New Directions in Research on Venture Capital Finance

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This paper surveys recent research on venture capital and suggests directions for future research. There is new empirical evidence in the field, and new theoretical models have resolved some issues. The paper selectively examines recent findings, particularly models and empirical work about the staging of financing, the use of syndicates, the process of screening investments, and the participation by venture capitalists in IPOs. Finally, the paper identifies some of the remaining issues for which new research is needed.

■ The investment of venture capital funds in growing enterprises is a remarkable feat of financial engineering. Investors in private venture capital funds place their money for long periods of time in the hands of venture capitalists of uncertain ability and who have committed only small amounts of their own funds. The venture capitalists seek out promising ventures, eventually placing money in risky ventures managed by entrepreneurs whose skills are unknown and whose future efforts are not predictable. Such investments are often made in firms that have not yet registered one single dollar of revenues; have no products in existence at the time of investment, only unproven and untested ideas; and do not have a complete, experienced management team. The entrepreneurs have information not possessed by the venture capitalists. The venture capitalists not only commit money to these entrepreneurs, but they also commit weeks of their time assisting them. Despite the extensive monitoring, more than one-third of the investments made by venture capitalists result in losses, and a sizable fraction results in loss of the entire original investment, often after years of waiting and after countless hours of handholding by the venture capitalists. Venture capital is an area of finance in which issues we encounter to a lesser degree in public companies can take on extreme importance.

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And yet venture capital survives. Hellman (1993) estimates that $2.5 billion of venture capital investments were made in 1992 from a pool of $33 billion in capital committed to the venture capital industry. In the first half of 1994, $1.7 billion of new capital was committed to private venture capital funds (*Private Equity Analyst* (1994)). The mere fact that venture capital exists bears testimony to the adaptability of financial systems. Because problems encountered in venture capital investing are so challenging, the uncertainty so high, the asymmetries of information so great, and the opportunities so outstanding, venture capital finance gives us an opportunity to study modern financial theory in a setting of extremes. In such a setting, some of the issues often assumed away in other circumstances cannot be ignored. Thus, we have the opportunity and the necessity in venture capital to learn more about risk, uncertainty, and contracting technology.

In spite of the intriguing issues in venture capital finance, relatively little has been published on this subject in the most influential finance journals. Why? Probably for two reasons. First, the theoretical problems are complex, many-faceted, and difficult to solve. Second, the very nature of venture capital creates difficulties for the empiricist because data on private investment by private firms are not easily obtained.

Nevertheless, significant progress has been made recently toward understanding the problems of venture capital finance. New theories have been formulated and new databases have been tapped or developed, shedding new light on issues about which we knew very little as recently as the 1980s. The door has been opened, and opportunities abound for new work on venture capital finance.

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The purpose of this paper is to provide a selective survey and synthesis of recent findings in venture capital research and to put them into perspective, suggesting new avenues for study. The goal of the paper is not to survey exhaustively all published work on venture capital finance. Two recent papers, taken together, provide a more comprehensive overview of the field. One is Sahlman's (1990) paper that explains venture capital and its organizational setting. A second is Norton's (1993) survey paper, which takes a more managerial orientation than does Sahlman's paper. The two papers contain 147 references on venture capital. In addition to those papers, Gompers (1994b) provides an updated history and an interesting analysis of the venture capital industry.

The present paper begins with an introduction to venture capital in the first section. The second section discusses recent findings and current controversies in a variety of topics on venture capital finance. The third section points to unanswered questions and offers suggestions for further research.

I. Introduction to Venture Capital

In most Spanish-speaking nations, there is no explicit term for venture capital; instead, the term "capital de riesgo," or risk capital, is used. That term captures an important dimension of venture capital—it is capital invested in highly risky ventures. But there is more to venture capital than making high-risk investments. Venture capital also entails an active and motivated working relationship in which the venture capitalists take on important roles within their portfolio firms in which they have invested. Venture capitalists, acting on behalf of third parties, actively monitor the investments and sometimes assume important managerial roles within the firm. Warne (1988) characterizes venture capital as the combination of capital and consulting. In brief, venture capital entails the investment of risk capital within a firm in substantial blocks coupled with the close monitoring of that investment.

Sahlman (1990) provides a detailed description of the way in which venture capital operates. There are various forms of venture capital organizations, including publicly traded corporations, captive subsidiaries of large banks or of corporations, small business investment corporations (SBICs), and private limited partnerships. The most important is the limited partnership form, which accounts for roughly two-thirds of venture capital invested in 1988.

In the limited partnership, the venture capitalists serve as general partners and typically put up about 1% of the funds raised. The limited partners consist of private individuals, pension funds, endowments, and insurance companies. The limited partners rely on the general partners to make investment decisions and to monitor the resulting investments on their behalf. The partnership has a finite life (usually ten years), and the funds must be distributed to the limited partners by the end of that period (subject to possible extensions for up to three years). Thus, the continued activities of the venture capitalists depend on creating a series of limited partnerships that can attract new investment funds.

An important aspect of the relationship between the general and limited partners is the form of compensation. The common form of compensation is an annual management fee based on capital committed, which usually amounts to 2.5% of capital and a portion (typically 20%) of carried interest. Carried interest refers to the investment gains realized by the fund.[1] Thus, the venture capitalists receive both a stated fee to fund their operations and a share in the upside potential of the fund.

Venture capitalists typically screen hundreds of proposals in a year but invest in only a few. Many venture capital firms specialize, investing in firms at a particular stage of development[2] (such as start-up or at product introduction) or in particular industries. By specializing, venture capitalists can better understand the industry in which the firm operates and its technology. They may also have contacts with suppliers, customers, or others with technical expertise in the industry. Experienced venture capitalists will also have experience with the process of going public, with the process of selling or merging a portfolio firm, with the liquidation of unpromising ventures, and with the replacement of management. That experience is a key resource that the venture capitalist brings to the table in helping to nurture a developing firm.

Recent research has sought to understand the relationships among the limited partners, venture capitalists, and portfolio companies from both a theoretical and empirical point of view. I turn now to some of the important issues addressed in the literature.

II. Recent Work in Venture Capital Finance

What do venture capitalists do? How do they do it? And, how well do they do it? Several papers have investigated the

[1] Carried interest refers to the profits realized from the investments made by the fund. The venture capitalist's share of carried interest is disproportionate to the percentage of capital invested since the venture capitalist usually invests only 1% of the capital but receives 20% of the gains as a carried interest. See Sahlman (1990) and Gompers and Lerner (1994).

[2] Sahlman (1990) describes the stages of a company's development at which venture capital might be invested.

activities and decision-making process of venture capitalists. Most have taken the point of view that venture capitalists add value as financial intermediaries, although even that basic assumption has been challenged recently (see Amit, Glosten, and Muller (1990)). I begin here by looking at the activities of venture capitalists and then, against that background, turn to the more recent investigations of the issue of whether venture capital plays a positive or negative role. Finally, I examine a number of recent studies that deal with the wide array of agency issues confronted in a venture capital setting.

A. What Do Venture Capitalists Do?

Gorman and Sahlman (1989) surveyed venture capitalists and asked how they spend their time. They found that venture capitalists spend roughly half of their time monitoring an average of nine portfolio companies. They spend an average of 110 hours per year working with each portfolio firm, and their most frequent activity is assisting the firm in raising additional funds. Typical respondents said that they had replaced three chief executive officers in portfolio companies during their careers as venture capitalists. This finding is consistent with the broad view that key activities of venture capitalists are identifying and recruiting members to the management team of portfolio companies. Those same venture capitalists identified weak management as the dominant cause of failure among their portfolio companies, so it is natural that considerable emphasis would be placed on management ability.

Venture capitalists typically specialize by emphasizing a particular industry, such as biotechnology, or by emphasizing a particular stage of development, such as startup companies or companies in the expansion stage. A number of papers describe the specialization of venture capitalists (see, for example, Gupta and Sapienza (1992), Norton and Tenenbaum (1993), and Ruhnka and Young (1991)); some suggest that the specialization of venture capitalists makes it prudent for the venture capital investor to diversify across venture capitalists to eliminate the diversifiable risk inherent in specialization. Barry, Muscarella, Peavy, and Vetsuypens (BMPV) (1990) provide a table showing the industry specialization of venture-backed IPOs and suggest that specialization aids in the monitoring process. A number of papers by Lerner (1994a, 1994b, and 1994c) focus specifically on biotechnology ventures and provide details of the functioning of venture capital within that industry.

Other papers have examined the activities of venture capitalists in evaluating new opportunities. Most notable has been the work of Tyebjee and Bruno (TB) (1984), who examined 90 deals made by 41 venture capitalists. They point out five principal activities carried out by the venture capitalists:

1. Deal origination
2. Deal screening
3. Deal evaluation
4. Deal structuring
5. Post-investment activities

Recent research on venture capital in the finance literature has focused on steps four and five. A body of literature also exists that focuses on steps two and three (for example, see Roberts (1991) and MacMillan, Zemann, and Subbanarasimha (1987)).

In this issue of *Financial Management*, Fried and Hisrich (1994) present results of field studies and interviews with venture capitalists to understand their activities better, specifically their decision to invest. They show that, in the average investment made by the 18 venture capitalists in their sample, the venture capitalists spent three weeks of full-time effort in evaluating and closing the deal and that nearly 100 days elapse during this process. Fried and Hisrich examine the investment decision-making process in order to identify the activities venture capitalists undertake to avoid the adverse selection problem described by Amit, Glosten, and Muller (1990). They argue that an intensive screening and evaluation process allows the venture capitalists to gather substantial amounts of information prior to investing and that this information reduces the adverse selection problem.

Lerner (1994b) finds another way in which venture capitalists reduce the adverse selection problem: They tend to syndicate their investments, i.e., venture capitalists tend to invest with other venture capitalists. Lerner investigated 651 rounds of investment in 271 biotechnology firms. He found that syndication is common from the first investment round of investing, a fact that he argues is a part of the screening process: Venture capitalists are more comfortable with a deal when other venture capitalists of similar experience are willing to invest as well.

The post-investment activities of venture capitalists are also extensive. BMPV (1990) examined venture capitalists' activities by studying prospectuses of IPOs by venture-backed firms. They found that the average venture-backed IPO had three venture capital investors holding 34% of the pre-IPO equity in the firm. The average IPO had two venture capitalists serving as members of the board of directors, and an average of 1.8 venture capitalists remained on the board a full year after the IPO. Surprisingly few venture capitalists sold any of their shares in the IPO,

even though participating in the IPO is viewed as a key exit strategy for the venture capitalists.

Lerner (1994a) examined the activities of venture capitalists in providing oversight of their portfolio companies. Lerner studied the association between the venture capitalists' degree of involvement and the need for monitoring. In particular, he found that venture capitalist representation on boards of directors increased by 44% for firms in which the chief executive officer (CEO) had no prior experience in running an entrepreneurial firm. Lerner also examined the impact of a change in CEO. He refers to CEO replacement as an instance of "organizational crisis" and as an indication of a need for more intense monitoring. He found that on average venture capital investors added 1.75 board members between financing rounds when the CEO was replaced, versus an average increase of only 0.24 board members between rounds in which the CEO was not replaced. Thus, the monitoring activities of venture capitalists appear to intensify as the need dictates.

B. How Successful Are Venture Capitalists?

Venture capitalists manage other people's money to achieve high returns. In order to do so, they invest in risky investment opportunities. An important indicator of the success of venture capital, therefore, is the realized rate of return in relation to riskiness of investments in venture capital funds: Have venture capitalists provided returns adequate to compensate for the risk incurred?

Huntsman and Hoban (1980) examined 110 investments by three venture capital firms over the period 1960-1975. They showed that venture capital returns depend on outliers. While the average return over the period was 18.9%, eliminating the top 10% of investments resulted in an average return of -0.28%. In other words, venture capital success is highly dependent on finding a few outstanding investments, and diversification is vital. Huntsman and Hoban provide no formal tests of the superiority or inferiority of their returns with respect to a formal model of returns.

Martin and Petty (1983) compared publicly traded funds with mutual funds with a stated goal of maximum growth. They found that the venture capital funds were riskier on average (measured by total risk) than their mutual fund counterparts but that they were not dominated, i.e., they also exhibited higher returns on average. Kleiman and Schulman (1992) provide a more recent analysis of the performance of publicly traded funds, examining small business investment corporations (SBICs) and business development corporations (BDCs).[3] They find that SBICs have higher returns and higher risk than BDCs but that the risk of SBICs is largely unsystematic. SBICs dominated BDCs on the basis of systematic risk in comparison to returns over the 1980-1986 period, although Kleiman and Shulman argue that subsequent comparisons have not been so favorable.

Brophy and Gunther (1988) studied the performance of publicly traded venture capital funds. They constructed a portfolio of such funds. They found that, although the individual funds had high total risk, their systematic risk was low, and so a portfolio of such funds had low risk. On a return versus total risk basis, they found the portfolio of venture capital funds dominated mutual funds with maximum growth goals and the S&P 500 Index.

Chiampou and Kallett (1989) examined 55 private venture capital funds, breaking them into two groups. One group consisted of 35 funds more than six years old; the other group contained the 20 newer funds. Chiampou and Kallett found that the investment returns of the 35 mature funds over the period 1978-1987 averaged 24.4% per annum against a standard deviation of returns of 51.2%. The younger firms performed much more poorly, averaging only 5.4% over their shorter lives. However, the results for the younger funds probably reflect two biases in the sample. First, venture capital returns for the broad sample were lower in the middle years of the 1980s than in the earlier part of the sample, and the newer firms' returns heavily reflected that period. Second, it is difficult to measure the value of relatively recent investments since their values are unlikely to have been realized through merger or public offering or other events. Their values will often be reflected at cost rather than at market value. The older firms will have more investments whose values have been marked to market.

Gompers (1994b) presents an analysis of the pattern of returns in the venture capital industry, explaining why venture returns have fallen broadly since the early 1980s. Gompers points out that returns were relatively high, generally greater than 20% on an annual basis, in the first half of the 1980s. However, the early success of venture capital, a hot IPO market, and financial deregulation attracted capital in record amounts from pension fund investment managers. The larger quantity of capital placed pressure on the industry to find deals, and so the valuation of venture capital deals tended to rise. Also, many relatively inexperienced venture capitalists entered the market. The increase of institutional investors in the market, according to Gompers, put pressure on the venture capital funds to demonstrate earlier the investment results that would be

[3]SBICs are licensed under a program of the Small Business Administration. They receive federal government loan guarantees that allow them to leverage their investment by three to four times. BDCs are public venture capital companies, regulated by the Securities and Exchange Commission, that enjoyed preferential tax treatment until the enactment of the Tax Reform Act of 1986.

reflected in the performance of the pension fund investment managers. This pressure tended to cause investment in relatively later-stage investments, which could be harvested more quickly but which, involving less risk, would be expected to produce lower average returns.

The analysis of venture capital performance indicates that venture capitalists take on high risks that appear to be rewarded on average. Those risks tend to be unsystematic, so that portfolios constructed by investing in a variety of venture capital funds will have much lower risk than will investment in a single fund. The evidence regarding the performance of those investments is mixed, so it remains to be seen whether venture capital is a superior form of investment.

C. Venture Capital and the Going-public Process

One way to find data on venture capital activities is to identify IPOs in which venture capitalists have been investors in the offering firm. For example, using IPO listings from Venture Economics, the major provider of data on the venture capital industry, BMPV developed an exhaustive set of initial public offerings (IPOs) by venture-backed companies over the period 1978-1987. BMPV examined whether the presence of experienced venture capitalists on the board of a firm going public affects the results of the offering. Evidence indicated that the market recognized the quality of the venture capitalists because IPO underpricing was lower when the firm had more experienced venture capitalists who had been investors.

The reputation and certification role of venture capital was also confirmed in a study by Megginson and Weiss (1991). Their findings are consistent with a recognized role for the venture capitalists as monitors. Megginson and Weiss used a matched sample of IPOs with venture backing and IPOs without venture backing. They found significantly less underpricing in those issues with venture capital backing, which is similar to other studies' findings that the quality of the underwriter or auditor can influence IPO pricing.

Lin and Smith (1994) developed a series of hypotheses to describe the role of venture capital in the IPO process. Because the venture capitalist is likely to return to the IPO market with future offerings of portfolio companies, the venture capitalist has reputational capital to protect, a factor that may influence whether, when, and at what price the company will go public. Lin and Smith argue that firms with venture capital will be able to come to the market earlier in their development, backed by the relationship with venture capital. Gompers (1994a) notes, however, that the venture capitalist may in fact choose to bring the portfolio firm public earlier than would be optimal for the entrepreneur in order to attract new investment funds. Gompers calls that phenomenon "grandstanding."

Lin and Smith go on to argue that the venture capitalist's IPO selling decision will depend on the venture capitalist's reputation, the reputation of the underwriter, and the degree of underpricing. In particular, high-quality venture capitalists making offerings via high-quality underwriters will be more likely to sell in an underpriced IPO, but unlikely to sell in cases in which the IPO is overpriced. Lin and Smith find empirical support for all of these hypotheses.

Furthermore, the role of monitoring can change after the IPO due to the publication of information that was previously private, i.e., informational asymmetries will decrease as a result of the offering and its accompanying disclosures. Consistent with those points, Lin and Smith expect the value of monitoring and control to decline, and they hypothesize that ownership by venture capitalists will also decline following the offering. (This is an implication of the Admati and Pfleiderer (1994) model as well.)

Lerner (1994c) provides evidence that experienced venture capitalists can time the IPO market. In particular, Lerner demonstrates that venture capitalists tend to bring their portfolio firms public at times when the market valuation of those firms is particularly high, whereas privately financed firms tend to go public at times when market valuations are lower. These results suggest that the venture capitalist provides a valuable service in assisting the entrepreneur in timing the market. They also suggest that more experienced venture capitalists have greater ability and/or greater incentives to time the market than do their less experienced counterparts.

Gompers (1994a) shows that relatively less experienced or less reputable venture capitalists have incentives to bring a portfolio firm public prematurely. A related paper by Gifford (1994) investigates the same phenomenon from a theoretical perspective.

Many studies have examined the role of the entrepreneur as agent and the venture capitalist as principal. Conflicts arise in such situations because the entrepreneur may have information unknown to the venture capitalist and may choose to shirk or overinvest, creating agency costs. However, we may also see the venture capitalist as agent for the entrepreneur. The entrepreneur brings in the venture capitalist as a financial partner and consultant. The venture capitalist may have incentives to offer bad consulting advice to the entrepreneur, i.e., advice that suggests a course of action contrary to the interests of the entrepreneur, up to and including the abandonment of an investment that has economic value (see Sahlman (1990) for a discussion of the abandonment decision). Premature abandonment may come

about because the venture capitalist has a diversified portfolio of opportunities and a high opportunity cost of time, whereas the entrepreneur is fully committed to the venture and in fact may choose to overinvest other people's money.

Hence, conflicts of interest may arise because of the incentives of venture capitalists to give advice counter to the interests of their entrepreneur-partners. Gompers (1994a) points out that one such area is in the timing of a public offering. Instead of abandonment of a viable venture, however, the venture capitalist encourages a premature public offering in order to achieve the visibility associated with that offering and use that visibility in marketing the next limited partnership. Since the value of the portfolio held by the venture capitalist is not normally updated to its current market value in the absence of transactions, an IPO may permit the venture capitalist to mark-to-market an investment that previously was carried at a lower book value. This opportunity may be especially pertinent if the venture capitalist markets new funds to pension fund managers who are concerned with reporting their own investment performance. Gompers suggests that venture capitalists without a substantial track record would be especially prone to premature offerings.

Gompers' empirical results support these hypotheses. Relatively inexperienced venture capitalists tend to bring portfolio companies public earlier in the life of the firm than do established venture capitalists. They also tend to raise new funds sooner after an IPO than do more experienced venture capitalists. Finally, the IPOs tend to be more underpriced than are offerings by the more experienced venture capitalists. This finding also coincides with Lerner's finding concerning the timing of IPOs: Venture capitalists with their own agendas may be less concerned about the optimization of timing viewed from a valuation perspective and may be concerned instead with timing as it affects the marketing of their own services.

Gompers' results are disturbing for another reason. In addition to suggesting that the venture capitalists have incentives to offer bad advice to their entrepreneurs in the matter of IPO timing, a premature IPO can also be harmful to the venture capitalist's investors. That is, Gompers suggests that the interests of investors in existing funds may be compromised by the desire to find investors for an additional fund. That situation reflects a potential agency conflict with existing investors as well as with entrepreneurs.

D. Contracting Technology between Venture Capitalists and Entrepreneurs

Sahlman (1990) describes a myriad of agency conflicts in venture capital. Sahlman explains why conflicts exist, and he explains the mechanisms to deal with such conflicts. There are conflicts between the investors and the venture capitalists as well as conflicts between managers of portfolio firms and venture capitalists. Sahlman demonstrates that there is a similarity in the mechanisms for addressing such conflicts, and he relates agency costs in a venture capital context to agency issues in other settings.

One feature of contracts between entrepreneurs and venture capitalists is that an entrepreneurs receive a payoff that is typically tied to performance in several ways. First, entrepreneurs will have an equity interest (perhaps the dominant equity interest) and will benefit from value creation. Further, it is common that the degree of dilution of entrepreneurs' ownership interests is tied directly to performance, so that entrepreneurs (venture capitalists) receive a larger (smaller) fraction of a more successful venture. Entrepreneurs commonly receive a relatively modest salary so that their success is tied to the success of the venture. It is also common for venture capitalists to retain sufficient control to be able to fire or demote an ineffective manager. The manager would typically suffer some loss of equity interest in such an event in addition to suffering a loss in the value of human capital.

Most of the research on agency issues in venture capital examines contracting technology between entrepreneurs and venture capitalists, taking the narrow perspective of analyzing agency conflicts in isolation from other realities of the venture capital process. Some of the more recent work has attempted to take a broader perspective. For example, Gompers' (1994a) "grandstanding" analysis recognizes that the relationship between venture capitalist and entrepreneur is affected by the relationship between the venture capitalist and investors. Nevertheless, most of what we know has been developed from the narrower perspective.

A conflict arises between venture capitalists and entrepreneurs because entrepreneurs have information unavailable to venture capitalists and because entrepreneurs make choices that are not fully known by venture capitalists. For example, initially, an entrepreneur knows more about his or her product than will the venture capitalist. The entrepreneur may be of unknown quality. Because entrepreneurs are often committed to a single venture and venture capitalists have a portfolio of investment projects, there are potential conflicts over the amount to invest in a venture. Using other people's money and having limited liability, entrepreneurs may want to continue to invest even after a project ceases to be viable. Such investment preserves the option of the entrepreneurs on the upside potential of the project. Entrepreneurs have expectations that are incompletely known to the venture capitalists and, in the

process of selling the venture, the entrepreneurs may overstate its likely outcomes.

Venture capitalists can design contracts to lessen these concerns. Sahlman (1988, 1990) stresses the use of "staged" capital commitment as one feature of such contracts, i.e., the venture capitalist commits only a fraction of the capital needed for the ultimate development of a project. Subsequent financing is then tied to the successful completion of intermediate objectives.

Staging the capital commitment creates an abandonment option and thereby increases the value of the investment. Further, an entrepreneur's decision to accept such a contract will provide information about the entrepreneur's beliefs in his or her own estimates and in the time and cost required to develop the first stage. Subsequent capital commitments will then benefit from additional information. The venture capitalist will be able to reduce risk before the second round of financing, and if all goes well, the entrepreneur may benefit from an increase in valuation, leading to less dilution of his or her ownership interests in subsequent rounds. Staged capital commitments also keep the entrepreneur focused on the task at hand and may motivate a more rapid pace of activity. Hellman (1993) points out that an unintended consequence of this focus could be one of myopia, i.e., the entrepreneur could lose sight of the big picture in focusing too narrowly on meeting short-term goals. A way around that problem is to design short-term performance objectives that are essential as intermediate steps towards a longer-term goal.

Gompers (1993b) further develops the notion of staging and shows how it can deal with agency costs and can create a strategic option. He points out that the fraction of intangible assets affects the level of agency costs and the need for monitoring.[4] Gompers provides empirical evidence on staging from a database of 2,145 rounds of venture capital financing for 795 firms. He finds that early stage investments typically receive relatively small amounts of capital, that the rate of capital consumption (the "burn rate") increases as a venture matures, and that greater industry sales growth is associated with capital commitments of longer durations. Gompers measures the intensity of monitoring by the length of the period between successive capital commitments since the decision to continue or abandon a project is the ultimate measure of control.

Other recent papers have also addressed the contracting problem. Admati and Pfleiderer (1994) focus on the investment and continuation decisions when capital is provided in stages. They identify the overinvestment problem—the problem that an entrepreneur who can attract outside funds may continue to invest in the project even when it is no longer valuable based on the entrepreneur's inside information. Even if the information would show that a project has a negative net present value, as long as it has some probability of being successful, the entrepreneur's option-like position suggests he or she will continue as long as others will provide the financing. In principle, an external investor, such as a venture capitalist, can enter the picture, invest, monitor, and become equally informed. However, having become an insider, the venture capitalist may suffer the same problem as the entrepreneur: Having invested and having learned that a project is not favorable, but has a probability of success, the venture capitalist may have an incentive to attract new outside funds as well.[5]

Thus, neither entrepreneurs nor venture capitalists can be assumed to provide unbiased views concerning the prospects of the investment. How can the issue be resolved? Admati and Pfleiderer demonstrate that a contract in which venture capitalists continue to maintain the same fraction of equity in subsequent financing rounds as they had in the earlier round will resolve the conflict. This solution neutralizes the venture capitalists' incentive to mislead. Admati and Pfleiderer also show that their contract is robust in the sense that minor changes in the set of possible outcomes will not render the contract sub-optimal.

Lerner (1994b), in a companion paper in this issue of *Financial Management*, provides empirical evidence in support of the Admati and Pfleiderer model. Lerner studied 651 rounds of financing for 271 biotechnology ventures. His study focused on the process of syndication. He demonstrates that the ownership stake of venture capitalists frequently stays constant in later rounds of venture capital financing.

The most common form of venture capital investment is convertible preferred stock. The preferred stock gives the venture capitalist a superior claim to cash flow and to distributions in liquidation in the event that the venture is unsuccessful. The conversion feature provides participation on the upside. The conversion price is commonly a function of performance, so that if a venture is unsuccessful, the

[4]For example, tangible assets can be liquidated in the event of failure of the venture, allowing the venture capitalist to recover some part of the initial investment. Intangible assets are less easily disposed of and are more difficult to value.

[5]The incentive for the lead venture capitalist to provide misleading information will be lower than that for the entrepreneur because of the nature of the venture capital investment process. Venture capitalists depend on referrals, and they tend to syndicate their investments. Their reputational capital is important by virtue of their status as repeating players in the investment process. Thus, the venture capitalist has an incentive not to encourage the participation of other venture capitalists in a bad deal. An action that is myopically optimal may prove very costly over the longer term.

venture capitalist stands a better chance of recovering the investment. At the same time, the increased conversion price following good performance increases the incentives to the entrepreneur.

Gompers (1993a) and Marx (1993) develop theoretical models of venture capital contracting that explain the use of convertible preferred stock. Marx shows that convertible preferred dominates pure equity and debt investments. Gompers shows that convertible preferred can overcome adverse selection and prevent excessive risk taking by entrepreneurs.

E. Contracting Technology between Venture Capitalists and Their Investors

Sahlman (1990) describes potential conflicts between venture capitalists and their investors. The venture capitalists may be of unknown quality. They invest in and monitor a variety of ventures that are not known to the investors when they commit their funds. Poor returns may be due to bad outcomes of a random process, or they may reflect a lack of skill or effort. An investor, like the venture capitalist selecting ventures in which to invest, faces a sorting problem (distinguishing good investment opportunities from bad) as well as the problem of how to provide the proper incentives.

Sahlman's solution likens the investor's problem to those of the venture capitalist. The venture capitalist receives a contract in which he or she benefits from the success of investors. The benefit comes in the form of a fraction of carried interest on the fund's investments. Like the entrepreneur, the venture capitalist also receives a cash inflow to fund operations while the portfolio is being developed. Like the venture capitalist, the investor retains the right to abandon by refusing to continue to meet commitments to invest beyond the initial capital infusion, although that decision is typically costly—it usually results in the forfeiture of earlier investments. The investment funds have finite lives, usually ten years, so that conflicts of interest over the distribution of gains are eliminated at some point. Perhaps as importantly, the investor can refuse to invest in future funds initiated by the venture capitalist. To avoid self-dealing, most partnership agreements restrict the general partner's ability to invest in companies in the portfolio. For example, some agreements specify that the venture capitalists cannot invest in portfolio companies for their own account at prices lower than those paid by the venture capital partnership.

Gompers and Lerner (1994) investigate compensation in venture capital partnerships. They develop a set of hypothesized relationships between aspects of the venture capitalists, their target portfolio environment, and their compensation. Using 441 offering prospectuses from venture capital funds formed between 1978 and 1992, Gompers and Lerner examine the empirical features of compensation against their model of the process. They find that compensation is highly clustered; 81% of their sample funds call for the venture capitalists to receive between 20 and 21% of the gains earned by the partnership, and most receive exactly 20%. They find a tendency for older and larger venture capital firms to earn a larger share of their income in this incentive form rather than in stated fees, and indeed they find that stated fees based on a percentage of net asset value have greatly diminished in importance in recent years.

Gompers and Lerner also examine the effects of the environment in which the funds invest. For example, funds that invest in higher technology areas or in earlier stage ventures—ventures traditionally associated with higher risk—receive greater base compensation as well as a greater carried interest. In general, as the amount of effort associated with the investment increases, base compensation also rises.

F. The Positive Role of Venture Capital

Does venture capital play a positive role in financial markets? Not all scholars have been in agreement on this basic issue. Chan (1983) developed a model that illustrates the value of the venture capitalist as an intermediary. Chan begins with a world where there are entrepreneurs with projects and only uninformed investors, all of whom have positive search costs. A "lemons" result occurs in the sense that only projects of low quality are offered to the investors, and they accordingly pay a price that reflects low quality. Chan introduces the venture capitalist as an informed intermediary. The venture capitalist solves the adverse selection problem, and good projects can come to the market.

Recently, Amit, Glosten, and Muller (1990) have again questioned the value of venture capital. They assume that entrepreneurs know their own skill levels. Although the entrepreneurs need capital and want to share risk, the venture capitalists cannot assess accurately the skill level of the entrepreneurs. In equilibrium, less capable entrepreneurs will choose to attract venture capital investment, whereas the more capable ones will develop their projects without the participation of venture capitalists. The market appears to break down. Amit, Glosten, and Muller argue that the dismal investment returns of the 1980s are perhaps attributable to the breakdown of the market in the manner their model describes.

In reality, the market does not break down. Investment returns were not strong in the 1980s, but Gompers (1994b) presents an alternative explanation based on changes in the

make-up of the funds flowing into venture capital in the 1980s. Further, a theory like that of Amit, Glosten, and Muller cannot be said to have explained the poor returns of the 1980s unless it can also account for the much better returns of other periods of time, as Gompers' arguments do.

More importantly, Amit, Glosten, and Muller (1990) ignore important aspects of the real world that deal with exactly the breakdown they describe.[6] One aspect is the state of contracting technology designed to deal with the adverse selection problem, or the "sorting" problem as Sahlman (1990) describes it. In particular, staged financing addresses this problem precisely. In staged financing, venture capitalists make a relatively small commitment initially and only commit additional funds after the entrepreneurs have been able to demonstrate in deed rather than in words the promises made to attract funds. Even in the second stage, only a partial commitment is normally made. Thus, a minimum of capital is placed at risk. The venture capitalists essentially buy a call option on further investment, and the entrepreneurs are given powerful incentives to perform. Additionally, entrepreneurs know that if they mislead the venture capitalists in the beginning, they may be "found out" before additional funds are committed. Thus, an entrepreneur's willingness to accept staged financing is a signal of that entrepreneur's beliefs in the prospects of the project.

A second point that is often ignored in discussions regarding the value of intermediaries is that the venture capitalist can add value to a project. As discussed previously, the venture capitalist is often a specialist in a particular technology or stage of development and can offer strategic guidance as well as money. Further, the venture capitalist is a consultant with a stake in the outcome of the venture—a consultant with incentives. In addition, at least some entrepreneurs with narrow technical specialties may recognize their limitations as captains of industry and may welcome an incentivized investor who can help guide the business toward public offerings or a merger.

Finally, at the level of small, risky ventures, access to capital markets is restricted. Presumably, not all entrepreneurs can self-finance their projects, and not all can find bankers or angels who will carry the shortfall. Venture capital offers them a source of funds that is designed for use in risky settings. The venture capitalists themselves perform due diligence prior to investing, and information gleaned in that process can reduce the adverse selection problem.

[6]The reader should note that Amit, Glosten, and Muller (1990) fully document the conditions needed for their model to hold. They also note that their model ignores aspects of, for example, contracting technology that could address adverse selection.

In sum, while there are theoretical arguments that venture capitalists may not add value or may suffer from severe adverse selection, the venture capital industry has engineered solutions to this problem. Contracting technology, the added value created via consulting assistance, and the unavailability of suitable funds from other sources all act to add value in the venture capital process.

G. Summary

Recent research has shed new light on the venture capital process. We have learned about the venture capitalist-entrepreneur relationship, but we know considerably less about the venture capitalist-investor relationship and only very little about the interactions across those two relationships. The problems are difficult analytically, and empirical research of high quality is a particularly difficult and labor-intensive process, as can be seen in recent empirical papers. Among those papers, the work of Lerner (1994a, 1994b, and 1994c), Gompers (1993b), and Gompers and Lerner (1994) stand out as examples of the efforts required to identify and collect data on a large sample of observations. Empirical research in venture capital is not easy. There are few tapes to spin. Because of that difficulty, comparatively little has been done, and the opportunity to develop results that are novel and important is great.

III. Directions for Future Research

Research on venture capital is in its infancy. The problems encountered are not simple. Realistic treatments of the issues faced in venture capital research will require innovative approaches. Further, empirical research on venture capital was virtually non-existent before the decade of the 1990s. It is not easy to do, mainly because of lack of data, but some good examples do now exist, and unanswered questions are available in abundance.

A. Angels and Venture Capitalists

Angel investing is a process in which a wealthy person or group places funds in a venture without taking on the consulting role of venture capitalists. Sahlman (1990) argues that "angels" invest an order of magnitude more funds than do venture capitalists, and yet we know even less about angel investing than we know about venture capital. How successful is angel investing? Given that there is $33 billion invested in venture capital in the United States, why do angel investors choose to bypass venture capital and invest directly? What motivates an entrepreneur to seek angel funds rather than venture capital? (Presumably, control issues are

important in this decision. Likewise, an entrepreneur may perceive no need for the advice and guidance of a venture capitalist.) Are the terms of financing arrangements similar to those of venture capital? Do they avoid adverse selection in ways similar to those of venture capitalists? How do their rates of return compare to those attainable through investment in venture capital funds?

In many parts of the developing world, venture capital is virtually nonexistent; raising funds for new ventures from private groups or family members is common. The so-called informal capital markets are often more important than the formal markets, especially early in the life of a market economy. Sometimes this process is a way of avoiding disclosure and/or taxes. Understanding better the process of angel investing in this country may shed light on the structure of investing in developing economies as well. Likewise, the process of informal market investing in developing markets may offer insights that will prove helpful in investigating the angel market in the United States.

B. Do Venture Capitalists Add Value within the Portfolio Firm?

While we have examined the role of the venture capitalist as an intermediary, a related issue that has not been resolved is whether or not venture capitalists add value within a portfolio firm. We know that IPOs with venture backing are often younger and less developed (see Lin and Smith (1994), and see Gompers' (1994a) caveat) than are IPOs without venture backing, but we don't know if the firms are more successful. Do companies perform better when venture capital is present than when it is absent, all else equal? This question ultimately suggests another: "Is more value created when venture capital is present than when it is absent?" Evidence based on the price-earnings (PE) multiples of venture-backed IPOs is not adequate to address this issue since the PE multiples could be a result of reputation and signaling effects rather than improved performance per se.

C. The Interaction among Multiple Principals and Agents

The venture capital process is characterized by multiple principal-agent relationships. There is the relationship between investors and the venture capitalists and the relationship between venture capitalists and entrepreneurs, in addition to other obvious relationships that include minority shareholders, employees, bankers, clients, and suppliers. Focusing only on the three major players (investor, venture capitalist, and entrepreneur), we have already seen Gompers' (1994a) example in which the need to attract additional investors may cause the venture capitalist to offer advice counter to the interests of the entrepreneur. That example further points out that the venture capitalist serves a dual role as principal in some respects and agent in other respects in working with an entrepreneur.

These multiple agency relationships can play an important role in determining the success of venture capital investing. For example, the extent to which a venture capitalist is already committed because of monitoring responsibilities in the management of existing funds may influence the investment decisions of potential investors in subsequent funds. Is there a tendency to use less experienced associates to share the burden so that more time is available to solicit potential new investors? A new fund will typically have ten years in which to create value—and generate management fees—whereas an older fund will have less time, hence less potential, to add value over its remaining lifetime. For example, if the venture capitalist makes an investment with the money from fund A in company X, and fund A has a relatively short remaining life, will that short life influence the venture capitalist's advice and/or efforts with respect to company X? If so, then the entrepreneur and limited partners may want to know the source of funds for a particular investment. Do venture capital contracts with investors and with entrepreneurs address this problem up front? If so, how?

D. Exit Strategies and Value Maximization

Venture capitalists may exit an investment in a number of ways. The most common avenues for exiting a successful venture are via an IPO or a merger. In other cases, exit may occur through liquidation or share repurchase. It appears that exit via IPO is the most profitable form, although that does not mean that investments that are harvested via merger would have been better served by an IPO. What aspects of the ventures themselves or the market environment (including the IPO market) characterize the decision to exit by way of an IPO rather than by a merger? Presumably, venture capitalists and entrepreneurs make value-maximizing exit decisions at the time they are made, but what factors influence this decision? Are merged companies essentially not good candidates for an IPO? Do mergers occur earlier or later in a company's development than would an IPO? Are there characteristics of the product market that dictate the IPO-versus-merger decision?

E. Alternative Organizational Forms and Venture Capital Performance

There are various types of venture capital organizations. This paper and most of the literature tends to stress the limited partnership form, but there are others. There are, for

example, public venture capital funds, and there are captive venture capital firms (such as Citibank Venture Capital or Hambrecht and Quist). How do these different types of organizations perform? How are they similar, and how do they differ?

Sahlman's discussion of the agency conflicts and their resolution in limited partnerships does not apply fully to the public or captive form. Captive venture capital firms, for example, receive their funding from a single source and lack many of the features and issues that Sahlman discusses. Presumably they would not inflict the grandstanding phenomenon (discussed by Gompers (1994a)) on their parent. On the other hand, they bring their own issues to the table. Hambrecht and Quist, for example, was the most active venture capital firm in the IPO sample of Barry, Muscarella, Peavy, and Vetsuypens (1990), and Hambrecht and Quist's investment banking group is also active as a lead underwriter in the IPO process.[7]

Because venture capitalists operating within different organizational forms differ in their relationships with their principal investors, their behavior may be expected to be different: Their contracting technology may differ, the consulting role they play within a portfolio firm may differ, they may follow different investment strategies, and they may exhibit differences in performance. Also, this richness of organizational forms provides an arena in which to examine extant empirical results. For example, if the grandstanding phenomenon is specific to limited partnerships, we should not see that phenomenon in the context of other organizational forms.

A related issue is whether organizational form is associated with performance. One might expect both risk and return to vary by the form of the organization. Bank-affiliated venture capitalists are often thought to be more conservative in their strategy and, if so, that should affect risk and return. Similarly, bank-affiliated venture capitalists are often reputed to be less experienced on average, and a number of papers have argued that the age or experience of the venture capitalists can affect the investment process.

F. Risk and Return in Venture Capital

Is venture capital a superior form of investment? Is it inferior? The answer appears to depend on the time period in question. Results are widely mixed, as is highlighted in Gompers' (1994b) brief history of the venture capital industry and as is obvious from reading the performance results contained in a variety of studies of venture capital (e.g., Bygrave and Timmons (1992), Brophy and Gunther (1988), Chiampou and Kallett (1989), Kleiman and Schulman (1992), and Martin and Petty (1983)). The performance of venture capital investing remains an open issue. The results vary by time period, by type of fund, and by the degree to which the funds are combined into portfolios. It is difficult to draw any general conclusions from the mixed results obtained to date; therefore, additional research is needed to address this issue.

IV. Conclusions

Much has been learned recently in the area of venture capital finance. We understand more about the contracting technology that permits venture capitalists to manage their dual roles as agents with respect to their limited partner-investors and as principals with respect to entrepreneurs in their portfolio firms. Venture capitalists are active, blockholding investors who provide monitoring services and whose contractual relations guard against failure while permitting participation in the upside in their ventures. They use some of the same contractual mechanisms for alleviating concerns on the part of their investors as they apply themselves in their relations with the entrepreneurs in whose ventures they invest.

In a venture capital setting, adverse selection is an especially important concern. Investors do not wish to invest with venture capitalists who shirk, and the contracting technology gives the venture capitalists strong incentives to perform on behalf of the investors. Similarly, venture capitalists want to invest their funds in ventures that are successful, and contractual mechanisms can assure that the entrepreneurs with whom they place their funds have strong incentives to perform. Further, the venture capitalists take a number of steps to avoid adverse selection, including their own due diligence activities as well as investing through a syndicating mechanism in which the collective judgment of several members of the industry is brought to bear on the investment decision.

All is not perfect. For example, venture capitalists have incentives to realize gains in order to demonstrate performance and raise additional funds. Those incentives can lead to conflicts of interest with existing investors as well as with the entrepreneurs who rely on the venture capitalists for guidance on matters such as when to make a public offering.

Empirical evidence on venture capital is not easy to develop because of the private nature of venture capital firms and their investments. Nevertheless, recent work has tapped into existing databases and led to the development of some

[7] In their sample of venture-backed IPOs, Barry, Muscarella, Peavy, and Vetsuypens (1990) noted 87 IPOs in which venture capital investors were affiliates of underwriters and 19 cases in which the underwriter affiliate was the lead underwriter in the IPO. There was no evidence that underpricing was different for the sample in which underwriter-affiliate venture capitalists were present than for the residual sample.

new ones, paving the way for further work. Recent evidence details the process by which venture capitalists carry out their responsibilities. Among the recent studies, we find evidence of the participation by venture capitalists in their portfolio companies. For example, new evidence suggests that venture capitalists can time the IPO market, i.e., they tend to issue IPOs close to market peaks and to avoid them at market valleys. We also see evidence on the form of compensation and on investment behavior by venture capitalists.

The paper suggests a number of areas in which further work is needed. For example, although recent work explains what venture capitalists do, it does not show whether those activities in fact create value. Is a firm better off seeking venture capital or finding other financing vehicles? When is one avenue better than the others? Why is angel investing so important? Do angel investors sacrifice return or take on greater risk by circumventing the venture capital process? Which approach is better, and under what circumstances?

Do venture capital investments produce superior investment returns? The evidence to date has been mixed, dependent on the time period in question and on characteristics of the venture capitalists and the investment environment. Does venture capital in fact add value for the investor? Is venture capital an investment class into which private investors should be attracted?

Related to both of these issues is a question about how venture capitalists choose an exit strategy. We know that exit or "harvesting" can come in various forms, but we don't know if the chosen forms are ideal. What are the circumstances under which mergers are superior to public offerings? When is it optimal to terminate or liquidate a venture? We do now know that there can be a conflict between the venture capitalists and entrepreneur about this latter decision, but we do not know how it is resolved or how it ought to be resolved.

Finally, one source of complexity in venture capital investing is the existence of multiple principal-agent relationships operating at the same time. The venture capitalist has a set of investors in each fund that is under management, and the venture capitalist also has incentives to continue soliciting new funds. Might the interests of one principal (investor) be compromised in order to attract the other? Might the advice given by the venture capitalist to the portfolio firms be affected by the investor relationships? We have seen evidence that the multiple relationships can lead to conflict. In view of those prospective conflicts, how can we model the venture capital process more comprehensively in order to reflect the realities of a multiple-principal, multiple-agent market? Is the existing contracting locally optimal but globally inadequate? New work is needed to amplify our understanding in this area.

Venture capital is ripe for new research. Enough has been learned recently that scholars do not have to begin their work in darkness, but important issues remain that have not been fully addressed or have barely been touched. Both theoretical studies and empirical studies are needed. Such studies will not be easy to complete, but they can make an important contribution to our knowledge about venture capital. The risks are high, but the potential rewards are enticing. ■

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