

New Venture Valuation by Venture Capitalists: An Integrative Approach

Dingkun Ge

Assistant Professor, San Francisco State University

James M. Mahoney

Economist, Federal Reserve Bank of New York

Joseph T. Mahoney

Professor of Strategic Management

Abstract

How to value accurately a new venture is a critical and under-researched question in entrepreneurial financing. Leveraging established theories in strategic management, this research study develops an integrative theoretical framework to examine whether venture capitalists' valuation of a new venture can be explained by variables identified in the strategy literature as important to predicting firm-level economic performance. A systematic linkage between well-developed theories in strategy and venture capital valuation practice are corroborated empirically. This research study proposes a complementary method to extant valuation methods to value a new venture.

We thank Rajshree Agarwal, Mark Glennon, Glenn Hoetker, Yasemin Kor, Jeffrey Krug, Huseyin Leblebici, Steven Michael, Bob Valli, and Zhijie Xiao for comments on an earlier draft of this paper. The usual disclaimer applies. The opinions expressed in this paper are those of the authors and do not necessarily represent those of the Federal Reserve Bank of New York or the Federal Reserve System.

Published: 2005

URL: http://www.business.uiuc.edu/Working_Papers/papers/05-0124.pdf

New Venture Valuation by Venture Capitalists: An Integrative Approach

Dingkun Ge
Assistant Professor
College of Business
San Francisco State University
1600 Holloway Ave.
San Francisco, CA 94132-1722
(415) 338-7475

James M. Mahoney
Economist
Federal Reserve Bank of New York
33 Liberty Street
New York, NY 10045
(212) 720-8910

Joseph T. Mahoney
Professor of Strategic Management
Department of Business Administration
College of Business
University of Illinois at Urbana-Champaign
1206 South Sixth Street
Champaign, IL 61820
(217) 244-8257

We thank Rajshree Agarwal, Mark Glennon, Glenn Hoetker, Yasemin Kor, Jeffrey Krug, Huseyin Leblebici, Steven Michael, Bob Valli, and Zhijie Xiao for comments on an earlier draft of this paper. The usual disclaimer applies. The opinions expressed in this paper are those of the authors and do not necessarily represent those of the Federal Reserve Bank of New York or the Federal Reserve System.

New Venture Valuation by Venture Capitalists: An Integrative Approach

Abstract

How to value accurately a new venture is a critical and under-researched question in entrepreneurial financing. Leveraging established theories in strategic management, this research study develops an integrative theoretical framework to examine whether venture capitalists' valuation of a new venture can be explained by variables identified in the strategy literature as important to predicting firm-level economic performance. A systematic linkage between well-developed theories in strategy and venture capital valuation practice are corroborated empirically. This research study proposes a complementary method to extant valuation methods to value a new venture.

Key Words: Valuation, Venture Capital Investment, and Entrepreneurial Finance.

Executive Summary

Determining the economic valuation of a company is one of the more challenging and important discussions an entrepreneur can have with investors (Quindlen 2000). Research that provides operational guidance on such economic valuation, is, however, lacking. Indeed, Wright and Robbie conclude that: “little work is available on the valuation of venture capital investments” (1998:558). Furthermore, some venture capitalists maintain that: “the truth about valuing a start-up is that it’s often a guess” (May and Simmons, 2001:129). For example, inviting thirty-one valuation experts (e.g., venture capitalists, valuation consultants and business professors) to place an economic value on a small avionic company acquired by Goodyear, Waldron and Hubbard (1991) find these economic valuation experts provided valuation estimates ranging from \$6 million to \$17.5 million for the *same* company based on exactly the *same* information. Waldron and Hubbard conclude that: "From these results it is easy to see why so many consider the valuation of a closely held business akin to alchemy" (1991:49).

Motivated by such an unmet research need, we develop an integrative framework from strategic management theories to investigate how factors identified in the research literature that are important to firm-level performance may affect the economic valuation of a new venture when the new venture seeks equity financing from venture capitalists. Our integrative framework suggests that firm resources, external ties, and market opportunities jointly influence firm-level profitability, which can serve as the fundamental basis for the economic valuation of a new venture. Our empirical results from analyses of 340 rounds of early stage venture capital investments in 210 new ventures corroborate hypotheses developed from our integrative framework. We find empirically that venture capitalists typically value a new venture higher if: (1) the new venture is in an industry with higher product differentiation and faster growth; (2) the founder(s) has top management experience and startup experiences before founding the current venture; (3) the new venture was founded by a team of founders rather than a solo founder and, major management functions are covered by a complete management team; and (4) the new venture has external partners.

Our integrative approach contributes at least three advances to the research literature. First, leveraging strategic management theories, our approach systematically identifies key factors that influence firm-level profitability. Second, we utilize recent empirical methodologies on how to measure these key factors. These methods can help both venture capitalists and entrepreneurs better measure those important variables, instead of subjective evaluation from experience. Third, adopting a regression analysis method to estimate the relative importance of each variable in the model, our approach essentially decomposes the economic valuation decision into many input factors; and thus, we extract market-implied prices for the input factors, and thereby do not rely solely on the aggregate-level deal characteristics. This decomposition method overcomes some critical problems embedded in the venture capital market. As in the more efficient public capital market, while each individual venture capital investor is not able to estimate precisely the true economic value of new venture, the mean of their individual estimates is always close to the true economic value, as long as their estimation is independent and the number of investors is large enough. The problem for the venture capital market to set this “market price” is that the venture capital market is not efficient and more importantly, the economic valuation is always determined in a “small numbers” bargaining situation – it does not have the opportunity to let the high valuations and low valuations cancel out each other, as in an efficient market. Like the hedonic regression method in pricing research, the artificially created “market” in our approach can be expected to figure out the true economic value of each of the input factors when the deal number is large enough. The strength of this approach resides critically in “pooling” the individual investors across the market, which the venture capital market itself could not achieve due to illiquidity of ownership and “small number” bargaining situation.

At a minimum, when it is difficult to value a subject based on output (e.g., future cash flows), pricing it based on inputs (e.g., entrepreneur, industry attractiveness, etc.) may provide a useful complementary method to value new ventures when key variables can be systematically identified and reliable coefficients can be consistently estimated from large samples.

INTRODUCTION

What are the key factors that influence the economic value of an entrepreneurial firm when such a firm seeks equity financing from a venture capitalist? Generations of entrepreneurs and venture capitalists have been facing this challenge; yet, how to place an economic value on a new venture is still one of the more difficult tasks in venture capital decision-making (Mechner, 1989). New venture valuation is also an under-developed area in the research literature (Barry, 1994; Davila, Foster and Gupta, 2003; Sarasvathy, 1999). As one of the few large-sample empirical studies on this important issue, the current paper attempts to fill this research gap.

Providing the perspective of a well-known venture capitalist in Silicon Valley, Quindlen maintains that determining the economic valuation of an entrepreneurial firm is a challenging task, and: “It’s much more art than science” (2000: 169). Also, May and Simmons state that: “the truth about valuing a start-up is that it’s often a guess” (2001: 129). Scholarly research in this area is rare and “little work is available on the valuation of venture capital investments” (Wright and Robbie, 1998: 558). Indeed, both academic researchers and venture capitalists are increasingly recognizing the importance of contributing both sound theoretical and practical contributions to this nascent research area (Blaydon and Horvath, 2002).

This research applies an integrative approach to investigate whether the economic valuation of a new venture by a venture capitalist can be explained by key factors identified in the research literature as important to explaining and predicting firm performance.¹ According to corporate finance theory, the economic value of any investment is determined by the sum of the discounted value of its future cash flows (Brealey and Myers, 2001). Building on this well-

¹ In this paper, we treat industrial organization economics, resource-based theory and the social network perspective as foundational theories of strategic management and we refer to these theories collectively as an integrative approach.

established theoretical foundation, we propose that key factors that are theorized to be important to firm-level economic performance in strategic management theories should be related to the economic value of a new venture. Thus, we maintain that savvy venture capitalists should take these key factors into consideration when valuating a new venture.

In this paper, eight hypotheses are developed from this central proposition and are empirically tested on 340 rounds of early stage venture capital financing in 210 new ventures. Our empirical results suggest that when valuating a new venture, venture capitalists do take into consideration those key factors important to firm-level economic performance --- such as industrial structure, founder and top management team characteristics, and the social network of a new venture.

These empirical findings have implications for both theory building and entrepreneurial financing practice. First, guided by established theories in strategic management, this paper proposes a theoretical rationale and develops an integrative framework to assess new venture valuation. The current paper helps establish an initial linkage between well-grounded research and venture capital valuation practice, which has been criticized for lacking a sound theoretical foundation (Fried and Hisrich, 1994; Tyebjee and Bruno, 1984).

Second, the idiosyncratic characteristics of new ventures (e.g., their short operating history, and limited accounting information) and inefficiency of the venture capital market present fundamental theoretical and economic measurement challenges for extant financial valuation approaches, which rely heavily on accounting information that early stage new ventures typically cannot provide. The integrative framework proposed in this paper is less dependent on accounting information and most of the variables in our integrative framework can be objectively measured.

Third, our proposed integrative framework has immediate application and is readily useable by both venture capitalists and entrepreneurs. Estimated with a large sample, the model can empirically derive the relative value of each input factor from real market data. The empirical findings of this paper should inform future research that explores and improves traditional financial valuation approaches to help venture capitalists and entrepreneurs value their new ventures more precisely.

The remainder of this paper is organized as follows. In the next section, we review the relevant research literature in corporate finance, entrepreneurship, and strategic management, which leads to our central proposition that an integrative research approach can improve the precision of new venture valuation. We then introduce the theoretical framework, upon which hypotheses are developed. In the fourth section, we discuss the empirical context and research methodology. In the fifth and final section, we conclude by discussing potential contributions, limitations and future research direction.

LITERATURE REVIEW

Systematic and theoretically grounded research on new venture valuation is rare. Although a few research studies in corporate finance, entrepreneurship, and strategic management provide some insight, little systematic attention has been given to this important topic. Here, we briefly review the limited research literature and highlight the need for a more rigorous and integrative approach in this area.

How to value accurately a firm is traditionally a financial economics topic and most extant valuation methods are based on accounting information. According to financial economics theory, the economic value of any investment is the sum of the present value of its future cash flows (Brealey and Myers, 2001). Such an economic valuation depends on the ability of the enterprise to generate future cash flows and investors' assessments of, and attitudes towards, the risk of these future cash flows (Smith and Smith, 2000). The corporate finance literature reports four valuation methods most commonly used in startup valuation: discounted cash flow, earnings multiple, net asset, and venture capital method. However, as we discuss below, none of these approaches is fully satisfactory for new entrepreneurial firms.

A fundamental assumption underlying these financial valuation methods is that there is an efficient capital market for the ownership of the firm. This assumption may be workable for the public capital market, as legal rules are in place, which regulate public firms to release all material information to the market and private information is not as common (Fama, 1991). Traded in a competitive market, the ownership of these firms is also highly liquid.

This perfect capital market assumption may approximately hold for public companies, but may not hold in capital markets for new ventures. The venture capital market is arguably an inefficient market and quite different in several aspects from the public capital market (Lerner,

2000). First, venture capitalists invest in private and new ventures. New ventures have a short operating history, and thus accounting information is limited, making the new venture's future cash flows difficult to estimate. Second, the law does not require that private firms report any financial or management information. Such information is difficult to collect and to verify. Thus, the information asymmetry between entrepreneur and potential investors is typically high. Third, due to regulation (Lerner, 1994) the tradeability of shareholdings in these firms is low. Thus, there is not a ready market for these new entrepreneurial firms. Finally, most of the assets of these entrepreneurial firms are intangible and highly firm specific (Gompers and Lerner, 2001).

The inefficiency of the venture capital market renders the four major financial valuation methods less satisfactory in valuing new ventures (Timmons and Spinelli, 2004). For DCF approach, it is difficult to estimate the future cash flows and to determine the appropriate discount rate. For the earnings multiple approach, three challenges exist. First, most new ventures do not have earnings. Second, defining the boundary of the reference group (to determine the multiple) is not always easy or even possible (e.g., for some breakthrough innovations – such as the personal computer or biotechnology firms at their infant stage). Third, even if the reference group is defined, it is still quite subjective to choose the multiples and there is no theoretical guidance for this choice. The limitation of the net assets approach is that it ignores the economic value of growth opportunities and, most new ventures do not have substantial levels of tangible assets. Finally, the venture capital method is very subjective and the valuation computed is not easy to justify (Gompers, 1999).

The deficiencies of the above methods are well documented in Waldron and Hubbard (1991). Inviting thirty-one valuation experts (e.g., venture capitalists, valuation consultants and business professors) to place an economic value on a small avionic company acquired by

Goodyear, Waldron and Hubbard (1991) find these financial valuation experts provided valuation estimates ranging from \$6 million to \$17.5 million for the *same* company based on exactly the *same* information. Waldron and Hubbard conclude that: "From these results it is easy to see why so many consider the valuation of a closely held business akin to alchemy" (1991:49).

The huge disparity of economic valuations for same firm still persists today. For example, the *Wall Street Journal* (2003) reports that Santera Systems, a Texas-based telecommunication firm, was valued at \$4.42 a share by Austin Ventures *at the same time* that Sequoia Capital held it at 46 cents a share. Clearly, we need to go beyond extant financial economics theory to look for an alternative conceptual lens for valuation. Unfortunately, contemporary entrepreneurship research literature does not offer much guidance either.

The entrepreneurship literature has an increasingly large body of research on venture capital investment. Many research studies find that venture capital investment follows a somewhat well-defined staged process (Fried and Hisrich, 1994; Wells, 1974), which typically consists of the following six stages: deal origination, deal screening, deal evaluation, deal structuring, post-investment activity, and exit of investment. However, this line of research focuses on criteria that venture capitalists use to screen and evaluate a deal, and not on how to value accurately a new venture (e.g., Hisrich and Jankowicz, 1990; Kaplan and Stromberg, 2002; MacMillan, Siegel and SubbaNarasimha, 1985; MacMillan, Zemmann and SubbaNarasimha, 1987; Rah, Jung and Lee, 1994).

Though these works have shed some light on what factors that venture capitalists use to make the "GO/NO-GO" decision, the research literature has not discussed whether or how these factors affect the economic valuation of new ventures. Besides several teaching notes on financial valuation methods (e.g., Gompers, 1999; Lerner and Willinge, 2002), the most relevant

industry report on startup valuation is perhaps Hill and Power (2001), which asks venture capitalists to rate a number of factors when valuating a deal, with a rating of 5 being the most important and 1 being the least important. The top factors are reported below:

Relative Importance of Key Factors in Venture Capitalists' Valuation of New Ventures:

	Key Factor	Points
1.	Quality of Management	4.5
2.	Size of the market	3.8
3.	Product qualities	3.7
4.	Rate of market growth	3.5
5.	Competition	3.5
6.	Barriers to entry	3.4
7.	Company's stage of development	3.2
8.	Industry that the company is in	3.0

Important for developing an integrative approach to new venture valuation, Hill and Power (2001) provide an empirical investigation of the factors used by venture capitalists in the economic valuation of a new business venture. These key factors are similar to those identified in strategic management theories as important influences on firm-level economic performance. Furthermore, most of the identified key factors can be classified into two major categories: (1) **resources and capabilities** (quality of management, product qualities, company's stage of development), and (2) **market structure** (size of the market, rate of market growth, competition, barriers to entry, and industry the company is in).

These two major categories are consistent with the scope of two major strategic management theories: (1) resource-based theory (e.g., Barney, 1991; Mahoney and Pandian, 1992) and (2) the structure-conduct-performance paradigm in industrial organization economics

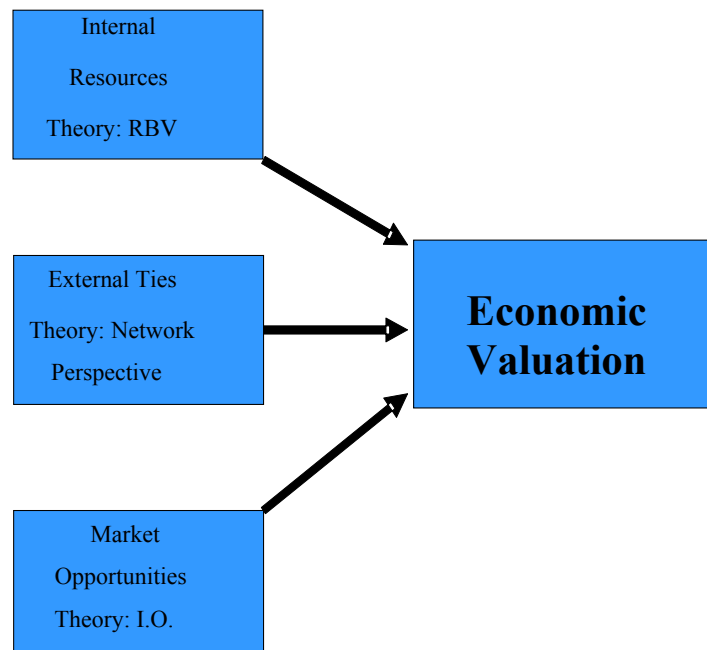
(e.g., Bain, 1959; Scherer and Ross, 1990). As proposed by Shepherd (1999), this consistency, between venture capitalists' assessment policy "in use" and more rigorous theoretical predictions, suggests a potential opportunity to apply integrative frameworks to better meet the challenge of valuating a new venture accurately. With the objective of providing a synthesis of research "know-why" and practitioner "know-how," the current paper applies strategic management theories to develop an integrative framework to value a new venture accurately.

This research opportunity can be further justified on at least two additional grounds. First, financial economists have long called for including non-financial variables in economic valuation models (e.g., Damodaran, 2002). Along these lines, and inspired by Modigliani and Miller (1958), Madden (1999) develops an economic valuation approach that incorporates both accounting and non-accounting variables, such as managerial skills and customer satisfaction, to better assess the economic value of a public company. Strategic management theories are well positioned to more systematically guide the selection of such variables. Second, the fundamental concern of financial valuation is to estimate expected future cash flows (or other equivalents). As a measure of firm-level economic profitability, future cash flows can be readily interpreted as an indicator of the expected future economic performance of the firm, and can be used productively to analyze venture capitalists' economic valuation of new ventures. In the next section, we develop an integrative framework to guide our analysis of new venture economic valuation, upon which hypotheses are developed.

THEORY AND HYPOTHESES

Several strategic management theories have been developed to help explain and predict firm-level economic performance, and the following three are of particular relevance for our purpose: (1) the structure-conduct-performance paradigm of industrial organization economics; (2) the resource-based approach; and (3) the network perspective. Each of these approaches explains and predicts firm-level economic performance from a different theoretical lens.

The industrial organization economics' structure-conduct-performance (S-C-P) paradigm (Scherer and Ross, 1990) focuses on market conditions in which firms interact and the theory highlights the importance of industrial structure influencing firm-level conduct or strategies, which in turn impact economic performance. The resource-based approach conceptualizes a firm as a bundle of valuable resources (Penrose, 1959) and stresses the importance of firm-specific resources and organizational capabilities in helping to predict firm performance. Bridging these two theoretical lenses, the network perspective underscores the importance of external ties of a firm in channeling resource flows, both enabling and constraining a firm's strategies and, impacting firm performance. Putting these three theoretical perspectives together, we propose an integrative strategic management framework to help contribute to an improved and theoretically grounded economic valuation of a new business venture:



Industrial Structure and New Venture Valuation

The industrial organization “S-C-P Paradigm” originated from the works of Mason (1939) and Bain (1959). The central causal linkages are that industry structure determines firm-level strategy, which in turn determines economic performance (Scherer and Ross, 1990). Structural elements that are posited to impede competitive forces (e.g., entry barriers) are predicted to lead to better industry-level and firm-level economic performance. Extant theoretical and empirical research has identified industry concentration, product differentiation, and industry demand growth, among other variables as important structural elements for explaining and predicting economic performance (Scherer and Ross, 1990; Shepherd, 1972). However, to make our framework more tractable, the current paper focuses on product differentiation and industry growth, which have been consistently reported as two of the more important structural elements in explaining and predicting the economic performance of both established business ventures and of new business ventures (Bain, 1959; McDougall, Covin, Robinson, and Herron, 1994; Sandberg, 1986).

Product Differentiation

Product differentiation is believed to be one of the more important structural elements of an industry for the purpose of explaining and predicting economic performance (Bain, 1959; Caves, 1972; Harrigan, 1981). Building on the “S-C-P” logic, Porter (1980) argues that industries characterized by low product differentiation require new entrants to attend to cost and capacity considerations, which encourages competitive responses by the incumbent firms towards these entrants, which, in turn, typically leads to decreases in economic profitability. Sandberg (1986) finds that new ventures entering industries characterized by heterogeneous

products achieved higher levels of economic performance than those entering industries characterized by homogeneous products.

Based on the theoretical logic described above and the fact that new ventures in high product differentiated industries perform better economically than those in low product differentiated industries, it follows that a venture capitalist will, *ceteris paribus*, value a new venture higher in a more highly product differentiated industry. Therefore, we propose that:

H1: *Ceteris paribus*, the higher the product differentiation in an industry, the higher the economic valuation of a new business venture, in that industry.

Industry Demand Growth

While product differentiation is a compelling structural element on the *supply side* for helping to explain and predict differences in economic performance, the industry demand growth is a compelling structural element on the *demand side* for helping to explain and predict differences in economic performance (Caves, 1972). Porter (1980) argues that because rapid industry growth ensures that incumbents can maintain strong financial performance, even though a new entrant takes some market share, an entrant into a rapidly growing industry may experience less competitive response since it is not a zero-sum game. McDougall, Covin, Robinson and Herron (1994) found empirically that new ventures in high-growth industries achieved higher sales growth and profitability. Indeed, venture capitalists actively seek investment opportunities in such high growth markets (Zider, 1998). Given the above logic, venture capitalists may give startups in a fast growing market a higher economic valuation (Timmons and Spinelli, 2004). Therefore, we propose that:

H2: *Ceteris paribus*, the higher the demand growth rate of an industry the higher the economic valuation of new business ventures in that industry.

Internal Resources and New Venture Valuation

From a resource-based approach, superior firm-level economic performance is derived from the possession (Barney, 1991, Peteraf, 1993), deployment (Mahoney and Pandian, 1992), configuration (Eisenhardt and Martin, 2000) and renewal (Alvarez and Busenitz, 2001; Teece, Pisano and Shuen 1997) of superior firm resources. Early research focused on developing analytical frameworks to identify such superior resources (Barney, 1991; Dierickx and Cool, 1989). The resource-based approach maintains that only those resources that are valuable, rare, inimitable and non-substitutable --- the so-called VRIN test --- can lead to sustainable competitive advantage.

In this research paper we maintain that entrepreneurial human capital skills and organizational capabilities embedded in team-based human capital are primary candidates for passing the VRIN test. Emphasizing this perspective helps bridge the resource-based theory and entrepreneurship research on both the individual entrepreneur and entrepreneurial management team. Arguably, as the most important human resource a new venture can have, the founder / entrepreneur plays a critical role in initiating, maintaining and growing the new business (Cooper, Gimeno and Woo, 1994; Kaplan and Stromberg, 2000; Muzyka, Birley and Leleux, 1996; Rah, Jung and Lee, 1994). Recently, however, the fundamental importance of the entrepreneurial *team* has also gained increasing research attention. With increasing complexity of technologies and intensity of competition, the characteristics of new venture team become a major concern to venture capitalists (Hall and Hofer, 1993; Zacharakis and Meyers, 1998). Consistent with this research tradition, we focus here on the founder/entrepreneur and the entrepreneurial management team.

Founder Effects

“Nearly every mistake I’ve made has been in picking the wrong people, not the wrong idea,” reflected Arthur Rock, one of the most respected venture capitalists, who funded Intel (Sahlman, Stevenson, Roberts and Bhide 1999: 351). MacMillan, Siegel and SubbaNarasimha (1985) and Hill and Powell (2001) provide corroborative evidence for this insight. Indeed, in our literature review, we found ten out of the thirteen extant research studies on venture capitalists investment process report that the entrepreneur’s “track record” is very important for predicting the success of a new venture. Three types of experience are considered important in determining this track record: 1) industrial experience (technical and/or market), 2) management experience, and 3) start-up or entrepreneurial experience (Bird, 1993).

Industrial Experience

It is typically highly risky to start a business without specialized (technological and/or market) knowledge of the industry. Previous experience in the same or related industry can help the entrepreneur gain such critical knowledge. Such experience provides the entrepreneur with certain key competencies that are highly useful for identifying opportunities and evaluating and managing risk. Recognizing the importance of industry experiences, would-be entrepreneurs may follow a self-selection process, albeit the process is by no means perfect. For example, prior marketing experience in the same or related industry was found in 48% of the entrepreneurial teams starting high-tech firms in Canada (Doutriaux and Simyar, 1987) and that such experience was positively related to the sales growth in the first three years of business. Similar empirical results have also been found for technical experiences (Baum, Calabrese and Silverman, 2000).

Growth firms tend to be led by entrepreneurs who began their new business venture based on ideas developed in their previous jobs (Dunkelberg, Cooper, Woo and Dennis, 1987). Moreover, the number of years the entrepreneur has worked in a similar industry has been found to be significantly and positively related to sales growth (Cooper and Daily, 1997; Gimeno, Folta and Cooper, 1997; Siegel, Siegel and MacMillan, 1993). Further, founders' industry experiences are positively related to various measures of investment returns (Scheffczyk and Gorpott, 2001). Based on this logic, we propose that:

H3: Ceteris paribus, a new venture is valued higher if its founder has relevant industry experience before founding the business venture.

Top Management Experience

The research literature on top management experience highlights the skills and knowledge gained through managing layers of hierarchies. Its relevance to the financial performance and economic valuation of a new business venture is that the founder "has been there before." Thus, the founder presumably knows the necessary strategies and organizational structures to grow the small new venture to a larger size that requires more sophisticated management infrastructures to support. Bird (1993) argues that organizations may stay small because they lack appropriate management systems to sustain expansion and growth. Therefore, managerial experiences should enhance a new business venture's ability to grow. Empirical findings are consistent with this argument (Gimino, Folta, Cooper and Woo, 1997; Teach, Schwartz and Tarpley, 1989). Therefore, we propose that:

H4: Ceteris paribus, a new business venture is valued higher if its founder has previous top management experiences.

Start-up Experiences²

Prior startup experience of the founder is assumed to yield valuable entrepreneurial skills, a business reputation, and numerous network contacts, which are strategic resources that can be leveraged in future business ventures (Starr and MacMillan, 1990). Experienced founders have accumulated the wealth, power and legitimacy that can be used to surmount the liability of newness (Starr and Bygrave, 1991). Prior experiences as a founder lead to optimism in implementing the current venture (Cooper, Willard and Woo, 1986) and sales growth in the first year of high-tech firms (Doutriaux and Simyar, 1987). Moreover, venture capitalists believe that direct experience in starting up a new business is an important predictor of new venture success (Stuart and Abetti, 1990). Lerner (1995) finds that venture capitalists' representation on boards of directors increased by 44% for startups in which the CEO had no prior experience in running an entrepreneurial firm. Increased board presence of venture capitalists indicates increased needs for both assistance and monitoring, which incurs more costs for the investors. Increased assistance and monitoring costs by venture capitalists lead to lower economic valuation of a new venture. Therefore, we propose:

H5: Ceteris paribus, a new venture is valued higher if its founder has previous startup experiences.

² Startup experience and top management experience are two related, but not identical, concepts. The emphasis of startup experience is on the detailed process of founding a company, unlike top management experience, which highlights the skills and knowledge gained through managing hierarchies. Some argue that startup experience may be a subset of top management experience. This argument is based on an assumption that the startup that a founder starts ultimately grows up. However, 47% of startups fail within the first two years of founding (Timmons and Spinelli, 2004). Government data show that between 1990 and 1999, the average termination rate of small businesses is 90% (Small Business Administration, 1999). Therefore, having startup experience does not guarantee top management experience later on, and each concept warrants separate theoretical discussion.

Entrepreneurial Team Effects

Recently, the importance of the entrepreneurial team has gained increasing attention from researchers and has had increased salience to venture capitalists in their investment decision. Specifically, venture capitalists are concerned with the founding team and the completeness of the skill set of the new venture management team (Daily, McDougall, Covin and Dalton, 2002; Muzyka, Birley and Leleux, 1996; Timmons and Spinelli, 2004; Zacharakis and Meyers, 1998)

Solo Founder vs. Founding Team

With increasing complexity of technologies and intensity of competition, more and more new ventures are now founded by a team of founders, rather than a solo entrepreneur. Eisenhardt and Schoonhoven argue that: “more founders mean that there are more people available to do the enormous job of starting a new firm that there is more opportunity for specialization in decision making” (1990: 510). Teams help reduce cycle time in new product development (Ancona and Caldwell, 1992), increase the likelihood of innovation (Eisenhardt and Tabrizi, 1995), and improve product and service qualities (Lawler, Mohrman, and Ledford, 1995). Entrepreneurial teams help attain strategic maneuvers including attaining first-mover advantages, forming strategic alliances, and/or developing discontinuous innovations (Tushman and Anderson, 1986). Entrepreneurial teams also allow firms greater agility to enter markets quickly and to maintain responsiveness to changing market conditions.

Teams are particularly crucial in the context of technological entrepreneurship because investment decisions are based, at least in part, on the quality of the founding team (Gupta and Sapienza, 1992). Such founding members are the repositories of much of the technical and management knowledge, skills, and ability that make up the intangible assets of the firm (Cooper

and Daily, 1997). Likewise, the size of the founding team has been found positively related to a new business venture's sales growth (Feeser and Willard, 1990; Eisenhardt and Schoonhoven, 1990). Following this logic, we propose that:

H6: Ceteris paribus, new business ventures founded by a team are valued higher than those founded by one founder.

Completeness of Management Team

In this increasingly complex and competitive marketplace, a “one-man” shop is less likely to survive – simply because no one can have all the necessary skills and knowledge to compete effectively. Managers with different skills must perform a variety of necessary managerial functions in order to cope with this increasing complexity and competition. Depending on the specific business situation, key managerial positions may include the president, VP of marketing, engineering, finance, and manufacturing (Roure and Keeley, 1990). Thus, the completeness --- in terms of variety of necessary managerial functional skills --- of the management team in a new business venture is crucial (Hill and Power, 2001).

The completeness of the management team not only affects the future economic performance of the new venture, but also directly affects the economic valuation of the new venture by potential venture capitalists, as venture capitalists are known to routinely help with recruitment for their portfolio companies. Indeed, Kaplan and Stromberg find that: “management risk is one of the most common sources of uncertainty that VC identifies. It is present in more than 60% of the sample investments... the concern is more about the management team being *incomplete* in some sense” (2002: 41, italics added). Therefore, we propose that:

H7: Ceteris paribus, new business ventures, with a functionally complete management team, are valued higher than those without one.

External Ties and New Venture Valuation

The importance of external ties has been emphasized to understand the start, continued viability, and expansion of new ventures (Dubini and Aldrich, 1991). The more developed the entrepreneur's network, the easier it is to start and grow the new business. An entrepreneur's network plays an important role in searching for new opportunities, acquiring resources, and gaining legitimacy (Stuart, Hoang and Hybels, 1999).

First, a social network facilitates the entrepreneur in finding lucrative new business opportunities (Lechner, Dowling and Welppe, 2005). Second, once the new business opportunity is identified, the entrepreneur can leverage the social network to pursue this new business opportunity. The social network usually provides access to resources at a cost substantially lower than that from the open market (Larson and Starr, 1992). Finally, the social network is useful when the emerging business requires legitimacy, as more established institutions (and credible individuals) extend their endorsement to these new business ventures (Stuart, Hoang and Hybels, 1999), which is typically essential to penetrate the information asymmetry between the entrepreneur and venture capitalists. Since new ventures have limited operating history, their own accomplishments are rarely sufficient to resolve the uncertainty about such business ventures' quality and viability. Thus, the social structure of business relationships can substantially influence perceptions of the quality (and hence economic valuation) of new business ventures (Stuart, Hoang and Hybels, 1999).

In the network research literature, the importance of the position that a focal firm holds in its network (its ego network) has long been emphasized. A general proposition is that actors' differential positioning within a network structure has an important impact on resource flows and on entrepreneurial outcomes (Hoang and Antoncic, 2002). As one of the more important aspects

of network structure, *ego network size* has been frequently used to describe the position of a focal firm in its network (Gulati, 1995; Zaheer and Bell, 2005).

Analyses of network size measure the extent to which resources can be accessed at the level of the entrepreneur (Aldrich and Reese, 1993) and the organization (Baum, Calabrese and Silverman, 2000; Katila, 1997; Katila and Mang, 1999). The network literature has found that the larger its ego network size, the more economic benefits accrue to the focal firm. For example, Shan, Walker and Kogut (1994) find in the United States biotechnology industry, new biotechnology firms with more external ties (collaborative relationship with other firms or research agencies) enjoy much higher innovation rates (measured by number of patents). Stuart, Hoang and Hybels (1999) find the more strategic alliances a new biotechnology venture has formed, the sooner it will go public and the more money it will raise in an IPO (higher market valuation). The presence of strategic partners, such as venture capitalists, established pharmaceutical firms, and other business firms, all are positively related to the speed to, and economic valuation of, an IPO. Given both the theoretical arguments and empirical findings that corroborate the theory, we propose that:

H8: Ceteris paribus, the larger the size of the new venture “ego network” the higher the economic valuation by venture capitalists.

METHODOLOGY

Early stage companies include seed stage, startup stage, and first stage (Sahlman, 1990). The venture capital valuation data come from Thomson Financial Security Database, which is the official data collector of the national association of venture capitalists and the most authoritative data source for venture capital investment (Lerner, 1994).

Since the valuation data are the outcomes of existing VC valuation methods, one may question whether we can use them as the dependent variable to test a complementary valuation approach. Our choice is consistent with the corporate finance research literature. The central idea is that while each individual investor is not able to estimate precisely the true economic value of any asset, the mean of their individual estimates is always close to the true economic value, as long as their estimation is independent and the number of investors is large enough.

The problem for the venture capital market to set this “market price” is that the venture capital market is not efficient and more importantly, the economic valuation is always determined in a “small numbers” bargaining situation – it does not have the opportunity to let the high valuations and low valuations cancel out each other, as in an efficient market. Our proposed approach essentially decomposes the economic valuation decision into many input factors; and thus, artificially creates a market for the input factors (not the deals). We can expect that the artificially created “market” can figure out the true economic value of each of the input factors when the deal number is large enough. The strength of this approach resides critically in “pooling” the individual investors across the market, which the venture capital market itself could not achieve due to illiquidity of ownership and “small number” bargaining situation.

The sampling procedures are as follows. The sample firms must 1) have received their early stage venture capital funding in the period from 1/1/1995 to 12/31/2001; 2) be less than

three years old at the time of funding; 3) be United States firms and 4) not be in the financial, insurance, or real estate sector. The sample window period covers both “hot” and “cold” markets. After dropping unusable observations, we have a sample of 210 new business ventures in 48 industries (defined at 4-digit SIC code) receiving 340 rounds of early stage financing in the seven-year period. To check that this sub-sample is not biased, we conducted several T-tests (not reported here), which indicated no significant statistical difference between the sample and the population in terms of age, financing stages, industry, and economic valuation. The independent variables and control variables are collected from several sources, which include Compustat, US Census, Recapit Database, Lexus-Nexus and firm web sites.

Measurements

Following the standard practice in corporate finance and venture capital investment literature, the economic valuation of a new venture is measured by its pre-money valuation, which equals the announced amount of economic valuation minus the money invested at the financing round (Gompers, 1995; Sahlman, 1990). For example, a post-money economic valuation of \$10 million reported in the SDC database after raising \$3 million implies a pre-money economic valuation of \$7 million. To check that the dependent variable is normally distributed, we conducted a Shapiro-Wilk W Test to diagnose possible deviation from normal distribution. The empirical result of this test shows that the data are not normally distributed.³ Following established practice in the corporate finance literature (Gompers, 1995), we performed

³ Shapiro-Wilk W test for normal data

Variable		Obs	W	V	z	Prob>z
Valuation		340	0.54048	109.416	11.087	0.00000

a log transformation of the raw data and proceeded to use the logarithm of the absolute amount of the pre-money valuation to measure the pre-money valuation of a new venture. After the transformation, we could not reject the null hypothesis that the transformed variable is normally distributed.

Product differentiation has been commonly measured as the advertising intensity ratio, i.e., advertising expenditures divided by sales revenue of an industry. However, venture capital investments are typically biased toward high-tech industries (Gompers and Lerner, 2001; Lerner, 1995). In high-tech industries, firms aggressively pursue technology superiority and develop products with advanced technological features. Thus, R&D investment is an important way for firms to differentiate themselves. In other words, product differentiation may consist of at least two dimensions: perceptual differentiation and innovative differentiation. Therefore, we also use the average R&D investment over sales of an industry as a measure of R&D intensity to capture the innovative differentiation as a complementary measure of product differentiation together with the advertising intensity ratio. Industry growth rate is measured as the percentage change of the revenue of an industry in year two (t2) over the revenue of the same industry at year one (t1).

Management experience of the founder(s) is measured by a dummy variable, coded “1” if any of the founder(s) has worked in any high-level management positions (VP and above level). Startup experience of the founder / founding team is measured by a dummy variable, coded “1” if any of the founder(s) founded a company before, and “0” otherwise. To measure the completeness of management team, we first identify the key positions in the top management team of a typical new venture. Following extant research literature (Roure and Keeley, 1990; Siegel, Siegel and MacMillan 1993), these key positions in the top management team of a typical new venture include the (1) CEO/President, (2) VP of marketing/sales/business development, (3)

VP of engineering/technology, (4) VP of finance, CFO or Chief Controller, and (5) VP of operation/ production/manufacturing (for manufacturing ventures). We use a dummy variable to capture the completeness of the top management team, which is coded “1” if all of the above top management team positions were filled at the time of the financing, and “0” otherwise.

Following the conventional practice in the network research literature, ego network size is measured by a direct count of the number of alliance partners a new venture has *before* the time it received funding from the venture capitalists, which include formal partners for all purposes. A potential endogeneity problem between an alliance partner and firm valuation can be partially mitigated in this way.

To control for other relevant factors, we also include several control variables in the model, which include the age (measured in month) and development stage of the firm at financing (using seed stage as the reference group), whether the firm is a “dotcom” (coded “1” if it is; “0” otherwise), the size of its industry and the S&P 500 index at the time of investment, and VC experience (measured by the number of companies the lead VC firm has invested) and VC size (measured by the total investment fund under management by the lead VC firm).

Summarizing the discussions so far, the equation below represents the whole model to be estimated in the empirical analyses:

Log (Pre-money Valuation of A New Venture) =

$$\alpha + \beta_1 (\text{Adsales}) + \beta_2 (\text{R\&Dsales}) + \beta_3 (\text{Industry Growth}) + \beta_4 (\text{Industrial Experience}) \\ + \beta_5 (\text{Management Experience}) + \beta_6 (\text{Startup Experience}) + \beta_7 (\text{Team-Founding}) \\ + \beta_8 (\text{Team Completeness}) + \beta_9 (\text{Network Size}) + \beta_{1-k} (\text{Vector of Controls})$$

where α is the intercept, β_1 to β_9 are the coefficients of the theoretical variables to be estimated, and β_{1-k} represent the coefficients of the eight control variables to be estimated.

Model Estimation and Results

Firms received multiple early stage financings in the sample, with a minimum of one and a maximum of four. Including repeated observations on the same firm is likely to violate the standard assumption of independence from observation to observation in regression models. The interdependence of observations may lead to firm-specific heteroscedasticity and autocorrelation. If these econometric problems exist, the coefficients estimated by OLS are inefficient. We went through three procedures to detect any potential violations of the classic assumptions. To diagnose potential heteroscedasticity problem, we examine the data by the Modified Wald test for heteroscedasticity (Greene, 2000). The empirical results show that the variances of the dependent variables are not constant (heteroscedastic). To correct this heteroscedasticity problem, we estimate the model with random-effect GLS estimator, assuming heteroscedasticity across panels. By choosing a GLS estimator with assumed heteroscedasticity, the variances of the error terms are allowed to vary from panel to panel and the effects of those contemporaneous variances are taken into account in the intercept term (Hsiao, 1986). To ensure we make a correct choice of the random-effect estimator, we also conducted the Hausman (1978) specification test and the result confirms that that random-effects model is appropriate for our data. Finally, we used the Breusch (1978) and Godfrey (1978) Lagrange multiple test to detect possible autocorrelation problem⁴. Empirical results indicate that there is no serious autocorrelation in the error terms.

Insert Table-1 about here

⁴ The test is asymptotically equivalent to the Durbin-Watson 'H' statistic when the time lag equals to 1, which may be considered a special case of the Breusch-Godfrey test statistic.

Results

Table-1 reports the means, standard deviations and correlation of all variables used in the model. The 210 new ventures received a total of 340 rounds of early stage venture capital financing during the sampling period. There is sufficient variability among all the variables in the model. The bivariate correlations between the dependent variable and a number of independent variables are largely consistent with our theoretical predictions. The matrix also indicates some of the independent variables are significantly correlated, but significant correlation between individual variables does not necessarily mean severe multicollinearity for the whole model (Neter, Kutner, Nachtsheim and Wasserman, 1999). Indeed, the VIF (variance inflating factor) of the model is only 1.23, which is far below the conventional threshold level of 10 (Neter, et al., 1999: 387). Thus, there is no multicollinearity problem in our data.

Table-2 reports the estimates from the random-effects GLS estimation of pre-money valuation of the new ventures in the sample. The coefficients are obtained after correcting the heteroscedasticity across **panels** and controlling other potential confounding effects.

Insert Table-2 about here

Given the explorative nature of this research, our primary interest at this stage is to establish a theoretical linkage (and substantiate it with empirical evidences) between venture capitalists' economic valuation of a new venture and the theoretical variables derived from the three strategy theories, not to estimate the exact quantitative coefficients of these variables. Here we focus our report on the general relationships, instead of individual coefficients.

Industry Structure Effects

Extending the industrial organization economics perspective of industry structure on firm-level economic performance, we proposed that venture capitalists should consider the characteristics of industry structure when valuating a new venture. We include three measurements of the two industry structural variables to capture the industry structure effects on new business venture economic valuation and each of them are hypothesized to be positively related to pre-money valuation of a new venture. Consistently, both measures of product differentiation (R&D intensity ratio and advertising intensity) are highly significant and in the predicted direction. The empirical results show that new ventures in high product differentiated industries (both perceptual and innovative differentiations) do receive higher economic valuation from venture capitalists. Thus, **H1** receives empirical support.

H2 hypothesizes that industry demand growth should be positively related to the economic valuation of new ventures by venture capitalists. As predicted, industry demand growth is indeed positively and significantly related to the pre-money valuation of new business ventures. As observed by veteran practitioners (Zider, 1998), venture capitalists do give higher economic valuation to new ventures in growing industries. All in all, our proposition and hypotheses regarding the effects of industry structure on new business venture economic valuation are largely corroborated.

Internal Resources (Founder and Management Team Effects)

Rooted in the resource-base approach and built upon empirical research on new venture economic performance and venture capital investment literature, this paper proposes that venture capitalists consider the characteristics of the founder (s) and the top management team when

valuating a new venture. More specifically, we propose that the quality of entrepreneur and the top management team should be positively related to the economic valuation of the new venture. Consistent with our theoretical prediction, all five hypotheses about the founder/entrepreneur and the top management receive strong empirical support. In terms of founder experiences, the empirical results show that venture capitalists value a new venture significantly higher if its founder(s) has: relevant industry experience (**H3**); relevant managerial experiences (**H4**); and startup experiences (**H5**) before the entrepreneur founded the current new venture than those without such valuable experiences. Thus, all three hypotheses on the important experiences measuring the quality of the founder received strong empirical support.

Regarding hypotheses on the entrepreneurial team, a new business venture founded by a team of entrepreneurs rather than a solo founder is valued significantly higher than those without one, in support of (**H6**). And, new ventures with a complete management team are valued significantly higher than those without one, in support of (**H7**). These empirical findings are consistent with those from the venture capitalist screening and selection literature that focuses on the “GO/NO-GO” decision (e.g., Kaplan and Stromberg, 2001).

External Ties

Consistent with previous empirical findings on the public stock market’s valuation of new ventures on the IPO market (Stuart, Hoang and Hybels 1999), the size of the network (as measured by the number of alliance partners) of a new venture is significantly and positively related to its economic valuation by venture capitalists. This empirical finding is quite consistent with previous empirical findings from extant research literature on the economic benefits of alliances.

It is worth noting that the above empirical results are obtained after controlling for potential confounding effects of other factors from financial market, industry and firm age, stage of development and whether the new business venture is a dotcom, all of which are significantly related to the economic valuation and in the positive direction (except VC experiences). It seems that valuations by more experienced venture capital firms exhibit downward bias, which is consistent with Hsu's finding that entrepreneurs pay a premium for affiliation with more experienced venture capitalists (2004). VCs with more money in the pocket tend to give higher valuation.

Relative Importance of the Three Theoretical Perspectives

It may be interesting to compare the relative importance of industry structure variables (external opportunity) and firm resource variables in explaining the variability of new venture valuation. While the random-effect generalized least square estimator used in the model is more efficient and reliable, one of its drawbacks is that it only reports the Wald Chi-squared Test but the R-squared coefficient and we can not compare the explaining power of two models directly. However, the ratio of two independent Chi-squared variables has an F-distribution (Greene, 2000). Therefore, we can compare the relative explanatory power of two models by dividing the two Chi-squared statistics, which is an F distribution. Analyzing it in this way, we find no significant difference among the three theoretical perspectives in terms of their explaining power of new venture valuation. In other words, it seems that venture capitalists weigh these factors equally in their valuation, which is not consistent with the findings from Hill and Power's interviews with venture capitalists (2001). However, such a conclusion may be premature, as the models estimated are not fully specified, since many other important variables from each theoretical perspective are not included in the model.

CONCLUSIONS, AND FUTURE RESEARCH

“Entrepreneurship plus innovation are the foundations of US prosperity while entrepreneurship is the US’ most important strategic advantage” (Bygrave, 1998: 1). Venture capital has been an important factor behind both entrepreneurship and innovation in the United States economy for the past thirty years (Gompers and Lerner, 2001). Despite its critical importance in entrepreneurial financing, how to value a new venture accurately is seldom considered in the extant research literature. Moreover, even the few existing studies are clinical and descriptive in nature. As one of the few large sample quantitative studies on this important issue, this paper fills this noted gap in the research literature.

How to value a company accurately is traditionally a corporate finance topic; however, most financial valuation methods were developed for well-established companies, especially companies in the more efficient public capital market. Research efforts to develop economic valuation methods specifically for new ventures have just begun (Wright and Robbie, 1998). For example, the *Wall Street Journal* (2003) reports that Private Equity Industry Guidelines Group (PEIGG) just recently announced a proposal to “standardize” the valuation practice in the private equity industry, which was immediately endorsed by 15 of the 18 firms represented on the PEIGG board, including HarborVest Partners, Bank of America Corp. and the University of California Regents (Grimes, 2003). As demonstrated by Waldron and Hubbard (1991), the traditional financial methods yield economic valuations with large variability. Against such a backdrop, the current paper leverages established theories in strategic management to use those input variables important for explaining firm-level economic performance in order to predict directly the economic valuation of an early stage new venture. Presumably, when it is difficult to value a young firm based on output (e.g. future cash flows), pricing it based on inputs (e.g.

entrepreneur, industry attractiveness, and so forth) may be a better alternative than a “pure guess.” Though tentative, the results from our empirical analyses support this central proposition. Such empirical findings may hold great promise for both future theory building and practice in entrepreneurial financing.

This paper makes at least three major contributions to the research literature. First, as one of the few large sample management studies addressing the economic valuation of business ventures in venture capital investment, this paper fills a noted gap in the research literature.

Second, building an integrative theoretical framework, it is one of the first research studies bringing theoretical rigor from strategic management theories to investigate the economic valuation of new ventures by venture capitalists. Entrepreneurship scholars have long called for “going beyond simple descriptive statistics” to not only report the “what,” but also explain the “why” in venture capital investment (Fried and Hisrich, 1994). The empirical results of this paper help to establish an initial linkage between well-developed theories in strategic management and under-researched venture capital valuation practice. This linkage enables us to use strategic management theories and associated empirical methodologies to *systematically* identify and measure variables important to new venture valuation.

Third, the venture capital market is not efficient and each investment deal is “privately” negotiated in a “small numbers” bargaining situation. The framework proposed here essentially decomposes each investment deal into many components of input factors (such as market structure and firm resources), thus artificially creating a “factor market” for investment deals. Like the hedonic regression approach in pricing research, the method developed here can effectively “price” each *factor* in the model, which can at least partially mitigate the market inefficiency problem arising from the “small numbers” bargaining situation.

This research paper also contributes to entrepreneurial practice. First, the model developed here is readily useable by both venture capitalists and entrepreneurs. Estimated with a large sample, the model can empirically derive the relative economic value of each input factor (the regression coefficients) from observed market data. Thus, venture capitalists and entrepreneurs can use these relative economic values to guide their economic valuation.

Second, compared with “guess work” of the extant valuation methods, this method may be a more accurate one for new ventures, since most of the factors can be objectively measured and empirically valued. Venture capital is inherently a cyclical business. Over-valuation of investment deals contributed greatly to large economic loss following the “Internet Bubble.” A more accurate valuation method can help to mitigate the side effects of this cyclicity.

Third, the venture capital method is essentially an internal-oriented, “rule of thumb” method, which is not often accurate (Harper and Rose, 1993) and is difficult to justify (Gompers, 1999). Unjustifiably low economic valuation is one of the major sources of venture capitalist-entrepreneur conflict. The integrative strategic management approach developed in the current paper can help venture capitalists improve both accuracy and defensibility of their economic valuation, and thus can facilitate venture capitalist-entrepreneur collaboration and improve productivity (Manigart, Wright, Robbie, Desbrieres and De Waele, 1998).

As one of the few research initiatives to explore an integrative strategic management approach to value a new venture, this research paper has its limitations. First, given the explorative nature of this research study, the empirical model is not fully specified. Other variables that are potentially important to economic valuation exist, such as the characteristics of the venture capital firm and its relative bargaining power over the entrepreneur, but are not included or controlled for in the model. To entrepreneurs and venture capitalists, only a fully

specified model can have full practical usefulness. Future research efforts are needed to further develop this integrative approach. Second, better measurement of relevant variables is needed to improve the efficiency of estimations of the model. For example, dummy variables are used in this research paper to measure entrepreneur and management effects, which are crude proxies to measure the quality of the founder and management team. Future study needs to find measurements to assess the quality of the founder and management team. Lastly, some scholars have argued that for a new business venture, aggregated measurement of industry structure at 4-digit SIC code level can provide only a rough proxy. To overcome this potential drawback, future research should measure the industry structure variables at a finer-grained level.

REFERENCES

- Aldrich, H. and P. R. Reese (1993). Does networking pay off? A panel study of entrepreneurs in the research triangle. In Churchill, N.S., et al. (Eds.), Frontiers of Entrepreneurship Research: 325–339.
- Alvarez, S. A. and L. W. Busenitz (2001). The entrepreneurship of resource-based theory. Journal of Management, 27: 755-775.
- Ancona, D.G. and D. Caldwell (1992). Cross-functional teams: Blessing or curse for new product development. In T. A. Kochan and M. Useem (Eds.), Transforming Organizations, 154-166. New York, NY: Oxford University Press
- Bain, J. S. (1959). Industrial Organization. New York, NY: Wiley.
- Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management 17(1): 99-120.
- Barry, C. (1994). New directions in research on venture capital finance. Financial Management, 23 (3): 3-15.
- Baum, J., T. Calabrese, and B. Silverman (2000). Don't go it alone: alliance network composition and startups' performance in Canadian biotechnology. Strategic Management Journal, 21 (3): 267-294.
- Bird, B. (1993). Demographic approaches to entrepreneurship: The role of experience and background, in J. A. Katz and R. H. Brockhaus (Eds), Advances in Entrepreneurship, Firm Emergence and Growth, JAI Press, Greenwich, CT: 11-48.
- Blaydon, C. and M. Horvath, M. (2002). What's a company worth? It depends on which GP you ask. Venture Capital Journal, May (1): 40-41.
- Brealey R. and S. Myers (2001). Principles of Corporate Finance. New York, NY: McGraw-Hill.
- Breusch, T. (1978). Testing for autocorrelation in dynamic linear models. Australian Economic Papers, 17: 334-355.
- Bygrave, W., (1998). Building an entrepreneurial economy: Lessons from the United States, Business Strategy Review, 9 (2): 11-18.
- Caves, R. E. (1972). American Industry: Structure, Conduct, and Performance (3rd ed.). Englewood Cliffs, NJ: Prentice-Hall.
- Cooper, A.C. and C. M. Daily (1997). Entrepreneurial teams. In D. L. Sexton and R. W. Smilor (Eds.) Entrepreneurship 2000: 127-150. Chicago, IL: Upstart Publishing.
- Cooper, A. C., J. F. Gimeno and C. Y. Woo (1994). Initial human capital and financial capital as predictors of new venture performance. Journal of Business Venturing, 4 (5): 317-332.

Cooper, A. C., G. E. Willard, and C. Y. Woo (1986). Strategies of high-performing new and small firms: A reexamination of the niche concept, Journal of Business Venturing 1 (3): 247-260.

Daily, C. M., P. P. McDougall, J. G. Covin and D. R. Dalton (2002). Governance and strategic leadership in entrepreneurial firms. Journal of Management, 28 (3): 387-412.

Damodaran, S. (2002). Investment Valuation: Tools and Techniques for Determining the Value of Any Asset. New York, NY: Wiley & Sons.

Davila, A., G. Foster and M. Gupta (2003). Venture capital financing and the growth of startup firms. Journal of Business Venturing, 18: 689-708.

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

Doutriaux, J. and Simyar, F., (1987). Duration of the comparative advantage accruing to from some start-up factors in high-tech entrepreneurial firms. In N.A. Churchill, J.A. Hornaday, B.A. Kerchhoff, O.J. Kranser and K.H. Vesper (Eds), Frontiers of Entrepreneurship Research. Wellesley, MA. Babson College: 436-450.

Dubini, P. and H. Aldrich (1991). Personal and extended networks are central to the entrepreneurial process. Journal of Business Venturing 6 (5): 305-313.

Dunkelberg, W.C., Cooper, A.C., Woo, C., and Dennis, W. (1987). New firm growth and performance. In N.A. Churchill, J.A. Hornaday, B.A. Kerchhoff, O.J. Kranser and K.H. Vesper (eds), Frontiers of Entrepreneurship Research, Wellesley, MA. Babson College: 563-577.

Eisenhardt, K.M. and B. N. Tabrizi, B.N., (1995). Accelerating adaptive processes: product innovation in the global computer industry. Administrative Science Quarterly 40: 84-110.

Eisenhardt, K. M. and C. Schoonhoven (1990). Organizational growth: linking founding team, strategy, environment and growth among US semiconductor ventures, 1978-1988, Administrative Science Quarterly, 35: 504-529.

Eisenhardt, K. and J. Martin (2000). Dynamic capabilities: what are they? Strategic Management Journal, 21 (10/11): 1105-1121.

Fama, E. F. (1991). Efficient capital markets: II. Journal of Finance 46 (5): 1575-1617.

Feeser, H. and G. Willard (1990). Founding strategy and performance: A comparison of high and low growth high-tech firms. Strategic Management Journal 11:87-98.

Fried, V. H. and R. D. Hisrich (1994). Toward a model of venture capital investment decision making. Financial Management, 23 (3): 28-37.

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

- Godfrey, L. (1978). Testing against general autoregressive and moving average error models when the regressors include lagged dependent variables. Econometrica, 46: 1293-1302.
- Gompers, P. (1995). Optimal investment, monitoring and staging of venture capital. Journal of Finance, 42: 1461-1489.
- Gompers, P. (1999). A note on valuation in entrepreneurial ventures, HBS case #9-298-082:1-17.
- Gompers, P. and J. Lerner (2001). The Money of Invention – How Venture Capital Creates New Wealth. Cambridge, MA: Harvard Business School Press.
- Greene, W. (2000). Econometric Analysis. Upper Saddle River, NJ: Prentice--Hall.
- Grimes, A. (2003). What's the investment really worth? *The Wall Street Journal*, December, 3rd, 2003.
- Gulati, R. (1995). Social structure and alliance formation patterns: A longitudinal analysis. Administrative Science Quarterly, 40 (4): 619-652.
- Gulati, R., B. Nohria and A. Zaheer (2000). Strategic networks. Strategic Management Journal, 21:203-215.
- Gupta, A. and H. Sapienza (1992). Determinants of venture capital firms' preferences regarding the industry diversity and geographic scope of their investments. Journal of Business Venturing 7: 347-362.
- Hall, J. and C. Hofer, C. (1993). Venture capitalists' decision criteria in new venture evaluation. Journal of Business Venturing, 8 (1): 25-42.
- Harper, C. and L. Rose, L. (1993). Accuracy of appraisers and appraisal methods of closely held companies. Entrepreneurship: Theory and Practice, 17 (3): 21-33.
- Harrigan, K. R. (1981). Barriers to entry and competitive strategies. Strategic Management Journal, 2(4): 395–412.
- Hausman, J. (1978). Specification tests in econometrics. Econometrica, 46: 1251-1271.
- Hill, B., and D. Power (2001). Inside Secrets to Venture Capital, John Wiley & Sons, Inc.
- Hisrich, R. and A. Jankowicz (1990). Intuition in venture capital decisions: An exploratory study using a new technique. Journal of Business Venturing, 5 (1): 49-62.
- Hoang, H. and B. Antoncic (2002). Network-based research in entrepreneurship: A critical review. Journal of Business Venturing, 17: 1-23.
- Hsiao, C. (1986). Analysis of Panel Data. Cambridge, MA: Cambridge University Press.

- Hsu, David, (2004). What do entrepreneurs pay for venture capital affiliation? Journal of Finance, 59: 1805-1844
- Kaplan, S. and P. Stromberg (2000). How do venture capitalists choose investments? Chicago, IL: University of Chicago Working Paper.
- Kaplan, S. and P. Stromberg (2002). Characteristics, contracts and actions: Evidence from venture capitalist analyses. Chicago, IL: University of Chicago Working Paper.
- Katila, R. (1997). Technology strategies for growth and innovation: a study of biotechnology ventures. In P. D. Reynolds, et al. (Eds.), Frontiers of Entrepreneurship Research: 405–418.
- Katila, R. and P. Y. Mang (1999). Interorganizational development activities: the likelihood and timing of contracts, Academy of Management Proceedings, B1–B6.
- Larson, A. and J. A. Starr (1992). A network model of organization formation. Entrepreneurship: Theory and Practice, 17, (2), 5–15.
- Lawler III, E. E., Mohrman, S. A. and Ledford, G. E. (1995). Creating High Performance Organizations, Jossey-Bass, San Francisco, CA.
- Lechner, C., M. Dowling and I. Welpel (2005). Firm networks and firm development: The role of the relational mix. Journal of Business Venturing, forthcoming.
- Lee, C.W, K. M. Lee, and J. Pennings (2001). Internal capabilities, external networks, and performance: A study on technology-based ventures. Strategic Management Journal, 22: 615-640.
- Lerner, J. (1994). The syndication of venture capital investments. Financial Management, 23: 16-27.
- Lerner, J. (1995). Venture capitalists and the oversight of private firms. Journal of Finance, 50: 301-318.
- Lerner, J. (2000). Venture Capital and Private Equity: a Casebook. New York, NY: John Wiley & Sons.
- Lerner, J. and J. Willinge (2002). A note on valuation in private settings. Harvard Business School notes, 9-297-050.
- MacMillan, I.C., R. Siegel, and P. N. SubbaNarasimha (1985). Criteria used by venture capitalists to evaluate new venture proposals. Journal of Business Venturing, 1: 119-128.
- MacMillan, I. C., L. Zemann, and P. N. SubbaNarasimha (1987). Criteria distinguishing successful from unsuccessful ventures in the venture screening process. Journal of Business Venturing 2 (2): 123-137.
- Madden, B. J. (1999). CFROI Valuation: A Total System Approach to Valuing the Firm. Butterworth-Heinemann.

- Mahoney, J. T. and J. R. Pandian (1992). The resource-based view within the conversation of strategic management. Strategic Management Journal, 13: 363-380.
- Manigart, S., M. Wright, K. Robbie, P. Desbrieres and K. De Waele (1998). Venture capitalists' appraisal of investment projects: An empirical European study. Entrepreneurship: Theory and Practice, 25: 521-570.
- Mason, E. (1939). Price and production policies of large-scale enterprise. American Economic Review, 1. 29: 61-74.
- May, J. and C. Simmons (2001). Every Business Needs an Angel. New York, NY: Crown Business.
- McDougall, P., J. Covin, R. Robinson, L. Herron (1994). The effect of industry growth and strategic breadth on new venture performance and strategy content. Strategic Management Journal, 15 (7): 537-554.
- Mechner, F. (1989). Present certainty equivalents and weighted scenario valuations, Journal of Business Venturing, 4: 85-92.
- Modigliani, F. and M. H. Miller (1958). The cost of capital, corporation finance and the theory of investment. American Economic Review, 48 (3): 261-297.
- Muzyka, D., S. Birley, and B. Leleux (1996). Trade-offs in the investment decisions of European venture capitalists. Journal of Business Venturing 11 (4): 273-287.
- Neter, K., K. Nachtshem and S. Wasserman (1999). Applied Linear Statistical Model. Chicago, IL: Irwin.
- Penrose E. T. (1959). The Theory of the Growth of the Firm. New York, NY: Wiley.
- Peteraf, M. (1993), The cornerstones of competitive advantage: A resource-based view. Strategic Management Journal, 14 (3): 179-191.
- Porter, M. E. (1980). Competitive Strategy. New York, NY: Free Press.
- Quindlen, R. (2000). Confessions of a Venture Capitalist: Inside the High-stakes World of New Venture Financing. New York, NY: Warner Books.
- Rah, J., K. Jung, and J. Lee (1994), Validation of the venture evaluation model in Korea. Journal of Business Venturing 9 (6): 509-524.
- Robinson, K., and P. McDougall, P. (1998). The impact of alternative operationalizations of industry structural elements on measures of performance for entrepreneurial manufacturing ventures. Strategic Management Journal, 19: 1079-1100.
- Roure, J. and R. Keeley (1990). Predictors of success in new technology based ventures. Journal of Business Venturing, 5 (4): 201-220.

- Sahlman, W. (1990). The structure and governance of venture capital organizations. Journal of Financial Economics, 27(2): 473-442.
- Sahlman, W., H. H. Stevenson, M. J. Roberts, and A. Bhidé (1999). The Entrepreneurial Venture. Cambridge, MA: Harvard Business School Press.
- Sandberg, W. (1986). New Venture Performance. Lexington Books.
- Sarasvathy, S. (1999). Seminar on research perspectives in entrepreneurship. Journal of Business Venturing, 15: 1-57.
- Schefczyk, M. and T. J. Gorpott (2001). Qualifications and turnover of managers and venture capital-financed firm performance: An empirical study of German venture capital investment. Journal of Business Venturing, 16 (2): 146-163.
- Scherer, F. M. and D. Ross (1990). Industrial Market Structure and Economic Performance. Boston, MA: Third Edition, Houghton Mifflin.
- Shane, S. and S. Venkataraman (2000). The promise of entrepreneurship as a field of research. Academy of Management Review 25 (1): 217-226.
- Shan, W., G. Walker and B. Kogut (1994). Inter-firm cooperation and startup innovation in the biotechnology industry. Strategic Management Journal, 15: 387-394.
- Shepherd, W. (1972). The elements of market structure. Review of Economics and Statistics, 54: 25-37.
- Shepherd, D. (1999). Venture capitalists' assessment of new venture survival. Management Science 45: 621-632.
- Siegel, R., E. Siegel, And I. C. MacMillan (1993). Characteristics distinguishing high growth ventures. Journal of Business Venturing, 8: 169-180.
- Smith, J., and R. Smith (2000). Entrepreneurial Finance. New York, NY: John Wiley & Sons.
- Spanos, Y. E. and S. Lioukas (2001). An examination into the causal logic of rent generation: Contrasting Porter's competitive strategy framework and the resource-based perspective. Strategic Management Journal 22: 907-934.
- Starr, J., and W. Bygrave (1991). The assets and liabilities of prior startup experience: An exploratory study of multiple venture entrepreneurs. In N. Churchill et al., (eds) Frontiers of Entrepreneurship Research, Wellesley, MA: Babson College: 213-227.
- Starr, J.A., and I. C. Macmillan (1990). Resource cooptation via social contracting: resource acquisition strategies for new ventures. Strategic Management Journal, 11: 79-92.
- Stuart, R. W. and P. A. Abetti (1990). Impact of entrepreneurial and management experience on early performance. Journal of Business Venturing, 5 (3): 151-160.

- Stuart, T. E., H. Hoang, and R. C. Hybels (1999). Interorganizational endorsements and the performance of entrepreneurial ventures. Administrative Science Quarterly, 44 (2): 315-349.
- Teece, D., G. Pisano, and A. Shuen (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18 (7): 509-533.
- Teach, R.D., R. G. Schwartz and F. A. Tarpley (1989). The recognition and exploitation of opportunity in the software industry: A study of surviving firms, In Frontiers of Entrepreneurship Research. Wellesley, MA: Babson College: 383-397.
- Timmons, J. and S. Spinelli (2004). New Venture Creation. New York, NY: McGraw-Hill/Irwin.
- Trigeorgis, L. (1996). Real Options: Managerial Flexibility and Strategy in Resource Allocation. Cambridge, MA: MIT Press.
- Tushman, M.L. P. Anderson (1986). Technological discontinuities and organizational environments. Administrative Science Quarterly, 31: 439-465.
- Tyebjee T. and A. Bruno (1984). A model of venture capitalist investment activity. Management Science 30(9): 1051-1066.
- Waldron, D. and C. Hubbard (1991). Valuation methods and estimates in relationship to investing versus consulting. Entrepreneurship: Theory and Practice, 16 (1): 43-52.
- Wells, W. (1974). Venture Capital Decision Making, doctoral dissertation, Carnegie-Mellon University,
- Wright, M. and K. Robbie (1998). Venture capital and private equity: A review and synthesis. Journal of Business Finance and Accounting, 25(5): 521-570.
- Zacharakis, A., and G. Meyer (1998), A lack of insight: Do venture capitalists really understand their own decision process? Journal of Business Venturing, 13 (1): 57-76.
- Zaheer, A. and G. G. Bell (2005), Benefiting from network position: Firm capabilities, structural holes, and performance. Strategic Management Journal, 26: 809-825.
- Zider, B. (1998). How venture capital works. Harvard Business Review, 76 (6): 131-139.

Table 1 Descriptive Statistics: Means, Standard Deviations and Correlations of the Variables

	Obs	Mean	Standard Deviation	Ad-Intensity	RD Intensity	Industry growth	Management Experience	Startup Experience	Team Founding	Team Completeness	# of Alliance	Market Size	SP500	Dotcom Dummy	Firm Age	Startup Stage	First Stage	# of Deals of Lead VC	Management of VC	
Ad-Intensity	340	3.716999	2.57582	1																
RD Intensity	340	17.88725	9.238932	0.2174*	1															
Industry growth	340	4.122549	3.164711	0.1640*	0.1117	1														
Management Experience	340	0.6077844	0.4889769	-0.0592	-0.0161	0.0198	1													
Startup Experience	340	0.8955224	8.185964	-0.0265	-0.0096	-0.0964	0.3678*	1												
Team Founding	340	0.6407186	0.4805097	-0.02	0.0277	0.0582	0.0631	0.099	1											
Team Completeness	340	0.2365269	0.4255869	-0.112	0.0641	0.0294	0.1152	0.0782	0.0203	1										
# of Alliance	340	0.5479042	1.347597	-0.0611	-0.056	-0.0025	0.0719	0.1065	0.0962	0.2813*	1									
Market Size	340	567.0689	918.5202	-0.124	-0.2919*	0.2349*	0.1439*	0.0894	-0.0201	0.0682	0.0497	1								
SP500	340	993.2395	288.8708	-0.3623*	0.0206	0.0128	0.0817	0.0355	0.0013	0.2114*	0.1826*	0.2125*	1							
Dotcom Dummy	340	0.2245509	0.4179123	0.0096	-0.2837*	-0.0355	-0.0968	0.0911	-0.0158	-0.0125	0.0688	0.0873	-0.033	1						
Firm Age	340	15.44311	13.57466	0.0669	0.1339	0.1610*	-0.0665	-0.0793	-0.0059	0.2583*	0.1820*	0.0585	0.0756	0.0073	1					
Startup Stage	340	0.1017964	0.3028341	0.0106	-0.0234	-0.0222	0.0271	0.0344	-0.0368	0.0223	-0.0635	-0.0532	0.0177	0.0324	-0.0212	1				
First Stage	340	0.6526946	0.4768282	0.0023	-0.0153	-0.0333	-0.0064	0.0518	0.0042	0.1544*	0.1802*	0.0603	0.1651*	0.0309	0.2656*	-0.4615*	1			
# of Deals of Lead VC	340	171.7115	133.0761	0.0767	-0.0237	-0.1015	-0.0379	0.1162	0.0592	0.0908	-0.0757	0.0397	-0.1202	-0.0781	-0.1138	0.0009	0.0449	1		
Fund of Lead VC	340	1854.434	2619.958	0.0211	0.01	-0.0053	-0.0199	0.0612	0.0805	0.0247	0.0423	0.0289	0.0062	0.0296	-0.1439	-0.029	0.1032	0.5958*	1	

Coefficients with a "*" significant at 1% level

Table 2 Estimates of Pre-Money Valuation of Early Stage Startups

Dependent Variable	Log of pre-money valuation of startup
	Random Effects GLS Regression
Industry Structure	
Advertising Intensity	0.0045**
R&D Intensity	0.0011**
Industry Growth	0.0021***
Founder/Team Effect	
Management Experience Dummy	0.123***
Startup Experience Dummy	0.064****
Team Founding Dummy	0.027****
Team Completeness Dummy	0.289****
Network Effects	
Number of Alliances	0.127****
Control Variable	
Market Size	0.0001***
SP500	0.0003****
VC experiences	-0.0001***
VC Fund	0.00003****
Firm Age at Funding	0.0054****
Dotcom Dummy	0.144****
Startup Stage	0.28****
First Stage	0.256****
Intercept	3.064****
Log Likelihood Ratio	49.56****
N	340
Wald Chi-Squared	3763.47****

**** P<0.001 *** P<0.01
 ** P<0.05 * P<0.1