theory discussed above, we expect that only

¹¹ Ford Motor Company is an example where talented human capital is spread throughout the firm, and competitive advantage is sustained through mass employee involvement and participation. There are circumstances when a valuable human talent may be centered on one key executive, such as Bill Gates. However, the more the use of strategic human capital is spread throughout the ranks of the firms’ employees, the harder it will be for a competitor to determine how the competitive advantage is being achieved. Thus, the spread of the resource can foster the lack of imitability.

the joint effect (i.e., capable of achieving organizational efficiencies and difficult to imitate), which generates sustainable economic rents, will be positively associated with market value. Thus, our formal hypothesis is:

H1: Human capital that is both capable of creating efficiencies and difficult to imitate is positively associated with a firm's market value.

Research Methods

Research design and measurement of financial variables

We are interested in whether the market values the use of strategic human capital. The use of strategic human capital is measured using a survey, which is discussed in the next section. Because the survey responses capture the use of strategic human capital as of a specific date, we use a valuation model to examine whether the use of this human capital is reflected in stock prices at the time of the survey. As discussed in the sensitivity analysis section, a firm employs human capital as part of an overall strategy encompassing other firm resources. Therefore it is important to control for other resources owned by the firm, many of which are recognized as part of book value. As such, we use a market valuation model which models price as a function of book value, net income, and other information. Consistent with prior research, we begin with the following valuation model (e.g., Ballester et al., 2003; Barth et al., 1998):

$$P_i = \beta_0 + \beta_1 BV_i + \beta_2 NI_i + \varepsilon_i \quad (1)$$

where P_i is the fiscal year end share price for firm i , BV_i is the fiscal year end book value of equity adjusted for net pension liabilities (discussed below) per share, and NI_i is net income per share before extraordinary items.¹²

Under current accounting rules, strategic human capital is not capitalized on the balance sheet and is therefore not included in book value. If the market considers the use of strategic human capital relevant to firm valuation and sufficiently reliable to be reflected in share prices, then, after controlling for recorded

¹² All variables are deflated by shares outstanding to control for heteroscedasticity. The choice of variable used to control for heteroscedasticity could lead to spurious scale effects (Brown, Lo, & Lys, 1999). As a sensitivity test, we also deflate all of the financial variables by book value of common equity and the results are qualitatively the same.

book value of equity and net income, proxies for the use of strategic human capital should be positively valued by the market. Accordingly, we expand equation 1 to include the underlying components of strategic human capital, as well as a control variable for salary costs:

$$P_i = \beta_0 + \beta_1 BV_i + \beta_2 NI_i + \beta_3 PENS_i + \beta_4 CAP_i + \beta_5 FS_i + \beta_6 CA_i + \beta_7 SPR_i + \varepsilon_i \quad (2)$$

where P_i , BV_i and NI_i are as defined above. The human capital variables are (1) whether human capital has the capability to create efficiencies (CAP), (2) the firm-specificity of human capital resources (FS), (3) the ambiguity of the work performed by the human resources (CA), and (4) how extensively human capital is spread throughout the firm (SPR). The measurement of these variables is discussed in the following section.

It is possible that firms with either more employees or higher salary and employee benefit expenditures have a greater use of strategic human capital. Therefore, we include pension and retirement costs after tax, deflated by shares outstanding ($PENS$), to control for the level of expenditures on salary and employee benefits. If a firm has a defined benefit pension plan, we include only the portion of pension costs related to employee service. We use pension and retirement costs for two reasons. First, it is highly correlated with salary expenditures, which are not disclosed by many firms. Second, companies typically offer benefits packages designed to foster long-term relationships with skilled employees. Prior studies document a positive relation between market values and pension contributions indicating that pension contributions may represent an unrecorded human capital asset (e.g., Barth, 1991). We also adjust the book value of equity for the net pension asset or liability (fair value of pension assets less the accumulated benefit obligation). Under U.S. accounting rules, this is often not recognized in the financial statements and may be correlated with the presence of human capital.¹³

Hypothesis 1 posits that to be associated with firm value, human capital should *both* be capable of creating efficiencies and difficult to imitate. We test this hypothesis in two ways. First, as discussed previously, for a resource to create a sustained competitive advantage, it must be able to create efficiencies (captured by CAP) and be difficult for competitors to imitate (captured by FS , CA , or SPR).

¹³ We also run the analyses without adjusting for the pension contributions. The statistical inferences using unadjusted book value are unchanged.

We create a composite variable (*SUSTADV*) by first ranking all of the firms by industry on each of the four human capital variables. We then create an indicator variable equal to 1 if a firm scores above the industry median on *CAP* and above the industry median on *either FS, CA, or SPR*.¹⁴ Because of the number of firms available, we define industries broadly. We identify three broad industry groups based on the importance of human capital versus physical capital to the firm, and the ease with which the knowledge and skills of the employees can be converted into a tangible asset owned by the firm: service firms, R&D intensive firms, and manufacturing firms. We identify service firms as those firms with an SIC code greater than 50 (i.e., retail, wholesale, financial, insurance and services), R&D intensive firms as those firms with SIC codes 28, 35, 36, and 38, and manufacturing firms as those firms with SIC codes 10-49, except for 28, 35, 36, and 38. To test hypothesis 1, we add *SUSTADV* to equation (2):

$$P_i = \beta_0 + \beta_1 BV_i + \beta_2 NI_i + \beta_3 PENS_i + \beta_4 CAP_i + \beta_5 FS_i + \beta_6 CA_i + \beta_7 SPR_i + \beta_8 SUSTADV_i + \varepsilon_i \quad (3)$$

Theoretically, *FS, CA, and SPR* are three distinct variables that measure a broader construct, lack of imitability. Since our data set is small, we have limited observations that are above the industry median for both *CAP* and either *FS, CA, or SPR*. Therefore, examining the imitability variables individually may result in very low power tests. The benefit of *SUSTADV* is that it is a powerful variable that captures in one variable all of the information contained in the four human capital variables. However, the problem with this variable is that it does not provide information on which attribute is valued by the market. Therefore, the second way that we test hypothesis 1 is by creating three sustained advantage variables; one for each different type of lack of imitability. This has the benefit of distinguishing between *FS, CA, and SPR* but

¹⁴ For example, if the industry median (and firm score) for firm A was 5.5 (5.7) on *CAP*, 5.8 (5.6) on *FS*, 4.5 (4.4) on *CA*, and 5.0 (5.6) on *SPR* the firm would be coded a “1” on *SUSTADV* since it scored over the industry median on *CAP* and at least one of the lack of imitability variables. If its score was 5.5 (5.7) on *CAP*, 5.8 (5.6) on *FS*, 4.5 (4.4) on *CA*, and 5.0 (4.9) on *SPR* the firm would be coded as a “0” on *SUSTADV* since it did not score above the industry median on at least one of the lack of imitability variables, even though it scored above the industry median on *CAP*. Finally, if its score was 5.5 (5.2) on *CAP*, 5.8 (5.9) on *FS*, 4.5 (4.4) on *CA*, and 5.0 (5.2) on *SPR*, the firm would be coded as a “0” on *SUSTADV* since it did not score over the industry median on *CAP*, even though it scored above the industry median on two of the lack of imitability variables.

may be a less powerful test. To create these variables, we interact CAP with each of FS, CA, and SPR. We then add these interaction terms to equation (2) both separately and at the same time:

$$P_i = \beta_0 + \beta_1 BV_i + \beta_2 NI_i + \beta_3 PENS_i + \beta_4 CAP_i + \beta_5 FS_i + \beta_6 CA_i + \beta_7 SPR_i + \beta_8 CAP * FS_i + \varepsilon_i \quad (4)$$

$$P_i = \beta_0 + \beta_1 BV_i + \beta_2 NI_i + \beta_3 PENS_i + \beta_4 CAP_i + \beta_5 FS_i + \beta_6 CA_i + \beta_7 SPR_i + \beta_8 CAP * CA_i + \varepsilon_i \quad (5)$$

$$P_i = \beta_0 + \beta_1 BV_i + \beta_2 NI_i + \beta_3 PENS_i + \beta_4 CAP_i + \beta_5 FS_i + \beta_6 CA_i + \beta_7 SPR_i + \beta_8 CAP * SPR_i + \varepsilon_i \quad (6)$$

$$P_i = \beta_0 + \beta_1 BV_i + \beta_2 NI_i + \beta_3 PENS_i + \beta_4 CAP_i + \beta_5 FS_i + \beta_6 CA_i + \beta_7 SPR_i + \beta_8 CAP * FS_i + \beta_9 CAP * CA_i + \beta_{10} CAP * SPR_i + \varepsilon_i \quad (7)$$

Measurement of human capital variables

We gather the data for the human capital variables (refer to the previous section for a thorough discussion and definition of these variables) through a survey that is described in the next section. See Appendix 1 for an abbreviated version of the survey. As appropriate, the responses to individual survey questions are combined to form an average summary measure. Since this study uses survey measures, we are concerned with both content and construct validity. Content validity can be assessed by (1) the “plan and procedures of construction,” (2) appearance, or face validity and (3) a measure of internal consistency through an empirical measure of reliability (Nunnally, 1978, p. 92). Construct validity can be assessed by (1) specifying an appropriate domain of observables underlying the construct, (2) using factor analysis to find relationships among the observables and (3) using correlation analysis to find relations among the constructs (Nunnally, 1978). To establish high degrees of both content and construct validity, we took the following steps: (1) reviewed existing literature to establish appropriate domains, (2) used previously validated measures whenever possible,¹⁵ (3) performed four in-depth field visits to learn more about the

¹⁵ These constructs were validated in a prior study on strategic human capital (see Widener, 2004). For this study, we remove one question from CAP in order to better align the construct measurement with the theoretical definition of “effectiveness and efficiency” that we use in this study. Since there are different data requirements in this study as

domain being measured, (4) used guidelines set forth in Dillman (1978) for the construction of survey questions, (5) pre-tested the survey on several academicians and a pilot sample of 30 respondents, and (6) performed various empirical tests. Factor analysis reveals that all measures are uni-dimensional; the Cronbach's Alphas, which range from 0.77 to 0.85, demonstrate acceptable internal reliability; and the Alpha coefficients exceed the inter-item correlation coefficient in all cases, which also helps demonstrate discriminant validity (Nunnally, 1978). In addition, plausible behavior of the constructs was demonstrated through a review of correlation analysis (Widener, 2004). Descriptive statistics for the multi-item variables are reported in Table 1.

[Insert Table 1]

We use the label “capabilities” (*CAP*) to capture what Barney (1991, p. 106) refers to as “valuable resources”. We measure it using two questions taken from the underlying literature that ask whether the firm’s strategic human capital enables the firm to be more efficient and effective in exploiting opportunities. We draw these questions from Barney (1991, p. 106) who specifically states that resources have the capability to be valuable “when they enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness.”

Since we are interested in the firm-specificity of human capital, we are interested in knowing the degree to which employees have skills and knowledge that are difficult to transfer among firms (Amit & Schoemaker, 1993; Williamson, 1979); therefore, we measure firm-specificity (*FS*) using four questions regarding the extent to which the knowledge base is specific to the firm, the ease with which experience workers could enter the firm and contribute without undergoing extensive firm-specific training, the time it would take a newly hired employee to become familiar with firm-specific customers and products and, finally, the time it would take a replacement employee to be equally effective as a current employee.

These questions are drawn from underlying literature (see e.g., Lohtia et al., 1994; Williamson, 1979).

compared to Widener (2004), the final set of firms differs between the two papers. However, construct validity is reliable across samples. Moreover, the purpose of this study, which has an external focus and relies heavily on Compustat and CRSP data, differs from Widener (2004) which investigated the management control system within the firm.

Causal ambiguity is “when the link between a firm’s resources and its sustained competitive advantage are poorly understood” (Barney, 1991, p. 109). We measure causal ambiguity (*CA*) using seven questions related to whether the employees’ duties are repetitious, if tasks are standardized, the difficulty of monitoring and evaluating employees’ effort, and if there is an understandable sequence of steps the employees follow. If activities are repetitious and lend themselves to the use of standard operating procedures, are easily monitored and evaluated by superiors, and there is an understandable sequence of steps employees follow, then the resources may be easier to imitate. This construct was originally used in Abernethy and Brownell (1997).

Activities that are low in causal ambiguity because they are characterized as repetitious; easily monitored and understood; and subject to standard operating procedures, may still be inimitable if they are embedded in social and/or complementary relations. Thus we also measure the mass or spread of resources throughout the firm (*SPR*). This is consistent with Barney and Wright (1998) and Dierickx and Cool (1998) who argue that it is difficult for competitors to replicate a competitive advantage when it is embedded in a mass of resources. There is no previously validated measure of *SPR*; therefore, this is a novel measure that uses three questions based on the concepts put forth by Barney and Wright (1998) and Dierickx and Cool (1998) to capture the spread of knowledge and skills throughout the firm. This construct was originally used in Widener (2004).

Survey procedures and sample population

The survey was undertaken during February – April of 1999. Highly diversified firms may pursue multiple strategies and rely on various strategic resources across business units or segments. Since firms reported in Compustat range in size and complexity, we exclude firms that are highly diversified from the sample population. More specifically, we included in the sample population only Compustat firms reporting sales for a single four-digit SIC code or reporting sales for between one and five four-digit SIC

codes within the same overall SIC division.¹⁶ To analyze non-response bias and to validate the variable measures, firms are required to report sales from 1993 – 1996 and depreciation expense for 1996, and have at least 250 employees. After deleting firms that were either used in the pretest or that are foreign-owned, the population is 1,662 firms, of which we randomly surveyed 800 firms. The largest concentration of firms (43%) is classified as manufacturing (SIC codes 2000 - 3999). Other concentrated segments include financial services firms (17%), other service firms (13%), and transportation, communication and utilities (11%).

To enhance the validity of the survey instrument, we followed the Dillman (1978) “total design approach.” We visited four firms and interviewed various members of management in order to better inform the survey. After designing the survey, we pretested it on 30 firms. Upon final revisions, we sent the survey along with a personalized cover letter and a stamped return envelope to the chief financial officer of 800 firms. We promised to provide the respondents with a summary of results as an incentive to respond. In addition, we performed three follow-up mailings, along with a postcard reminder.

The mailing process resulted in 118 responses (15% response rate), comparable to other survey results for top executives in U.S. firms. We tested for non-response bias to determine potential effects on our findings. We found that the pattern of SIC classifications for respondents mirrors both the sample and the Compustat population. We compared respondents to non-respondents for the Compustat variables. Using return date, we also divided the respondents into early, middle, and late respondents. We then compared early and late respondents for the four human capital variables that are derived from the survey. There are no statistically significant differences among groups of respondents, which provides some comfort regarding the lack of response bias. Non-response tests are reported in Table 2.

¹⁶ For example, Ampco-Pittsburgh reports sales in three SIC codes: 3452, 3462, and 3561. All three of these codes are classified as Division D (manufacturing) and either, Major Group 34 (Fabricated Metal Products) or Major Group 35 (Industrial and Commercial Machinery and Computer Equipment). Thus, Ampco-Pittsburgh is included as part of the study’s population. Analysis of the Compustat segment data reveals that our sample firms reported an average (median) of 1.76 (1) segments. We also note that the use of research and development expenditures (i.e., a type of structural capital) and the use of seasonal/part time employees (i.e., a type of human capital) is fairly consistent across segments within a firm, indicating that the use of strategic resources within the firm is likely consistent across segments. To the extent that our selection technique does not remove highly diversified firms, our measures will be subject to additional noise which will bias against finding results.

[Insert Table 2]

Final sample and descriptive statistics

We matched the survey data of the 118 respondent firms to Compustat data as of the fiscal year end closest to February - April of 1999. For most firms, this was December 31, 1998. We require that the following items be available in Compustat: price per share (data item #199), net income before extraordinary items (data item #18), and number of common shares outstanding (data item #25). These restrictions result in a final sample of 106 firms.¹⁷

Table 3, Panel A, presents descriptive statistics of the sample firms. The firms have an average market value of equity of \$1.9 billion. The average market price per share is \$19.03. The average number of employees is 10,000. Our sample firms contribute on average \$0.12 in pension expense per share, while the 23 firms that disclose salary information spend on average \$8.30 on salary expenditures per share. Although there are several loss firms in the sample, firms on average record \$0.72 per share in profits before extraordinary items. The average market-to-book ratio of 2.33 is consistent with the notion that our sample firms have a number of valued, unrecorded resources. That is, the market values more than just the recorded assets of the firm. This further reinforces the need to examine off-balance sheet items, such as human capital.

As shown in Panel B, manufacturing firms dominate our sample (34%); however, we also have a number of financial service firms (20%), wholesale and retail trade (12%), and transportation and utility firms (11%). As discussed earlier, the sample composition broadly mirrors the Compustat population.

[Insert Table 3]

Analysis and Results

Correlation analysis

¹⁷ One firm has negative book value of equity. In an unreported sensitivity test, we delete this observation and our results are qualitatively similar.

Table 4 shows the correlation between the variables. Previously, we argued that three characteristics of strategic human capital can make it difficult for competitors to imitate the firm's use of its strategic resources. It is important to note that, with the exception of the correlation between *CA* and *SPR* ($r = -0.226$, $p < 0.05$), the three dimensions of imitability, *FS*, *CA*, and *SPR*, are not significantly correlated. Both *CAP* and *SPR* are significantly positively correlated with *SUSTADV*. Also of significance is the fact that none of the human capital variables are correlated with the number of employees. This gives assurance that the survey variables are not simply capturing the size of the workforce. Finally, as expected, pension expense per share is highly correlated with both the number of employees and salary expense per share ($p < 0.01$), indicating that this variable is a good proxy for the overall level of spending on employee salary and benefits. We test for and find no evidence of multicollinearity in the final models presented in Tables 5 and 6.¹⁸

Looking at the individual strategic human capital variables, you can see that *CA* is increasing with respect to two measures of labor intensity (Graham, 2000): pension expense per share ($r = 0.204$, $p < 0.05$) and salary per share ($r = 0.457$, $p < 0.05$). Thus, firms that are more labor intensive have employees with less transparent jobs and employees who perform ambiguous tasks receive higher employee benefits. *CA* is also positively correlated with the amount spent on research and development per share ($r=0.260$, $p<0.01$), suggesting that firms in more R&D intensive industries have more ambiguous tasks. Finally, *FS* is positively correlated with net property, plant and equipment per share ($r=0.191$, $p<0.05$), suggesting that firms with a higher proportion of physical assets have more employees with firm specific skills and knowledge. These correlations are discussed again in the sensitivity analysis section

[Insert Table 4]

¹⁸ We calculate both the VIF (variance inflation factor) and the TOL (tolerance) for each coefficient. All coefficients are within the recommended guidelines of a maximum of 10 for the VIF and a minimum of .10 for the TOL (see Hair et al., 1995, p. 127).

Market Valuation of Human Capital

The results for our primary analysis are presented in Table 5. Panel A reports the results for the entire sample. Because the valuation model may not be well specified for certain regulated industries, in Panel B we present the results for a sub-sample of 81 non-regulated firms which excludes insurance, banking, and utility firms. Column (1) of Panel A reports the regression results from estimating equation (2). The model significantly explains stock price and has an adjusted R^2 of 49% ($F = 15.39$, $p < 0.01$). Consistent with prior research, book value and net income are significantly and positively associated with stock price ($p < 0.01$).

[Insert Table 5]

Examining the individual coefficients in column (1), we find that the associations between price and both the capabilities of human capital and firm-specificity are not significant. This is not unexpected since economic theory predicts that resources will only be valued when they are *both* capable of creating efficiencies and difficult to imitate. However, somewhat unexpectedly we find a significant and positive association between firm value and both causal ambiguity ($p < 0.10$) and the spread of strategic human capital within the firm ($p < 0.05$). Firms have a higher market value when the employees perform ambiguous tasks, although the significance level is only marginal. Uncertainty underlying firm resources can lead to excess profits because it is difficult for competitors to identify the firm's strategy and replicate it. This also has the benefit of potentially impeding entry of new firms into the market (Lippman & Rumelt, 1982). This result should be interpreted cautiously as it does not hold for the non-regulated industry sub-sample or in either of the sensitivity tests. In addition, firms have a higher market value when employees that possess valuable skills and knowledge are spread throughout the organization. When talents and skills are spread over a larger group of employees it is more difficult for competitors to imitate the process and receive the benefits. In addition, if the strategy involves employees throughout the organization, firms are able to spread costly start up expenditures (e.g., selection and staffing costs) necessary to establish a strategic workforce over a greater number of employees (Williamson, 1979). Finally, implementing a strategy that involves many employees may be less risky since the loss of one

talented employee may not be as detrimental to the firm's competitive advantage when the pool of talented employees is larger rather than smaller. Thus, although the employees do not necessarily rank high in their capability of producing organizational efficiencies, the market still values a large pool of human capital.

Column (2) of Table 5, Panel A reports the regression results from estimating equation (3). This is identical to equation (2), except that the composite variable capturing sustained competitive advantage is added to the model. The model significantly explains stock price and has an adjusted R^2 of 51% ($F = 14.61$, $p < 0.01$). There is also a positive association between price and the group of human capital variables ($F = 2.75$, $p < 0.05$). When *SUSTADV* is added to the model, *CA* is no longer significant. In addition, we find a negative and significant association between the capabilities of human capital (*CAP*) and firm price ($p < 0.01$); however, the relation between the composite variable (*SUSTADV*) and price is positive and significant ($p < 0.05$). The latter result provides support for hypothesis 1. Since the composite variable is defined as 1 if a firm is above the median on *CAP* and above the median on *FS*, *CA*, or *SPR*, it is essentially an interaction variable capturing the interaction between capability and imitability.¹⁹ The intuition behind these two results is that the market treats investments in human capital that is capable of creating organizational efficiencies similar to other expenses unless the firm takes steps to protect their source of competitive advantage by making the strategic resource difficult to imitate. Relying on human capital to create efficiencies while that resource can be imitated by rival firms increases the risk that the firm will lose its competitive advantage; however, when the human capital has the capability to create efficiencies and is difficult for competitors to imitate, the firm is able to realize a long-term benefit and the market positively values the investment in human capital

Columns (3), (4), (5) and (6) of Table 5, Panel A report the regression results from estimating equations (4)-(7). This is identical to equation (2), except that interaction terms of *CAP* with *FS*, *CA*, and *SPR* individually are added to the model both separately and at the same time. In all cases, the model significantly explains stock price and has an adjusted R^2 of 49% to 50% ($p < 0.01$). When the interaction

¹⁹ This variable captures the high-high cell versus all other cells for the interaction of capability and imitability.

terms are added to the model, both CA and SPR remain positive and significant. In addition, the interaction between CAP and FS is positive and significant ($p < 0.05$), although the interactions of CAP with both CA and SPR are insignificantly different from zero. The market positively values a sustained competitive advantage achieved through firm-specific human capital. This is in line with arguments made by Coff (1997) who argues that firm-specific investments are the best way to reduce worker mobility and reduce the threat of voluntary turnover. We should also note that the significance level decreases to 10% when all of the interaction terms are included in the model at the same time, likely due to power issues with a small sample.

Table 5, Panel (B) reports the results for the sub-sample of non-regulated firms. The format is the same as Panel A. The results are similar to those discussed above for the full sample, except that CA is not significant and SPR is significant at the 5% or above level in all cases. In addition, SUSTADV is significant at the 1% level, and the interaction between CAP and FS is significant at the 1% level when it is included in the model by itself and 5% when all interaction terms are included.

Sensitivity analysis - Returns model

There are two potential limitations associated with the price model used in the prior analysis. First, the choice of variable used to control for heteroscedasticity could lead to spurious scale effects (Brown, Lo, & Lys, 1999). Second, as can be seen in Figure 1, during this time period stock prices were generally inflated. Therefore, we also examine a returns model. Following Easton and Harris (1991), we relate returns to both the level and change in net income and pension expense per share. Ideally, we would also include both the level and change in the human capital variables, but we do not have survey data available for the prior year. However, we do not expect that the use of strategic human capital would change dramatically from one year to the next and, therefore, including only the level of the human capital variables is a reasonable approach (i.e., the change would be zero and drop out of the model). We use the following model:

$$\begin{aligned}
BHAR_i = & \beta_0 + \beta_1 NI_i + \beta_2 PENS_i + \beta_3 \Delta NI_i + \beta_4 \Delta PENS_i + \beta_5 CAP_i \\
& + \beta_6 FS_i + \beta_7 CA_i + \beta_8 SPR_i + \beta_9 SUSTADV_i + \varepsilon_i
\end{aligned}
\tag{8}$$

where NI_i and ΔNI_i are the level and change in net income per share before extraordinary items, deflated by beginning of the year stock price, $PENS_i$ and $\Delta PENS_i$ are the level and change in pension and retirement costs per share, after tax, deflated by beginning of the year stock price, and all other independent variables are as described previously. BHAR is the twelve month buy-and-hold, market-adjusted stock return.²⁰ The advantage of this model is that there are no spurious scale effect issues and the impact of inflated stock prices is mitigated by adjusting for the market return. The disadvantage is determining what period to accumulate stock returns over, since the survey was conducted over a several month period after the fiscal year end of most firms. We selected an accumulation period to cover both the dates during which the annual report was released and the dates during which the survey was administered. Specifically, buy- and-hold returns are cumulated over the 12-month period ending with the fifth month after the fiscal year end. For most firms this was June 1998 to May 1999

The results for the sensitivity analysis are presented in Table 6. Stock return data was obtained from the CRSP database. The information was not available for three of the sample firms, resulting in a sample size of 103 for this analysis. In addition to running the regression on the entire sample (column (1)), we also look at a subset of the sample where loss firms are removed (column (2)). Losses are less informative than profits about a firm's future prospects and the stock market reacts differently to firms in a loss position (Hayn, 1995). To ensure that the human capital variables are not proxying for future earnings potential when a firm has a loss, we exclude loss firms from the sample, resulting in a subset of

²⁰ We also calculated BHAR in two other ways. First, using raw stock returns, we find qualitatively similar results. Second, to control for differences in size and growth opportunities in the sample firms, we also estimated BHAR as the 12-month buy-and-hold, book-to-market and size adjusted stock return (Barber & Lyon, 1997; Fama & French, 1992). Following Chan et al., (2001), each sample firm is assigned a control portfolio at the beginning of the return accumulation period. There are 30 control portfolios corresponding to five possible ranks of book-to-market and six possible ranks of size. Following Chan et al., (2001), the breakpoints for the size portfolio are based on NYSE issues only. The first four groups correspond to the largest four quintiles, groups five and six are formed by splitting the lowest quintile in half, reflecting the fact that many NYSE firms are larger than the entire CRSP population. The book-to-market breakpoints are based on the book-to-market ratio at the end of the most recent fiscal year for all stocks included in the Compustat database. Once the control portfolio breakpoints were established, the portfolios were formed using all stocks in the CRSP database. The results using this measure are qualitatively similar.

82 profit firms. Finally, consistent with the previous analysis, we also look at a subset of the sample excluding regulated firms (column (3)), resulting in a subset of 58 profit firms in non-regulated industries.

The level of net income is positive and significant ($p < 0.05$) for the entire sample (column (1)), while the change in net income is positive and significant ($p < 0.05$) when the sample is limited to profit firms (columns (2) and (3)). This is consistent with Ali and Zarowin (1992), who show that the change in earnings is more appropriate when earnings are permanent, and the level of earnings acts as a proxy for unexpected earnings when earnings are not purely permanent, which would be the case when there are loss firms in the sample. The level and change in pension costs are both positively associated with stock returns for the three sub-samples. While we do not find results for *CAP* that are consistent with those in Table 5, we do find some support that the spread of strategic human capital within the firm ($p < 0.10$ in column (1)) is positively associated with market-adjusted stock returns. More importantly, we find an association between the composite variable (*SUSTADV*) ($p < 0.05$ in columns (2) and (3); $p < 0.10$ in column (1)) and market-adjusted stock returns, which is robust across all 3 sub-samples and consistent with the findings presented in Table 5. We conclude that the support for Hypothesis 1 is robust to alternative model specifications (price model vs. returns model), as well as different sub-samples (all firms, profit firms and non-regulated firms).

[Insert Table 6]

Sensitivity analysis – Other firm resources

As discussed previously, the resource based view of the firm posits that resources are important to achieve a particular competitive position. Barney (1991) classifies resources into three categories: physical capital, human capital, and organizational capital. A firm can implement a strategy through a single resource or through the use of bundles of resources—such as a particular mix of physical, human and organizational capital (Barney, 1991). Different resources can have no relation to each other, they may be complements, and they may also be substitutes (Amit & Schoemaker, 1993). For example, a firm may provide firm-specific training on a manufacturing process that is used only by the firm using specialized equipment. In

this case, there is a complementary relation between the human capital resource and the physical resource. This will differ for each firm and it is difficult to develop a systematic variable that captures the relationship between similar resources across firms.

Similarly, intellectual capital is often divided into three components: human capital, organizational capital, and customer capital (see, e.g., Mouritsen et al., 2001; Bontis, 1998). Bontis (1998) finds that human capital is associated with firm performance through customer and structural capital, but not directly. Similarly, Bontis and Fitz-enz (2002) find that human capital has an effect on human capital effectiveness (a measure capturing the return on employee expenditures) through its effect on relational capital (similar to customer capital). Bontis posits that this is because employee knowledge must be codified into organizational knowledge to impact performance (Bontis, 1998, p. 71). This idea is very similar to the resource based view of the firm, which states that human capital must not be imitable to create value and one way to do this is to provide firm-specific skills and knowledge.

The focus of this paper is on strategic human capital. Although we have controlled for the book value of assets, future earnings potential as captured by net income, and employee cash expenditures as captured by pension expense, we may have missing variables in the form of physical, structural, and customer capital. Recall from Table 4 that causal ambiguity is correlated with research and development expenditures and that firm-specificity is correlated with property, plant, and equipment. To ensure that our results are not driven by variables that are missing from the model we perform two sensitivity analyses. First, we include two additional archival variables in the model. The first variable is property, plant and equipment, which captures physical capital. Since property, plant and equipment is a part of book value, it was already in the model, although not separately. The second variable is research and development expenditures, which captures a portion of structural capital. In untabulated results, we find that these variables are significant; however, they do not change the statistical inferences drawn above. Second, we include two additional survey variables in the model. The first variable captures the importance of structural capital to the firm and is measured through questions on technology and innovation capital such as patents. The second variable captures the importance of physical capital to the firm and is measured through

questions on the firm's fixed assets. In untabulated results, we find that neither of these variables is significant and including them in the model does not change the statistical inferences drawn above. In addition, to capture complementarities between strategic resources we included interaction terms of SUSTADV with both the structural capital and the physical capital survey variables. In untabulated results, we find that the interaction terms are not significant.

Conclusion

Based on the strategy-based resource framework, we measure four dimensions of human capital—firm-specificity, causal ambiguity, spread, and capability for producing efficiencies—and demonstrate that human capital that is both difficult to imitate and capable of producing efficiencies is positively valued by the market. On the other hand, human capital that is *not* difficult to imitate, but still capable of producing efficiencies is valued as an expense. We also find some evidence that large numbers of human capital are valued positively by the market.

Consistency across countries in accounting standards is becoming more important, yet there is little agreement even on the underlying definition of intangibles, intellectual capital, and more specifically, human capital (Stolowy & Jeny-Cazavan, 2001). Since our research demonstrates that the market values *strategic human capital*, perhaps our findings can inform the debate on the conceptualization and definition of the type of human capital that is important to firms and their stakeholders.

One area where the parameters of human capital visibly matter is in the reporting of intellectual capital. Firms continue to experiment with producing and distributing intellectual capital reports. Johanson et al. (1998, p. 7) discuss the notion of linking measurement and reporting of human capital to the balanced scorecard (BSC) framework, but they state “However, before the application of HRCA [human resource cost accounting], BSC or any other model (i.e., before measuring) you have to know what to measure. For instance, which are the important value drivers in the firm?” Additional research has attempted to develop a structured approach to the reporting of intellectual capital in terms of the content

of the report (van der Meer-Kooistra & Zijlstra, 2001). Our study has theoretical implications for this line of research and sheds insights on the type of human capital that could be measured. Our findings provide a starting point for developing metrics that firms can measure and use both internally for decision-making and externally in the reporting of intellectual capital. A valuable extension of this study would be to develop archival measures of these survey constructs for use as a future performance measurement tool and for possible inclusion in an IC report.

In contrast to a structured, quantifiable, IC report, Roslender and Fincham (2001) suggest that the reporting of intellectual capital might provide more useful information if it was fluid, flexible, and perhaps more qualitative in nature. This is consistent with Mouritsen's discourse on the importance of the narrative in IC reports. Our study also informs this approach to the reporting of human capital by providing some structure to guide the narrative. Certainly, our results indicate that the firm would want to make it known the extent to which their human capital is both capable of providing strategic efficiencies and difficult to imitate.

Contrary to Johanson (2002) who concludes that "capital market actors" do not value *human capital* indicators, this study documents that the U.S. stock market values *strategic* human capital. This is an important distinction. Johanson (2002, p. 34) points out that "financial analysts are not stupid persons." Our results provide support for Johanson's statement and demonstrate that capital market participants are able to parse through the available information and attach a value to strategic human capital that is *both* capable of providing efficiencies and difficult for competitors to imitate. However, this study does not shed insight on how market participants form their valuation. Mouritsen (2003) presents an interesting high-level discussion of the mental processes that market participants must undertake in order to value intangibles and intellectual capital. Mouritsen (2003, p. 27) states "...a valuable avenue for research is exactly to develop more of an appreciation of how it is that capital market participants become knowledgeable about the projects they investigate. Such a process view may add significantly to our understanding of the role of intangibles and intellectual capital in valuing firms and projects." Since we

document that strategic human capital is valued by market participants, future research could investigate the process by which it is valued. Case studies in this area could be particularly illuminating.

This study offers insights about a critical intangible asset that is increasingly important in today's organizations. However, consistent with most empirical studies, this one does have its limitations.

Although we ran numerous sensitivity and robustness tests, and incorporate several different model specifications, we have a sample of 106 firms, which results in low power. Future studies could expand on the sample size to provide more definitive support of the findings and an extension of this study that incorporates firm data such as compensation expense. We also only have data at a point in time. Tracking the use of strategic resources over time would provide better information with which to test associations with future earnings, and allow more informative inferences regarding the timing of the future benefits and the strength of the associations. We also use survey measures to construct our independent measures, which may contain noise. This study examines the value relevance of quantitative nonfinancial data.

While this is an important and innovative extension of the current valuation literature, to the extent future studies could capture the four characteristics of strategic human capital in financial terms, corroborating evidence would be obtained. Finally, we limit our investigation to one type of strategic resource because we are interested in understanding how the market values various components of strategic human capital. Recalling Barney's (1991) statement that not all resources are *strategic* resources, future research could incorporate our findings with that of Bontis (1998) and investigate how a broader set of *strategic* resources (e.g., physical, organizational, and human capital) are bundled to create strategic capabilities, and how these strategic capabilities are then valued by the market.

APPENDIX 1

Survey questions

Capability	<p>Our strategic human capital resources enable the firm to be more efficient. (1=strongly agree, 7 = strongly disagree)</p> <p>Our strategic human capital resources enable the firm to be more effective in exploiting opportunities. (1=strongly agree, 7=strongly disagree)</p>
Firm-Specific	<p>Is the knowledge base held by your firm's strategic human capital primarily specific to your organization? (1=knowledge base is readily transferable to other firms, 7=knowledge base is specific to this firm)</p> <p>Indicate the extent of your agreement with the following statement: It would be easy for an experienced employee to come into your organization and contribute as part of your firm's strategic human capital without any additional firm-specific training. (1=strongly agree, 7=strongly disagree)</p> <p>How much time is required for a newly hired employee with experience in the industry to become familiar with firm-specific knowledge of your products and customers in order to contribute as strategic human capital? (1=little time, 7=much time)</p> <p>On average, how much time would it take for a replacement employee to learn the firm-specific tasks necessary to be as effective as a current employee that contributes to your firm's strategic human capital? (1=little time, 7=much time)</p>
Causal Ambiguity	<p>To what extent would you say your firm's strategic human capital perform repetitive activities? (1=all the time, 7=very little)</p> <p>To what extent are the tasks performed by your firm's strategic human capital the same from day to day? (1=tasks remain the same, 7=tasks change daily)</p> <p>Does the firm's strategic human capital perform about the same job in the same way most of the time? (1=methods used constantly change, 7=methods used are very stable)</p> <p>To what extent is there an understandable sequence of steps that can be followed by the firm's strategic human capital in performing tasks? (1=sequence of steps is very understandable, 7=sequence is not well understood)</p> <p>To what extent would you say the work of your firm's strategic human capital is routine? (1=very routine tasks, 7=very non-routine tasks)</p> <p>To do the work of your organization, to what extent can your firm's strategic human capital actually rely on established procedures and practices? (1=procedures exist for all tasks, 7=there are few procedures)</p> <p>How repetitious are the duties performed by your firm's strategic human capital? (1=duties are very repetitious, 7=duties are very unique)</p>

Spread

Approximately what proportion of your organization's employees would you consider to be strategic human capital (i.e., those employees critical to sustaining your firm's competitive advantage)?

0%	1-20%	21-40%	41-60%	61-80%	81-99%	100%
1	2	3	4	5	6	7

Are the skills used by the strategic human capital group found throughout the organization? (1=skills are localized in one employee, 7=skills are spread throughout organization)

Is the knowledge possessed by the strategic human capital group found throughout the organization? (1=knowledge is localized in one key employee, 7=knowledge is spread throughout organization)

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Table 1
Descriptive statistics for multi-item constructs

Panel A: Reliability measures and descriptive statistics for human capital variables

	<u>Min.</u>	<u>Max.</u>	<u>Mean</u>	<u>Std. Dev.</u>	Cronbach <u>Alpha</u>	Explained <u>Variance</u>
<i>Capabilities (CAP)</i>	1.50	7.00	5.23	1.15	0.85	87%
(HC enables firm to be more efficient)	1.00	7.00	5.14	1.22		
(HC enables firm to be more effective)	1.00	7.00	5.33	1.22		
<i>Firm-specificity (FS)</i>	1.75	6.50	3.75	1.05	0.77	60%
(knowledge base specific)	1.00	7.00	3.68	1.58		
(additional firm-specific training)	1.00	7.00	3.87	1.44		
(time to learn f/s products/customers)	1.00	6.00	3.50	1.21		
(time needed for firm-specific training)	2.00	6.00	3.90	1.16		
<i>Causal Ambiguity (CA)</i>	1.29	5.86	3.81	0.90	0.84	54%
(repetitive activities)	1.00	7.00	3.87	1.39		
(same tasks daily)	1.00	7.00	3.94	1.26		
(nature of job)	1.00	7.00	3.95	1.35		
(follow sequence of steps)	1.00	7.00	3.51	1.30		
(routineness of work)	1.00	6.00	3.92	1.18		
(est. procedures/policies)	1.00	7.00	3.63	1.19		
(repetitious duties)	1.00	6.00	3.88	1.16		
<i>Spread (SPR)</i>	2.33	7.00	4.24	1.07	0.79	71%
(% of workforce strategic human cap.)	2.00	7.00	3.74	1.49		
(skills found throughout organization)	2.00	7.00	4.53	1.17		
(knowledge found throughout organ.)	2.00	7.00	4.51	1.21		

Shown are the descriptive statistics for the variables that proxy for four characteristics of human capital. Each variable is constructed from the survey questions described in detail in Appendix 1 and is the simple mean of the survey responses to the questions related to each variable. All survey questions are on a scale from 1 to 7.

Variable Descriptions:

CAP – the capability of the human capital

FS – the firm-specificity of the human capital

CA – the ambiguity of the work performed by human resources

SPR – the extent to which human capital is spread throughout the firm

Table 2
Investigation of non-response bias¹

Panel A: Early respondents²

Human capital variable	N	Mean	Std. Dev.
CAP	34	5.19	0.93
FS	34	3.79	1.03
CA	34	3.63	0.93
SPR	34	4.04	0.95

Panel B: Late respondents²

Human capital variable	N	Mean	Std. Dev.
CAP	28	5.50	1.24
FS	28	3.67	1.25
CA	28	3.81	0.95
SPR	28	4.49	1.15

See Table 1 for a description of the variables.

¹ Response bias was investigated based on comparisons of 1997 sales, depreciation, total assets and number of employees. Although not reported, differences in means between (a) respondents and non-respondents, (b) early and middle respondents, (c) early and late respondents and (d) middle and late respondents are not statistically significant on these archival variables. Additionally, there are no significant differences between respondents and the population from which the sample was drawn.

² Early respondents are those surveys returned prior to the second mailing. Middle respondents are those surveys returned prior to the third mailing. Late respondents are those surveys returned subsequent to the last mailing.

Table 3

Descriptive statistics

Panel A: Descriptive statistics

Variable	Mean	Median	Std. Dev.	Min.	Max.
<u>Regression Variables</u>					
PRICE (P)	19.03	15.88	15.61	0.15	87.44
BV	11.99	8.69	11.32	-3.71	65.33
NI	0.72	0.88	1.60	-6.56	4.31
PENS	0.12	0.04	0.36	-0.03	3.38
SUSTADV	0.36	0	0.48	0	1
<u>Other Variables</u>					
Market Value of Equity (in millions)	1,899	253	5,074	2.81	30,598
Market-to-book	2.33	1.75	2.39	-1.01	15.69
Number of Employees (in millions)	0.01	0.001	0.03	0.0001	0.23
Salary Expense per Share	8.30	2.89	14.92	1.16	71.99
Research & Development per Share	0.29	0	0.65	0	3.62
Net Property, Plant & Equipment per Share	7.66	3.02	12.66	0	108.87

Panel B: Industry Breakdown

1-digit SIC Code	Industry Description	Number	Percent
1	Metal and construction	6	5.7
2	Food, textile, and chemicals	8	7.5
3	Rubber, metal, and machine products	36	34.0
4	Transportation and utilities	12	11.3
5	Wholesale and retail trade	13	12.3
6	Financial services	21	19.8
7	Hotel and other services	6	5.7
8	Health and other services	4	3.7
Total		106	100%

Shown are descriptive statistics for the entire sample of 106 firms, except for salary expense per share, which is only available for 23 firms.

Variable Descriptions

PRICE (P) = price per share;

BV = book value of equity adjusted for pension contributions, deflated by shares outstanding

NI = net income before extraordinary items, deflated by shares outstanding;

PENS = pension and retirement cost, after tax and adjusted for non-service cost items, deflated by shares outstanding;

SUSTADV = composite variable used to proxy for sustained competitive advantage. It is equal to 1 if a firm is above the industry median on CAP and above the industry median on either FS, CA, or SPR (see Table 1, Panel A, for definitions), otherwise it is equal to zero.

Table 4
Pearson correlation coefficients (p-values in parentheses)

	BV	NI	PENS	CAP	FS	CA	SPR	SUSTADV	Number Empl.	Salary Exp.	R&D Exp.
NI	0.444 (0.0001)										
PENS	0.377 (0.0001)	0.171 (0.08)									
CAP	0.010 (0.92)	-0.096 (0.33)	0.036 (0.71)								
FS	0.223 (0.02)	-0.050 (0.61)	-0.082 (0.40)	0.090 (0.36)							
CA	0.046 (0.64)	-0.066 (0.50)	0.204 (0.04)	-0.026 (0.79)	0.032 (0.74)						
SPR	-0.036 (0.71)	0.057 (0.56)	-0.126 (0.20)	0.142 (0.15)	-0.099 (0.31)	-0.226 (0.02)					
SUSTADV	-0.021 (0.83)	-0.100 (0.31)	0.036 (0.71)	0.676 (0.0001)	0.001 (0.99)	0.103 (0.29)	0.218 (0.02)				
Number of Employees	0.312 (0.001)	-0.003 (0.98)	0.237 (0.01)	-0.027 (0.78)	-0.031 (0.76)	0.014 (0.89)	0.043 (0.66)	-0.061 (0.53)			
Salary Exp. per Share	0.288 (0.18)	-0.101 (0.65)	0.960 (0.0001)	0.204 (0.35)	-0.265 (0.22)	0.457 (0.03)	-0.483 (0.02)	0.206 (0.35)	0.199 (0.36)		
R&D Exp. per Share	0.060 (0.54)	-0.163 (0.09)	0.085 (0.39)	-0.001 (0.98)	0.122 (0.21)	0.260 (0.01)	0.009 (0.93)	0.043 (0.66)	0.170 (0.08)	0.060 (0.78)	
Net PP&E per Share	0.371 (0.0001)	-0.072 (0.47)	0.222 (0.02)	0.015 (0.88)	0.191 (0.05)	0.001 (0.99)	-0.097 (0.33)	0.148 (0.13)	0.238 (0.01)	0.306 (0.17)	-0.036 (0.71)

The correlation coefficients are estimated for the entire sample of 106 firms, except for salary expense per share, which is only available for 23 firms.

See Tables 1 and 3 for a description of the variables.

Table 5
Valuation model regression results

Panel A: All firms

Variable	Pred.	Source of sustained advantage					
		Basic model (1)	Sustained advantage composite variable (2)	(3)	(4)	(5)	(6)
Intercept	Np	-2.74 (-0.29)	8.35 (0.80)	-5.89 (-0.63)	-3.37 (-0.35)	-4.72 (-0.50)	-7.79 (-0.81)
BV	+	0.52*** (4.35)	0.53*** (4.44)	0.52*** (4.40)	0.53*** (4.36)	0.51*** (4.26)	0.52*** (4.32)
NI	+	4.34*** (5.55)	4.41*** (5.75)	4.41*** (5.71)	4.35*** (5.55)	4.40*** (5.65)	4.47*** (5.76)
PENS	+	-2.75 (-0.80)	-2.79 (-0.83)	-1.96 (-0.57)	-2.14 (-0.59)	-3.82 (-1.09)	-2.38 (-0.66)
CAP	Np	-1.55 (-1.59)	-3.47+++ (-2.68)	-0.95 (-0.94)	-1.50 (-1.53)	-1.59+ (-1.64)	-1.06 (-1.03)
FS	Np	0.80 (0.71)	0.96 (0.86)	0.50 (0.44)	0.70 (0.61)	0.99 (0.87)	0.61 (0.53)
CA	Np	2.08+ (1.64)	1.51 (1.19)	2.42++ (1.92)	2.21+ (1.71)	2.19+ (1.74)	2.61++ (2.03)
SPR	Np	2.32++ (2.19)	1.84+ (1.73)	2.20++ (2.10)	2.35++ (2.20)	2.68+++ (2.46)	2.58++ (2.35)
SUSTADV	+		6.86** (2.21)				
CAP*FS	+			1.84** (1.93)			1.47* (1.46)
CAP*CA	+				-0.68 (0.56)		-0.78 (-0.61)
CAP*SPR	+					-1.60 (-1.40)	-1.45 (-1.17)
Adj. R ²		0.49	0.51	0.50	0.49	0.49	0.50

Column (1) shows the results from a regression of price per share on book value of equity adjusted for pension contributions (BV), net income before extraordinary items (NI), pension and retirement cost after tax and adjusted for non-service cost items (PENS), and four characteristics of strategic human capital: the capability of the strategic human capital (CAP), the firm-specificity of the strategic human capital (FS), the ambiguity of the work performed by strategic human resources (CA), the extent to which strategic human capital is spread throughout the firm (SPR). Column (2) adds a composite variable to proxy for sustained competitive advantage (SUSTADV). Columns (3), (4), (5), and (6) add interaction terms between CAP and the other strategic human capital variables. All financial variables are deflated by shares outstanding and are as of the fiscal year end closest to the survey period of February to April 1999. For most firms this was December 31, 1998. The characteristics of human capital are constructed from survey data and are described in Table 1. The sample is 106 firms responding to the survey.

Np: no prediction;

***, **, * Significant at $p < 0.01, 0.05, 0.10$ using a one-tailed test;

+++ , ++ , + Significant at $p < 0.01, 0.05, 0.10$ using a two-tailed test.

Table 5
Valuation model regression results

Panel B: Firms in non-regulated industries

Variable	Pred.	Source of sustained advantage					
		Basic model (1)	Sustained advantage composite variable (2)	(3)	(4)	(5)	(6)
Intercept	Np	-6.69 (-0.68)	7.87 (0.77)	-11.27 (-1.16)	-8.82 (-0.90)	-7.37 (-0.74)	-12.23 (-1.23)
BV	+	0.43*** (3.10)	0.46*** (3.57)	0.43*** (3.22)	0.42*** (3.05)	0.43*** (3.09)	0.43*** (3.14)
NI	+	2.77*** (3.27)	2.82*** (3.55)	2.83*** (3.44)	2.71*** (3.23)	2.81*** (3.28)	2.79*** (3.35)
PENS	+	0.44 (0.12)	-0.43 (-0.13)	1.57 (0.44)	2.83 (0.73)	-0.12 (-0.03)	3.01 (0.75)
CAP	Np	-1.49 (-1.41)	-3.98+++ (-3.22)	-0.66 (-0.61)	-1.42 (-1.36)	-1.46 (-1.37)	-0.71 (-0.65)
FS	Np	1.68 (1.41)	1.69 (1.52)	1.20 (1.02)	1.58 (1.33)	1.66 (1.39)	1.19 (1.01)
CA	Np	1.61 (1.21)	0.99 (0.79)	1.99 (1.54)	1.89 (1.43)	1.69 (1.26)	2.15+ (1.62)
SPR	Np	2.73+++ (2.53)	2.02++ (1.95)	2.75+++ (2.62)	2.88+++ (2.68)	2.82+++ (2.55)	2.85+++ (2.63)
SUSTADV	+		10.24*** (3.36)				
CAP*FS	+			2.35*** (2.36)			2.06** (1.87)
CAP*CA	+				-1.98 (-1.59)		-1.36 (-1.04)
CAP*SPR	+					-0.57 (-0.43)	-0.06 (-0.05)
Adj. R ²		0.36	0.44	0.40	0.37	0.35	0.39

Column (1) shows the results from a regression of price per share on book value of equity adjusted for pension contributions (BV), net income before extraordinary items (NI), pension and retirement cost after tax and adjusted for non-service cost items (PENS), and four characteristics of strategic human capital: the capability of the strategic human capital (CAP), the firm-specificity of the strategic human capital (FS), the ambiguity of the work performed by strategic human resources (CA), the extent to which strategic human capital is spread throughout the firm (SPR). Column (2) adds a composite variable to proxy for sustained competitive advantage (SUSTADV). Columns (3), (4), (5), and (6) add interaction terms between CAP and the other strategic human capital variables. All financial variables are deflated by shares outstanding and are as of the fiscal year end closest to the survey period of February to April 1999. For most firms this was December 31, 1998. The characteristics of human capital are constructed from survey data and are described in Table 1. The sample is 81 firms in non-regulated industries.

Np: no prediction;

***, **, * Significant at $p < 0.01, 0.05, 0.10$ using a one-tailed test;

+++ , ++ , + Significant at $p < 0.01, 0.05, 0.10$ using a two-tailed test.

Table 6
Sensitivity analysis using market-adjusted stock returns

Variable	Predictions	All firms (1)	Profit Firms (2)	Profit firms excl. regulated industries (3)
Intercept	Np	-0.30 (-1.12)	0.15 (0.49)	0.24 (0.64)
NI	+	0.53** (2.31)	0.04 (0.06)	-0.48 (-0.56)
PENS	+	3.44* (1.57)	4.10** (1.82)	4.58** (1.80)
ΔNI	+	0.03 (0.25)	1.45** (2.32)	1.65** (2.33)
ΔPENS	+	17.75*** (2.34)	17.28** (1.90)	18.19** (1.70)
CAP	Np	-0.01 (-0.41)	-0.04 (-1.20)	-0.04 (-1.10)
FS	NP	0.01 (0.34)	-0.01 (-0.38)	-0.03 (-0.69)
CA	Np	-0.01 (-0.32)	-0.06 (-1.50)	-0.07 (-1.62)
SPR	NP	0.05 ⁺ (1.81)	0.03 (1.09)	0.04 (1.07)
SUSTADV	+	0.11* (1.39)	0.19** (2.04)	0.24** (2.22)
Adjusted R ²		0.12	0.13	0.17
Number of Obs.		103	82	58

Shown are the results from a regression of market-adjusted stock returns (BHAR) on the level of net income per share before extraordinary items (NI), the level of pension and retirement cost per share, after tax and adjusted for non-service cost items (PENS), the change in net income per share before extraordinary items (ΔNI), the change in pension and retirement cost per share (ΔPENS), and five characteristics of strategic human capital: the capability of the strategic human capital (CAP), the firm-specificity of the strategic human capital (FS), the ambiguity of the work performed by strategic human resources (CA), the extent to which strategic human capital is spread throughout the firm (SPR) and a composite variable to proxy for sustained competitive advantage (SUSTADV). All financial variables are deflated by the beginning of the year stock price. The characteristics of human capital are constructed from survey data and are described in Table 1.

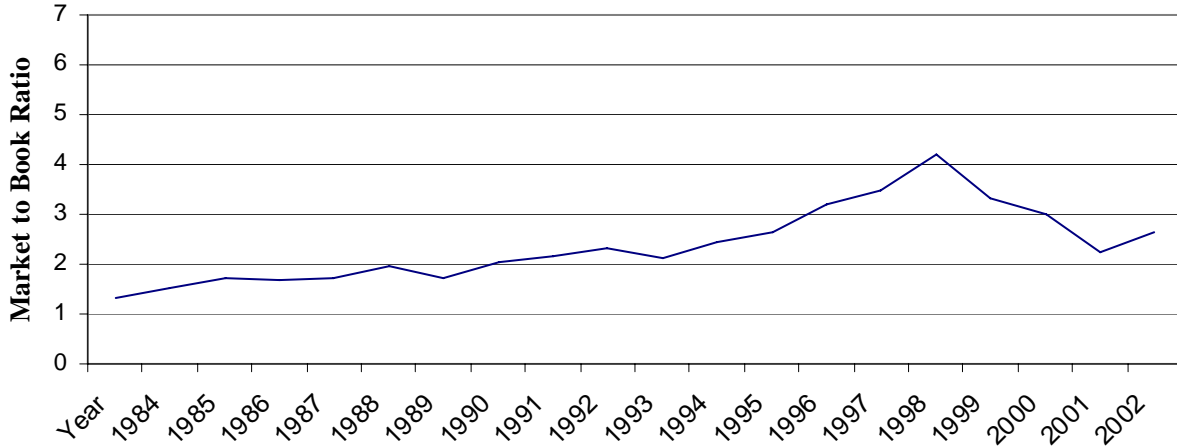
Np: No prediction

***, **, * Significant at $p < 0.01, 0.05, 0.10$ using a one tailed test;

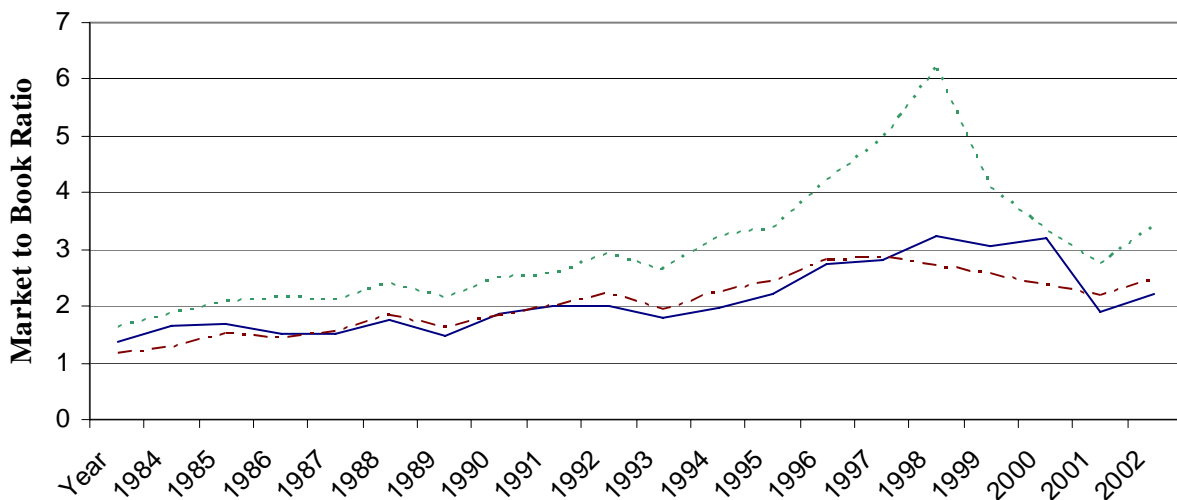
⁺ Significant at $p < 0.10$ using a two-tailed test

Figure 1
Market-to-book ratio over the past 20 years

Panel A: All Firms



Panel B: Broken Down by Broad Industry Classification



— Service and Retail Firms ····· R&D Firms - - - - Manufacturing and Other Firms

Figure 1 shows the aggregate market-to-book ratio for all firms in the Compustat database reporting book value of common equity, common stock price, and common shares outstanding. The aggregate market-to-book ratio is the aggregate market value of all firms divided by their aggregate book value at year-end. Service and retail firms are all firms with a two digit SIC code of 50 or higher. R&D firms are all firms in R&D intensive industries (SIC codes 28, 35, 36, 38). Manufacturing and other firms are all firms in SIC codes 01 to 49 except R&D intensive industries