Venture-Capital Syndication: Improved Venture Selection vs. the Value-Added Hypothesis

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Syndication arises when venture capitalists jointly invest in projects. We model and test two possible reasons for syndication: project selection, as an additional venture capitalist provides an informative second opinion; and complementary management skills of additional venture capitalists. The central question is whether venture capitalists are engaged primarily in selection or in managerial value added. These alternatives imply contrasting predictions about comparative returns to syndicated and standalone investments. Our empirical analysis, using Canadian data, finds that syndicated investments have higher returns, favoring the value-added interpretation. We also discuss risk sharing and project scale as possible reasons for syndication.

1. Introduction

One striking feature of venture-capital finance is that investments are often syndicated. This means that two or more venture capitalists share in the financing of a particular venture.[1] Syndication frequently occurs even when the capitalization requirements of the venture are modest compared to the financial resources of any one venture capitalist. The natural question to ask is why venture capitalists undertake syndication in such situations.

Syndication is not unique to venture capital, and also occurs with other types of investment. For that matter, any joint venture has a similar structure, as venture-capital syndication is just one example of a general phenomenon in which one party to a project brings in partners. Some of the insights drawn from our analysis should therefore be quite general. However, the motives for syndication may vary from case to case, and the model structures used here are designed to represent the venture-capital case. Our empirical analysis is based on information from the Canadian venture-capital industry.

One rationale for syndication, suggested by Lerner (1994), is what we call the *selection hypothesis*. There might be an advantage to having more than one venture capitalist evaluate a project before it is selected for investment or, in a staged[2] investment setting, before additional investments are made. Syndication is a way for the first, or *lead*, venture capitalist to bring other venture capitalists into the selection process. Even after its own evaluation of a venture investment, a venture capitalist might still be very unsure about the venture's prospects and might prefer to get the opinion of another venture capitalist. In effect, two (or more) independent venture capitalists might screen projects more effectively than one, because each learns something from the others' evaluation. This process could occur at the time of first investment by a venture capitalist in the firm, or it could occur when additional or continuation investments are being considered by a venture capitalist. Thus syndication would lead to improved venture selection or continuation decisions.

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1. Syndication is often taken to mean that two or more venture capitalists share a particular round of financing. Sometimes, however, the term is used more broadly to refer to situations where different venture capitalists invest in a given project at different times.

2. Venture-capital financing is normally *staged* in that a venture will typically receive a modest initial investment from one or more venture capitalists, with additional investments from those (and possibly other) venture capitalists coming in subsequent stages. See Gompers (1995) for a discussion and analysis of venture-capital staging based on the idea that staging is a valuable governance tool in the presence of potential agency problems.

One central objective in this paper is to provide a formal model of the selection hypothesis. Our second objective is to suggest and model an alternative hypothesis that we refer to as the *value-added hypothesis*. This second hypothesis is based on the idea that venture capitalists might add value to the ventures in which they invest. Our third objective is to test empirically the relative importance of these two hypotheses. Thus our analysis addresses the general question of whether venture capitalists are primarily engaged in venture selection or whether they are primarily engaged in managerial and related activities that add value to individual ventures.

Lerner (1994) attributes the underlying idea for the selection hypothesis to Sah and Stiglitz (1986), who provide a general model of organizational design and point out that it might sometimes be preferable to have a decision process in which a project must satisfy the evaluation of two separate observers, each of whom has veto power. Sah and Stiglitz (1986) do not mention venture-capital finance or any other financial-sector applications, and it is not obvious that their model would apply to venture-capital. However, Lerner (1994) provides some data on the pattern of venture-capital investments in the biotechnology sector and interprets this evidence as being consistent with the selection hypothesis.

We model the selection hypothesis as a sequential sampling problem. This model implies that returns to syndicated investments should be lower than returns to standalone investments. Initially, a project is brought to the lead venture capitalist for consideration. This venture capitalist assesses the project. If the estimated project quality is sufficiently low after this assessment, then the venture capitalist rejects the project outright, as there is little point in seeking a second opinion. At the other extreme, if the assessment yields a high expected value, then the venture capitalist accepts the project, as there is little need for a second opinion (i.e., little need for syndication) in this case either. The primary cost of syndicating is that the venture capitalist must share in the venture's proceeds. The venture capitalist would not want to incur this cost if a project were clearly acceptable.

The remaining possibility is that estimated project quality is in the intermediate range after the venture capitalist's initial assessment. It is therefore not clear whether the project should be accepted or rejected. This is the case in which a second opinion is valuable, leading the venture capitalist to pursue syndication. The most promising projects would be taken up as standalone investments, while projects of more moderate promise would be put in the syndication pool. This implies that standalone projects should, on average, yield higher returns than syndicated projects. Therefore, if improved selection

is the central motivation for syndication, it follows that syndicated investments should, on average, have lower returns than standalone investments.

The other hypothesis we consider is the value-added hypothesis, under which venture capitalists are presumed to add value to ventures rather than simply trying to select the best ventures. From the lead venture capitalist's point of view, the benefit of seeking syndication is that the value of the project rises if other venture capitalists become involved. Different venture capitalists have different skills and information. Some might be helpful in organizing production, others might line up customers, others might contribute in human-resource management, etc. As under the selection hypothesis, the primary cost is that some share of the potentially profitable investment must be given up to secondary venture capitalists. Syndication will be sought in cases where the expected benefits exceed the expected costs of syndication. If the value-added hypothesis is correct, then observed financial returns should be higher for syndicated projects.

The implications of these two hypotheses allow a very direct test using data on returns. We have access to a database on returns to Canadian venture-capital investments collected by Macdonald & Associates. Using this data set, we find that syndicated investments have significantly higher returns (in both the statistical and the economic sense) than standalone investments. Thus our analysis favors the value-added hypothesis over the selection hypothesis as a possible rationale for syndication. It also suggests that management rather than selection is at the heart of venture-capitalist activity.[3]

Both motives for syndication could be operating simultaneously. In that context, our empirical results indicate that the value-added hypothesis seems more important than the selection hypothesis. In addition to the two hypotheses we formulate and test, there are also other possible rationales for syndication. In particular, one hypothesis suggested but not tested by Lerner (1994) is the risk-sharing hypothesis. The idea is that venture capitalists undertake syndication so as to diversify their portfolios and reduce overall risk. We provide some evidence on the role of risk sharing and conclude that risk sharing may be present. A related idea is that syndication might arise from capital constraints: a venture capitalist might not have enough

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3. Gorman and Sahlman (1989) describe survey evidence on venture-capital activity that suggests that venture capitalists report themselves as being actively engaged in both selection, or *portfolio*, activities and in managerial activities. Hellmann and Puri (2000, 2002) provide evidence that is consistent with the idea that venture capitalists add value through managerial activities in the venture.

resources on hand to fully finance a large venture. The evidence we have suggests that such constraints are unlikely to be a major explanation for syndication.

There are other possible reasons for syndication that we do not test. One possibility is collusion: by banding together rather than competing, venture capitalists might improve their bargaining position with entrepreneurs. Another possibility is that syndication has an influence on *control rights* in the venture, as the question of who controls the venture is an important consideration in venture-capital finance. (See Kaplan and Strömberg, 1999.) A related idea is that potential agency problems can be mitigated by syndication. In particular, Admati and Pfleiderer (1994) provide a formal model in which venture capitalists can avoid agency problems by maintaining a constant share of ownership in a particular venture over time. This suggests a role for syndication if other venture capitalists are sought as alternative investors.

The role of syndication in venture capital is frequently discussed in the business press and in the descriptive literature on venture-capital finance. [See, for example, Kunze (1990) and Perez (1986).] However, the formal academic literature on venture-capital syndication is modest in scope. Aside from Lerner (1994), we are not aware of any published academic papers in which the rationale for venture-capital syndication is the central focus, although, as implied by previous paragraphs, some of the existing literature on venture-capital finance does bear on the syndication question.

Uncertainty and information acquisition are central to our formal models, but our analysis abstracts from the "agency" perspective that has been influential in the analysis of venture-capital finance. [See, for example, Amit et al. (1998).] We recognize that agency considerations might be relevant in explaining the motivation for venture-capital syndication, as in Admati and Pleiderer (1994) and Hellman (1998), but we believe that it is also important to consider the pure learning, selection, and managerial issues that we emphasize.

Section 2 provides a brief description of the venture-capital industry. Section 3 provides a formal development of the selection hypothesis, Section 4 formalizes the value-added hypothesis, Section 5 describes the data used to test these hypotheses, and Section 6 describes our econometric analysis. Section 7 provides consideration of the risk aversion and scale hypotheses, and Section 8 contains concluding remarks.

2. A Brief Description of the Venture Capital Industry

Unlike most other parts of the financial sector, the venture-capital industry lacks a precise legal or regulatory definition. Definitions of venture capital usually focus on four characteristics. Three of these are emphasized by the following definition from Shilit (1991, p. 34): "venture capital can be thought of as *financing for privately held companies* [our emphasis], generally *in the form of equity* [our emphasis] and/or long term convertible debt . . . . The venture capitalist, like the banker, serves as *an intermediary* [our emphasis]—or conduit—between the investors . . . and the entrepreneurs." The fourth characteristic is highlighted in the definition given by Kunze (1990): "The combination of equity participation *plus active involvement in the development of the company* [our emphasis] is what distinguishes venture capital from all other investment vehicles."

The core activity defining venture capital is investment in privately held companies, although venture capitalists sometimes hold shares of companies even after they have gone public. The willingness to make equity investments is also a defining characteristic, and venture capitalists typically provide a mix of debt and equity financing. The intermediation aspect of venture capital is what distinguishes venture capitalists from wealthy individuals (often called "angels") who invest their own money in fledgling companies. The venture capitalist obtains money from arm's-length investors—often pension funds and other institutional investors—and from individuals, and pools this money with internal resources. The capacity to be actively involved in the management of young companies is also an important characteristic of venture capitalists, although this capacity is not used in all investments. Venture capitalists usually operate by setting up *funds*, or partnerships, often with a fixed time horizon, and sometimes with a particular target set of investors. A single venture capitalist will typically have several funds.

Venture-capital finance is a dynamic activity in that there are many stages in the financing process. The categorization of different stages is somewhat arbitrary, but it makes sense to distinguish five stages. The earliest stage is referred to as *seed* investment and may occur before a company is founded. Seed investments are often based on a single individual with an idea and relevant expertise, and the venture capitalist may assist in forming a company. The next chronological stage is startup investment, which normally refers to investments made after a company exists but before sales occur. The next stage is the early growth phase, which corresponds to the period after

the first initial sales but before sales become a major source of finance for ongoing operations. The fourth stage is referred to as "follow-on" or "mezzanine" or *later-stage* financing. Finally there may be a stage of financing focused on a specific purpose for a mature privately held company, including *turnaround* investments and *leveraged buyouts*.

Within each stage there may be more than one round of investments. The amount of time associated with each stage is variable, but a horizon of about a year each is typical for the first three stages. Later-stage financing more commonly stretches out over two or more years, and *special-purpose* investments are usually one-time investments that might be made anytime after the first three stages are complete.

When we think of venture capital, we often think of seed and startup investment, but these stages are less important quantitatively than subsequent stages. In our data, obtained from Macdonald & Associates and described in more detail in Section 5, we have fairly complete records on the venture-capital investment history of Canadian companies founded in 1990 or later that ultimately received venture-capital financing from Canadian venture capitalists. In this population, a few (1%) received their first venture-capital investment in the calendar year preceding the founding of the company. These are definitely seed investments. A further 21% received their first investment in the same calendar year that the venture company was founded. These would be a mixture of seed and startup investments. Another 10% received their first investment in the calendar year subsequent to founding. This would include some investments that qualify as startup investments and some early growth-stage investments. An additional 7% of ventures received their first investment in the second calendar year subsequent to being founded. The median time from founding to first venture-capital investment is between three and four years.

Syndication, if it occurs, normally occurs soon after the first venture-capital investment. Specifically, of those ventures that received investments from more than one venture capitalist, about 70% received an investment from a second venture capitalist within the same calendar year as the initial investment by the lead venture capitalist. We can think of three major patterns for syndicated investments. The most common pattern is that first investment from a venture capitalist occurs in the early growth stage or later, with syndication occurring simultaneously or shortly after. The second pattern is that the lead venture capitalist makes a seed or startup investment, followed by syndication at a later stage. In such cases the experience of the lead venture capitalist will influence future investments, as a poor outcome at the seed or startup phase (as judged by
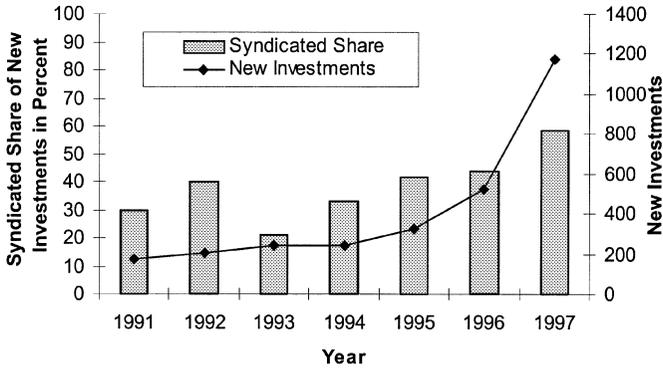
FIGURE 1. SYNDICATION AND INVESTMENT TIME TREND

the lead venture capitalist) may lead to termination of the venture. The third and least common pattern is that syndication occurs at the seed or startup stage. Under all patterns the lead venture capitalist is the primary decision-maker over whether syndication occurs.

As illustrated in Figure 1, one other important feature of venture-capital finance in Canada over the sample period is that the amount of it increased with time, as did syndication. The bars show the share of all new venture-capital investments in a given year that are syndicated in the (narrow) sense that two or more venture capitalists invest in a given venture in the same calendar year. Thus, in 1992 about 40% of all new investments were components in syndicated projects. The line shows the total number of new venture-capital investments.

3. A Formal Model of the Selection Hypothesis

We construct the simplest model we can that allows rigorous formulation of our research question.[4] We assume that a project or venture arrives at time t_1 for consideration by a lead venture capitalist. We assume, without loss of generality, that the project has a required investment of 1. The project will yield a (nonnegative) cash flow. If this cash flow is zero, then the entire investment is lost. The venture capitalist's problem is to investigate the project and decide whether to accept it or reject it.

This investigation consists of independent *trials*, each of which yields a *signal*. The signal is binary in that it can take on only two

4. We are particularly grateful to a referee for indicating how to provide a simpler and more general representation of the selection hypothesis than in our original formulation.

possible values: positive (good) or negative (bad). We can then write the expected cash flow from the venture as $R(j, N)$, where j is the number of positive signals and N is the number of trials. Each signal is assumed to be *informative*, as defined by the following conditions:

$$R(j+1, N) > R(j, N) \tag{1}$$

and

$$R(j, N) > R(j, N+1). \tag{2}$$

Condition (1) states that expected cash flows are higher if there are more positive signals in a given number of trials. Condition (2) states that expected cash flows decrease if it takes more trials to get a given number of positive signals. The simplest information structure that allows for the different information states we require is to assume that the venture capitalist's investigation is equivalent to two trials. This allows the information to be good (two positive signals), bad (two negative signals), or intermediate (one signal of each type).

At time t_2 the venture capitalist chooses among three possible actions: outright rejection, outright acceptance, and *seeking syndication*. If the venture capitalist seeks syndication, then additional venture capitalists are approached. These secondary venture capitalists evaluate the project and provide a recommendation to accept or reject. This evaluation is treated as a third trial, and the recommendation as a third signal for the lead venture capitalist, who then makes a final decision to accept the project as a syndicated project or to reject it. An implicit assumption is that the lead venture capitalist cannot simply purchase (at relevant cost) an extra signal from a consultant or outside source. To get the extra information it is necessary to seek syndication. Figure 2 illustrates this decision-making sequence.

To explain syndication we need to analyze the decision node that occurs at time t_2. We assume that the venture capitalist is risk-neutral and thus seeks the action with the highest expected value. If the venture capitalist rejects the project, then available funds are placed in an alternative investment. We define r as the expected gross cash flow per unit investment in this alternative. If the project goes ahead under syndication, the lead venture capitalist provides an (exogenous) share $\alpha < 1$ of the required investment, with the rest being provided by the other syndicating venture capitalists. The amount $1 - \alpha$ that the lead venture capitalist has left over out of the original potential investment is invested in the alternative asset and will therefore return expected cash flow $(1 - \alpha)r$.
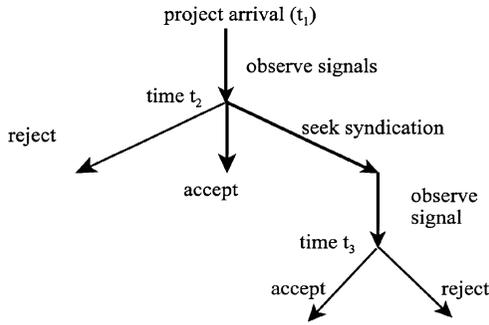
FIGURE 2. DECISION STRUCTURE FOR LEAD VENTURE CAPITALIST

The lead venture capitalist maximizes expected value and will therefore compare the expected values from the three possible actions at time 2 and select the action with the highest expected value. We impose the following structural assumption on the expected returns to ensure that rejection, acceptance, and syndication are all feasible possibilities:

$$R(1, 2) < r < R(2, 3). \tag{3}$$

Here $R(1, 2)$ is the expected return from one positive signal out of two trials. This is assumed to be less than the alternative investment value, r. On the other hand, the expected return from two positive signals out of three trials exceeds this alternative. We now state the main properties of the model in the form of propositions.

PROPOSITION 1:

  (i) *The lead venture capitalist will reject the project outright if the initial two signals are negative.*
 (ii) *The lead venture capitalist will accept the project outright if the initial two signals are positive.*
(iii) *The lead venture capitalist will seek syndication if the two initial signals differ in sign.*

Proof. (i): If the two initial signals are negative, the expected return under outright acceptance is $R(0, 2)$, whereas the expected return under outright rejection (and consequent investment in the alternative) is r. Using (1) and (3), $R(0, 2) < R(1, 2) < r$, so outright rejection dominates outright acceptance. In addition, rejection dominates seeking syndication. If syndication is sought, the best possible expected

return to the project after trial 3 is $R(1, 3)$. Under syndication the lead venture capitalist's expected value after trial 3 would be $\alpha R(1, 3) + (1 - \alpha)r$, where $\alpha < 1$. This must be less than r, as (2) and (3) imply that $R(1, 3) < R(1, 2) < r$. Thus, after two initial negative signals, rejection dominates even the best possible outcome under the syndication option.[5]

(ii):   The expected return from outright acceptance after two initial positive signals is $R(2, 2)$. From (1), (2), and (3) it follows that $R(2, 2) > R(2, 3) > r$, which implies that outright acceptance dominates outright rejection. Syndicated acceptance also dominates rejection, but syndication merely dilutes whatever return arises, as the lead venture capitalist would receive only a share $\alpha < 1$ of this return. Outright acceptance is therefore preferred.

(iii):   If the two initial signals differ, it follows from (3) that the lead venture capitalist will not accept the project outright, as $R(1, 2) < r$. However, the project would be worthwhile if the potential syndicating partners were positive (i.e., if the third signal were positive), as $R(2, 3) > r$. Therefore, seeking syndication dominates outright rejection, as the lead venture capitalist will either end up rejecting anyway, and still receive return r, or accept part of a syndicated project with an expected return exceeding r.   □

PROPOSITION 2:   *Syndicated projects will be lower in expected value than standalone projects. Therefore, observed syndicated projects should have a lower average return than observed standalone projects.*

Proof.   From Proposition 1 we infer that standalone accepted projects have expected return $R(2, 2)$, whereas syndicated projects have expected return $R(2, 3)$. It follows from (2) that $R(2, 2) > R(2, 3)$.   □

The logic of Proposition 2 is that high-quality projects are more likely to yield two initial positive signals and are therefore more likely to be accepted outright than lower-quality projects. Intermediate-quality projects are more likely to generate an intermediate initial information pattern and are therefore more likely to be considered for syndication.[6]

5. The lead venture capitalist could always reject after considering syndication, in which case seeking syndication would be equivalent to outright rejection. We break this tie in favor of outright rejection on the grounds that if we incorporated even slight concessions to additional realism such as discounting or transaction costs, then outright rejection would be strictly preferred.
6. Other structures with more ambiguous outcomes are possible. For example, if new ventures are immediately identified by the lead venture capitalist as coming from

4. THE VALUE-ADDED HYPOTHESIS

The idea underlying the value-added hypothesis is that the lead venture capitalist seeks syndication to enhance the performance of the venture. This contrasts with the selection hypothesis, under which syndication helps to select the best projects but does not affect the performance of any venture. As in the selection model, we assume that a representative venture or project requires capitalization normalized to 1 and that the expected cash flow or payoff is R. We need to abstract from the selection problem considered in the previous model, so we assume that R is known unconditionally and is not affected by learning.

As before, there are alternative investments available that return expected cash flow r. If $R > r$, then standalone acceptance will be preferred to rejection. Assuming, as before, that ties are decided in favor of rejection, if $r \geq R$ then rejection is preferred to standalone acceptance. Under the value-added model, syndication increases the expected return of some projects. The value added to the project from syndication is denoted φ. The expected payoff if the project is syndicated is therefore $R + \varphi$. A project might not benefit at all from syndication, or it might benefit substantially. To keep the analysis simple we assume that φ can take on only two possible values, v or 0:

$$\varphi = \begin{cases} v & \text{with probability } \pi, \\ 0 & \text{with probability } (1 - \pi). \end{cases} \tag{4}$$

As before, if syndication occurs, the lead venture capitalist takes on a fraction α of the project, and therefore invests only α in the project, with $1 - \alpha$ being invested in the outside alternative. As the outside alternative returns cash flow r per unit invested, an investment of $1-\alpha$ returns cash flow $(1 - \alpha)r$. We assume that v is large enough to make syndication attractive relative to standalone investment. Defining R^* as the upper bound on the expected value of a standalone project, we therefore require the following condition:

$$v > (R^* - r)(1 - \alpha)/\alpha. \tag{5}$$

As in the selection model, the lead venture capitalist chooses to reject the project (action 1), accept the project on a standalone basis (action 2), or seek syndication (action 3). This choice is made after

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one of two distributions, one of which has a high mean and a high variance, then syndication (i.e., more information) might be sought in the high-mean, high-variance cases. However, the structure underlying Propositions 1 and 2 seems to capture the central insight regarding selection effects.

observing φ. In this model, syndication will always occur if the lead venture capitalist chooses action 3.

It is useful to form the differences between the expected values. Using δ_{ij} to represent the difference between the expected values of actions i and j, we can write the following:

$$\delta_{21} = R - r, \tag{6}$$

$$\delta_{31} = \alpha(R + \varphi) + (1 - \alpha)r - r = \alpha(R - r + \varphi), \tag{7}$$

$$\delta_{32} = \alpha(R + \varphi) + (1 - \alpha)r - R = \alpha\varphi - (1 - \alpha)(R - r). \tag{8}$$

In practice R and φ might be correlated, but we make the inessential and algebraically convenient assumption that R and φ are independent: the value added of syndication does not depend on the underlying project quality. Proposition 3 states the conditions under which standalone investment, syndication, and project rejection will be chosen.

PROPOSITION 3:

  (i) *Standalone investment will be chosen if and only if $R > r$ and $\varphi = 0$.*
  (ii) *Syndication will be chosen if and only if $\varphi = v$ and $R > r - v$.*
  (iii) *Rejection will be chosen if and only if (a) $\varphi = 0$ and $\theta \le r$, or (b) $\varphi = v$ and $R \le r - v$.*

Proof. See Appendix. □

We can see from Proposition 3 that syndication hinges, as we would expect, on the project being one for which syndication actually provides added value. Otherwise, either rejection or standalone investment would be preferred. Proposition 3 indicates that v is large enough relative to R^* that syndication is preferred to standalone investment for those situations where syndication adds value. The lead venture capitalist will not choose to "cherry pick" the very best projects for standalone investment.

In order to compare the expected returns to syndicated and standalone investments, it is necessary to make some distributional assumptions about R. We assume that R is uniform on the interval $[0, R^*]$. We take this as a neutral case, and it has the advantage of providing computational simplicity. Recall that R is the expected value, not the realized value. Realized values are highly skewed, but expected values are based on a high level of ignorance and might perhaps be taken as uniform.

PROPOSITION 4: *The expected rate of return to syndication exceeds the expected rate of return to standalone investment.*

Proof.   See Appendix.   □

It might seem obvious that average returns from syndication will
exceed average returns from standalone investment, as venture-capital
firms will seek to syndicate in precisely those cases where syndication
has high value added. However, adding value through syndication
might allow a project that would fail the standalone standard to be
accepted for syndication. This might tend to lower the return of syndi-
cated projects relative to standalone projects. The relative importance
of this effect depends on α, on the correlation between φ and R, and
on the distribution of R.

The role of α arises because syndication has a cost to the lead
venture capitalist in that the project must be shared. This cost will
be borne only for those projects that yield a sufficiently high value
added from syndication. This is the key effect that tends to make
the aggregate return to syndicated projects higher, and this effect
is stronger if α (the lead venture capitalist's share under syndica-
tion) is smaller. Second, we have assumed that the value from syn-
dication, φ, is uncorrelated with the intrinsic quality of the project
as reflected by R. Alternatively, if we made the plausible assump-
tion that φ is positively correlated with R, then this would also tend
to make syndicated projects have a higher return than standalone
projects, as the very good projects would tend to be those that also
offered high returns from syndication. Therefore, the assumption that
φ is additive and uncorrelated is conservative. The distribution of R
is relevant because we need to rule out the possibility that adding
v in an uncorrelated way to the expected value R moves a large
mass of the expected-value distribution from being unacceptable to
being marginally acceptable under syndication. This would seem an
unlikely possibility that would be ruled out by many reasonable alter-
native assumptions. The uniform distribution is simple and sufficient,
and should be regarded as an illustrative example.

5. Data

The two models presented in Sections 2 and 3 have strikingly differ-
ent implications for the pattern of returns to venture-capital invest-
ments. The selection hypothesis implies that syndicated investments
should have lower rates of return than standalone investments. In
contrast, the value-added hypothesis suggests that syndicated invest-
ments should have higher expected rates of return than standalone
investments. To test the relative empirical strength of these hypothe-
ses we therefore need data on returns to venture-capital investments.

The data used for this study were collected by Macdonald & Associates and made available to us on an anonymous and confidential basis. In addition, no specific information related to a single firm—venture or venture capitalist—is reported or discussed. The data are derived from several surveys conducted by Macdonald & Associates. The most important survey for our purposes is the *exit survey*, which records information about the divestiture of venture-capitalist investments for the period from 1992 through 1997, plus the first quarter of 1998. These divestments, or *exits*, can occur in several ways. For unsuccessful ventures, the venture capitalist might exit simply by writing off the investment. For more successful ventures, the venture capitalist might exit by selling its shares to a third party as part of a private third-party acquisition. If the venture goes public in an initial public offering (IPO) and the venture capitalist subsequently sells its holding, this is recorded as an IPO. There are three other types of exit in the data. One type is the management buyout (MBO), in which the venture capitalist sells its share to managers or officers of the venture itself. Another type of exit is the secondary sale, in which the venture capitalist's holding is sold in a private sale to a third party, but not as part of an overall third-party acquisition. In the last type of exit, called "other," the exit vehicle was not reported. There are 584 exits in the data, including partial exits in which some but not all of the venture capitalist's holding is divested. Figure 3 shows the distribution of exit by exit vehicle.

The exit survey records the value of the venture capitalist's divestment. It also records the cost of obtaining the investment in the
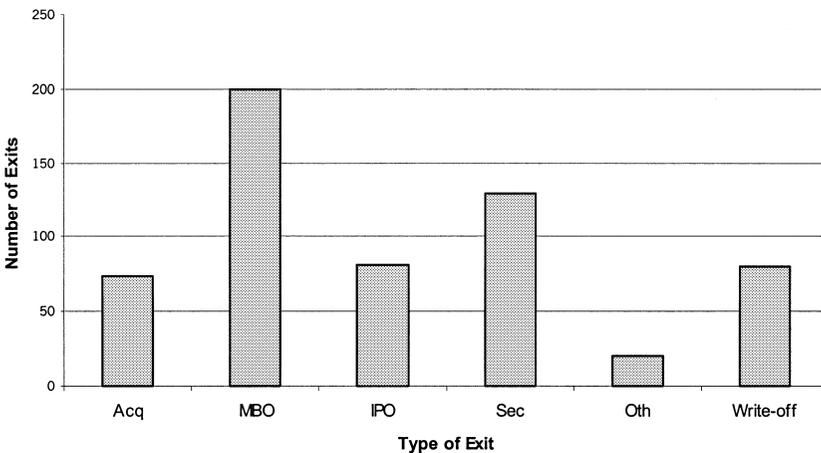

FIGURE 3. VENTURE-CAPITAL EXITS

first place. Thus, for example, the venture capitalist might acquire a block of shares for $1 million and subsequently sell it for $2 million. The apparent nominal return would then be 100%. It is, of course, important to know the holding period of the investment, so that an annualized rate of return can be calculated. Unfortunately, the holding period is not reported directly in the exit survey. It can, however, be inferred in principle from a related survey carried out by Macdonald & Associates, referred to as the *investment survey*, which tracks the timing of investments made by the venture capitalists. We say "in principle" because full prior investment information is not available for all exits. Of the 584 total exits, we can calculate holding periods and can therefore calculate annualized (real) rates of return for 393. For the other 191 exits, we know the aggregate nominal return but not the holding period.

It is possible to estimate the holding period for those investments using other characteristics of the data. For the data with known holding periods we form a regression equation that "explains" the holding period. The explanatory variables for this regression are industry, location, the investment round, and exit vehicle. This regression equation can then be used to predict the holding period for those observations where it is missing. The predicted holding periods,[7] while noisy, contain some useful information in the sense that a significant part of the variation in estimated returns is due to actual variation in annualized returns, and the rest of the variation can be viewed as noise. Restricting attention to just the 393 observations with known holding periods would involve wasting the information contained in the investment-cost and value information for the other exits. We therefore consider the extended 584-observation dataset as well as the smaller 393-observation dataset. We refer to these as the *extended* and *primary* datasets respectively. We report results for both datasets, although we put the main emphasis on the primary dataset.

Macdonald & Associates seeks to track all venture-capital investments in Canada made by Canadian venture capitalists. While the coverage is not complete, information is obtained on the vast majority of such investments. Fortunately for our purposes, the data contain information on syndication. Thus, for each exit made by a venture

7. The holding-period regressions have only a modest corrected R^2 of 0.19. The location variables include dummy variables for Quebec and the West, with the base being the rest (mostly Ontario). The industry dummy variables are manufacturing, biotech, and computers and communications, with the base being the rest. The exit dummies are as shown in Figure 3. We also use an activity counter associated with an exit. Any investment or exit counts, so if an exit has a count of, say 5, this would mean that the exit was the fifth recorded investment or exit event for this venture. Holding periods are increasing in this variable.

capitalist, we know if other venture capitalists also had investments in that venture, and we know, in most cases, when that investment occurred.

The unit of observation for the analysis in subsequent sections is the completed venture-capital investment. (In contrast, the data described in Section 2 are based on all venture-capital investments, not just completed investments.) For example, venture capitalist A might make an investment in firm 1, and get shares in the firm in return. At some future time, this investment might be sold, and a rate of return could then be calculated. This record would form one observation in the dataset used for subsequent sections. Venture capitalist B might also make an investment in firm 1 and might subsequently sell its share as well. This investment would be a second observation. Note that the rate of return to B could be quite different from that to A for investments in the same venture. In addition, venture capitalist C might also invest in firm 1, but might not have sold its share by the time of the latest survey in the dataset. This investment by C would not be recorded as a completed investment and would therefore not be a record or observation in our dataset.

There are two possible definitions of syndication (as described in footnote 1). The narrow definition is that syndication occurs when two venture capitalists make investments simultaneously. The broader definition allows investments to count as syndicated investments regardless of whether the investments occurred at the same or different times. Operationally, if investments by different venture capitalists occur in the same calendar year, we treat this as satisfying the narrow definition. Broadly defined syndication occurs if a second venture capitalist invests in the venture at any time, provided there is some overlap among venture capitalists in time.

One potential difficulty is that venture capitalist A might make an investment and exit fully at a later time, followed, at a still later time, by an investment from B. Such a situation should not be viewed as syndication. However, if these three steps (investment by A, full exit by A, and entry by B) all occurred in one calendar year, this would mistakenly count as a syndicated investment in the narrow sense. This is at most a very small problem in our data. Of 171 narrowly syndicated investments, only 10 have an investment and exit by the same firm in the same year, and most of these can determined to be genuine syndications by carefully inspecting the data. We believe that at most one or two cases are false syndications.

For the broad definition of syndication, false positives could indeed be a problem. Exits are observed from the first quarter of 1992 through the first quarter of 1998, so this does give time for full exit

by one venture capitalist and subsequent investment by another. We address this problem as follows. First we take all narrow syndications. Then we add all situations where a second venture capitalist entered in a calendar year subsequent to the first one's investment. We then remove all cases where the first venture capitalist had an exit in a prior year to the second one's investment. This will unfortunately eliminate cases where the first venture capitalist only sells part of its holding before the second one joins. We therefore add back those cases where the first one has another exit following the second one's investment, as this indicates that overlap did occur. Overall, the broad syndication variable should be a reliable indicator of overlapping investment by venture capitalists.

There are 171 (out of 584) narrow syndications in the extended data set, and 147 (out of 393) in the primary data set. Using the broader definition of syndication, there are 243 (out of 584) syndicated investments in the extended data set, and 194 (out of 393) in the primary data set. Even though broad syndications cover a much longer period (6 years) than narrow syndications (1 year), moving from narrow to broad increases the number of syndications by only about 30% in the primary database and about 40% in the extended database. We report results for both the narrow and broad definitions of syndication.

Our data do not track syndication attempts that do not yield syndication. Therefore, we cannot observe cases of syndication giving a "bad signal." This does not compromise the statistical tests we carry out. The quality and nature of the data we have are, to our knowledge, unique and allow more direct evaluation of the rationale for syndication than has previously been possible.

6. Estimation and Results

The empirical test is straightforward in principle. We wish to see whether syndicated or standalone investments have higher returns. We use two approaches. First we compare the mean returns of the two classes of investment. We also use regression analysis. The *rate of return* is the annualized arithmetic (or simple) real rate of return.[8] The

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8. We use the arithmetic (simple) rate of return rather than the geometric (compounded) rate because the arithmetic rate allows a much more satisfactory treatment of write-offs, which represent a significant share of the dataset. If a write-off occurs, then the geometric rate of return is -100% per year, regardless of the holding period. Thus, for example, if a $1-million investment is written off to 0 after 4 years, the only way this can occur under geometric compounding is if the loss in the first year is -100%. Any rate of return less (in absolute value) than 100% would imply that something must be left after 4 years. The arithmetic rate of return is simply -25% per year, which is much more likely to approximate the actual loss in value.

TABLE I.

DIFFERENCES IN ANNUAL RATE OF RETURN BETWEEN
SYNDICATED AND STANDALONE INVESTMENTS

Data Set	Primary, narrow	Primary, broad	Extended, narrow	Extended, broad
Standalone: μ_1	17.4	14.9	20.3	17
Syndicated: μ_2	39	36.5	34.8	35.3
Diff.: $\mu_2 - \mu_1$ [st. err.]	21.6 [9.3]	21.7 [9.0]	14.5 [8.12]	18.3 [7.49]
t-stat.: $H_a : \mu_1 \neq \mu_2$ [p-val.]	2.09 [.038]**	2.40 [.017]**	1.60 [.111]	2.35 [.019]**
No. of observations	393	393	584	584

overall average simple real return is 24.5% per year. The correspond-
ing portfolio return is 16.3% per year. (This is, in effect, the average
return weighted by investment size.)

6.1   USING t-TESTS TO EVALUATE DIFFERENCES IN AVERAGE RETURNS

Table I reports t-tests of the null hypothesis that the mean rates of
return for syndicated investments and standalone investments are the
same against the (two-sided) alternative that they differ, carried out
under the presumption of unequal variances. In the row reporting
estimated differences, standard errors are reported in square brackets.
Two asterisks indicate significance at the 5% level or better.

Table 1 shows that the syndicated investments had substantially
higher average returns for all four data classifications than the stand-
alone investments. The absolute difference in rates of return is large,
as standalone investments had average rates on the order of 15% to
20% whereas the syndicated investments had average returns of about
35% to 39%. Because of the underlying variability in rates of return
and the modest sample sizes, the t-statistics are not particularly large,
but they are significant at the 5% level for three of the four classi-
fications, including the "primary, narrow" case, which we take as
the most important. The significance levels are with respect to the
two-sided alternative that the two groups of investments have differ-
ent means. If we considered the one-sided alternative that syndicated
investments have a higher mean return, then the significance levels
would be stronger (i.e., smaller), and even the "extended, narrow"
case would allow rejection of the null hypothesis at better than the
10% significance level.

Therefore, if we treat the dataset as a sample, we reject the null
hypothesis of equality in favor of the alternative that the syndicated

investments have higher returns. Arguably, however, we might treat the data sets as a population rather than a sample, in which case we would simply observe that the syndicated investments in fact have much larger returns on average than the standalone investments.

The means test show a clear and striking pattern. Even though the distributions of returns for standalone and syndicated investments overlap (as implied by the standard errors), the differences in average returns are so great that we might wonder if some sort of selection bias could be present. One type of selection bias that might seem plausible is that syndication partners seek to sign on with successful ventures after observing early signs of success.

This effect is sometimes called *window dressing*, as venture capitalists try to make themselves look good by becoming associated with successful ventures. Presumably the secondary partners in such syndications would earn only normal returns, but the lead venture capitalist would earn large returns and this would be enough to bias the returns. If this is true, however, it should apply more forcefully to the broadly defined syndications, and should not really apply to the narrowly defined syndications, which take place within the same year, and which normally occur well before returns are realized. Looking at the primary dataset, however, we see that the differences in average returns are nearly the same for narrowly defined syndications as for broad, suggesting that this selection bias is either absent or very modest. Also, the mere fact that most syndications are narrow suggests that not many venture capitalists are joining late. More formal (regression) analysis shows no significant effect of time between investments on returns. Overall, we see little or no evidence of window dressing in our data.

6.2 Using Regression Analysis to Evaluate Differences in Returns

It is possible that the pattern found in Section 6.1 is induced by a failure to correct for other relevant factors. Perhaps, for example, some industries differentially attract syndication and also have higher returns. We do have several variables in the dataset that we might wish to correct for in a regression analysis. In particular, each exit is associated with one of six industries: computing and communications, electrical components, manufacturing, biomedical and pharmaceuticals, other health-related, and other. A dummy variable (COMP) for the computing-and-communications sector is significant as an explanatory variable for returns, while the other industries are not significant. More precisely, the returns to the computing-and-communications sector are significantly different from the returns to the aggregate of the

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TABLE II.

REGRESSION RESULTS

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Dataset	Primary, narrow	Primary, broad	Extended, narrow	Extended, broad
Syndication[a]	19.6 (2.13)**	18.1 (2.02)**	11.0 (1.37)	13.2 (1.76)*
Computer Industry	23.9 (2.35**)	21.8 (2.13)**	26.7 (3.17)***	24.8 (2.92)***
Pref. Tax Status	−28.4 (2.02**)	−29.3 (2.08)**	−31.1 (3.20)***	−31.2 (3.22)***
Const.	15.1 (2.31)**	14.2 (2.06)**	20.0 (3.88)***	18.2 (3.40)***
No. of Obs.	393	393	584	584
Adj. R^2	0.04	0.04	0.04	0.04

Dependent variable: annual percentage annual rate of return. t-statistics are in parentheses. *** represents a p-value of .01 or less, ** represents a p-value between .01 and .05, and * represents a p-value between .05 and .1.
[a]Dummy variable.

other sectors, while the other sectors are not significantly different from one another.[9] One other important explanatory variable is PTS, which stands for "preferential tax status." Some venture-capital funds enjoy preferential tax status that allows them to raise money more cheaply than other funds. This leads to an overall explanatory regression for the rate of return of the following form:

$$\text{r.o.r.} = \beta_0 + \beta_1 \, \text{SYN} + \beta_2 \, \text{PTS} + \beta_3 \, \text{COMP} + \varepsilon, \tag{9}$$

where SYN is a dummy variable that takes on the value 1 for syndicated investments and 0 for standalone investments. PTS and COMP are also dummy variables.

In Table II, the first row indicates whether the dataset being used is the extended one or the primary one, and whether the broad or the narrow definition of syndication is used. The second row shows the coefficient associated with the dummy variable for syndication. This coefficient is an estimate of the net value of syndication arising from the positive influence of the value-added effect and the negative influence of the selection effect. The narrow syndication dummy variable in the extended dataset is not quite significant at the 10% level. However, the overall pattern is consistent with the t-tests on the means and confirms that syndicated investments tend to have higher returns than standalone investments.

The computer and communications sector did well compared to other sectors, and this is a significant effect. Also, as one would expect, the tax-advantaged funds had lower rates of return than the others. This makes sense because the tax-advantaged funds offer tax

9. Since we use industry dummies to predict holding periods to construct the extended dataset, the reader might prefer to focus on the primary dataset for this analysis.

advantages to underlying investors in the venture fund and there-
fore require a lower threshold return for their investors than do other
funds. However, the apparent size of this effect is larger than might
be expected.

6.3   CORRECTING FOR OTHER FACTORS

There are other factors that might be important in determining
returns. In particular, we might anticipate scale effects if either
economies of scale or capital constraints induce an apparent advan-
tage from size. If syndicated investments give rise to larger ventures,
then perhaps it is scale rather than syndication that explains dif-
ferences in returns. We might also expect the year of exit to be
important (i.e., returns to be higher in good years than in bad), and
the age of the venture, as well. It is possible to correct for all these
factors. As it turns out, they are all insignificant, and do not affect
the main findings concerning syndication, and this remains true for
various permutations of specification. In the interest of providing
some insight into the performance of these variables, in Table III we
report results incorporating all these effects.

   Some of the new included variables have missing data. We are
therefore forced to drop some observations, leading to fewer observa-
tions than in the corresponding regressions reported in Table II. One

TABLE III.
OTHER POSSIBLE INFLUENCES ON RETURNS

Dataset	Primary, narrow	Primary, broad	Extended, narrow	Extended, broad
Syndication[a]	32.2 (2.96)***	29.4 (2.55)**	20.0 (2.07)**	23.3 (2.38)**
Computer Industry	35.6 (3.03)***	30.8 (2.62)**	38.3 (3.75)***	34.5 (3.39)***
Pref. Tax Status	−35.0 (2.08)**	−35.6 (2.11)**	−42.0 (3.21)***	−42.3 (3.25)***
log(Age)	−6.1 (0.89)	−6.3 (0.91)	0.07 (0.01)	0.07 (0.01)
Employment	.0025 (0.20)	−.004 (0.33)	−.008 (0.69)	−.006 (0.49)
1993	13.4 (0.31)	18.7 (0.43)	27.2 (1.01)	32.0 (1.19)
1994	−20.3 (0.47)	−16.3 (0.37)	15.9 (0.61)	20.0 (0.77)
1995	11.5 (0.27)	12.2 (0.29)	21.9 (0.86)	24.0 (0.95)
1996	38.7 (0.97)	38.2 (0.96)	34.4 (1.38)	37.1 (1.48)
1997	18.8 (0.49)	20.8 (0.53)	18.4 (0.78)	22.2 (0.95)
1998	26.12 (0.42)	32.1 (0.51)	32.0 (0.59)	36.3 (0.67)
Const.	3.3 (0.08)	0.3 (0.01)	−2.5 (0.09)	−10.2 (.37)
No. of Obs.	260	260	349	349
Adj. R^2	0.07	0.06	0.06	0.06

Dependent variable: annual percentage annual rate of return. *t*-statistics are in parentheses. *** represents a *p*-value
of .01 or less, ** represents a *p*-value between .01 and .05, and * represents a *p*-value between .05 and .1.
[a]Dummy variable.

of the additional control variables is age of the venture in years, measured as the time from business formation, which may precede incorporation. Most ventures are young, but there are some ventures that are relatively old, as firms can sometimes exist for a long time before seeking venture-capital financing, especially for turnaround and LBO investments. About 10% of the ventures in the dataset report an age of 20 years or more. Because the distribution of age is skewed to the right, we use the natural log of age. This variable is, however, insignificant. The estimated absolute effect of log(age) is small, and the standard errors are relatively large. Using raw (i.e., unlogged) age yields even less significant results and does not affect the coefficients on the other variables.

The regressions shown in Table III use the variable "employment" (measured by the number of employees in the venture). This is supposed to capture the size or scale of the venture. Employment is not an ideal measure of size, as it does not directly capture the amount of physical capital or other factors that contribute to total productive capacity. However, for most relatively young small private companies, the major expense and the major asset is the employees, so employment should capture an important element of scale. We have another variable that reflects size, which is the total investment in the venture by all venture capitalists. These two measures of scale have a significant positive correlation coefficient of 0.37, suggesting that they are both capturing some underlying size concept, but also suggesting that they might be capturing some different aspects of scale as well. However, regardless of whether we include one or the other or both of these variables, the scale effect is not significant, the syndication effect is significant, and the estimates and significance of syndication are only marginally affected.

The other factor we correct for is timing of the exit, using dummy variables to represent the year of exit. (The base year is 1992.) These dummy variables are insignificant, although the absolute level of returns does vary substantially on average from year to year. However, the variation across ventures is large compared to the variation over time. We tried using a time trend (not reported), without finding significant results, but it is clear from the pattern of the dummy variables that a time trend would not capture much. We also tried using a variable to capture the phase of the business cycle, which also was not significant. There are other variables that might serve as controls,[10] but after substantial specification testing we

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10. Two other variables in the dataset that might have been used as controls are mode of exit and location. The problem with mode of exit is that it is endogenous in

TABLE IV.
EFFECT OF THE DEGREE OF SYNDICATION ON RETURNS

Regression	No. of VCs[a]	COMP	PTS	Const.	No. of Obs.	Adj. R^2
Primary, broad	8.42 (2.97)***	24.4 (2.41)**	−26.8 (1.90)*	4.1 (0.49)	389	0.05
Extended, broad	6.50 (2.55)**	26.3 (3.13)***	−29.6 (3.05)***	10.6 (1.57)	584	0.05

Dependent variable: annual rate of return. *t*-statistics are in parentheses. *** represents a *p*-value of .01 or less, ** represents a *p*-value between .01 and .05, and * represents a *p*-value between .05 and .1.
[a]Count.

concluded that the syndication effect is robust, as are the tax-status effect and the computer-industry effect.

6.4 DEGREES OF SYNDICATION

So far we have treated syndication as a dummy variable—either syndication occurs, or it does not occur. However, it is possible to treat syndication more finely, as we know the number of syndicating venture capitalists associated with each venture. Of the 584 exits in the data set, 341 are standalone, 108 involve two venture capitalists, 59 involve three venture capitalists, 28 involve four venture capitalists, etc. Table IV reports the results of a regression similar to equation (10), except that we use the number of syndicating venture capitalists rather than just a syndication dummy variable.

We use only the broad definition of syndication in Table IV, as there is some ambiguity about exactly how the counts should be done for the narrow definition. For example, the appropriate classification if two venture-capital investments are simultaneous and one more is preexisting is not obvious. In any case, Table IV indicates that a larger number of venture capitalists is associated with increased returns, as we would expect from the value-added hypothesis.

Table IV suggests that value is increasing in the number of venture capitalists. There is insufficient evidence to suggest whether

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that the success of the venture largely determines the mode of exit. Successful ventures lead to exists in the form of IPOs and acquisitions. Less successful ventures normally lead to management buyouts or secondary sales, and the least successful ventures lead to write-offs. Thus exit type is largely determined by the returns and should not be included as an explanatory variable for returns in an ordinary least-squares regression. The problem with using location of the venture as an explanatory variable is that location is largely insignificant except for one effect—Quebec. However, it is primarily Quebec venture capitalists who have preferential tax status, so including location would induce collinearity with the tax-status variable. Our judgment is that it is the tax-status effect that is fundamental, not location per se, so we do not correct for location.

this effect might be subject to either increasing or decreasing returns. When we introduce a quadratic term (the number of venture capitalists squared), the extra term is insignificant and the adjusted R^2 falls. Similarly, if we use the log of the number of venture capitalists instead of the raw number, the adjusted R^2 falls and the significance of the explanatory variable is slightly reduced. In short, there is very little evidence to suggest that the relationship is anything other than linear, although there are insufficient data to place much weight on this finding regarding functional form.

7. The Risk-Sharing and Scale Hypotheses

In this paper we focus on two competing and possibly complementary rationales for syndication: selection and value added, and we assume that venture capitalists are risk-neutral. However, it is also plausible that risk aversion might be a motive for syndication, as venture capitalists might seek to share the risk associated with a particular venture. Equivalently, we might say that by syndicating, each venture capitalist is able to invest in more ventures, given the size of its pool of investment capital, and thus achieve (potentially) greater diversification.

Furthermore, as pointed out by a referee, it might be difficult to distinguish between the risk-sharing hypothesis and the value-added hypothesis. Depending on the joint distribution of risk and return across the population of available investments and on the precise specification of the venture capitalists' attitudes toward risk, it is possible that we could observe a set of high-risk, high-return syndicated ventures. This could induce a higher *ex post* return for syndicated ventures. Thus risk sharing is an alternative explanation for the results of Section 6.

It is difficult to test the importance of risk sharing. The relevant risk consideration from the venture capitalist's point of view is the contribution of a given investment to the overall portfolio risk, and this depends on the investment's entire covariance structure vis-à-vis other investments in the venture capitalist's portfolio, including the various investments that are not in our dataset. However, if the total contribution of an investment to the venture capitalist's risk is correlated with its own variance, then we might expect a risk-sharing motive to cause syndicated investments to exhibit more variability than standalone investments, as venture capitalists would seek syndication over more risky investments so as to allow themselves more diversification.

TABLE V.
SIZE STATISTICS
STATISTIC (MILLION 1997 CANAD. $)

Population	Mean	20th Percentile	Median	80th Percentile	Number
Ventures	2.74	0.27	1.04	3.99	2889
Venture capitalists	40.92	4.97	15.66	67.09	114

Syndicated investments do have higher variability in our data. The returns to syndicated investments (broad definition) have a standard deviation of 100.2, while the standard deviation of standalone investments is 80.3. Using a variance-ratio test for the difference of standard deviations, this difference is significant at the 1% level, suggesting that risk sharing might be a plausible partial explanation for syndication.

Another relevant piece of information concerns the size of a typical investment, relative to the size of a typical venture capitalist. We would expect risk aversion to be more important if the capital requirements of a venture are large compared to the resources of the interested venture capitalists. The size measure we have for a venture is investment in the venture by venture capitalists in the dataset. The size measure we have for venture capitalists is their total investments recorded in the dataset. As many venture capitalists have substantial "passive" investments (treasury bills, money-market investments, etc.) and have investments in other countries or in other types of assets as well, this is likely to significantly understate the size of the venture capitalist. In addition, many venture capitalists are subsidiaries of much larger financial institutions. However, using our limited definition of size, the Table V shows the mean and several percentiles of the size distribution for ventures and for venture capitalists.

The table includes all venture capitalists with five or more investments in the dataset. These venture capitalists account for 94% of all investments. The other venture capitalists would consist mostly of investors who are primarily invested in other countries or in areas other than venture capital. This table covers all 2889 ventures in the database, not just those where exits have occurred. The table shows that typical ventures are small compared to typical venture capitalists, and this effect would be stronger if we had the total financial portfolios of venture capitalists. However, the larger ventures are significant in size relative to the smaller venture capitalists, so this table would not rule out the possibility of risk aversion playing a significant role for some investments.

Our informal discussions with practitioners suggest that venture capitalists, of all financial intermediaries, seem most conscious of being willing to take risks. Still, we recognize that risk sharing might play a significant role. Collusion would also offer an explanation as to why syndicated returns are higher. However, we can at least still infer that the selection effect is *not* the major factor in determining the pattern of relative returns to standalone and syndicated ventures.

Table V also sheds light on whether capital constraints might play a role in syndication. Syndication is more likely to occur in cases where a single venture capitalist is not large enough to fully finance the venture-capital needs of a particular venture. Considering that scale effects are not significant in explaining venture-capital returns, the capital constraint effect would seem unlikely to bias the pattern of returns in favor of syndicated investments, so it is less of a concern than risk sharing. Still, it is useful to know if capital constraints are important. Table V does not rule out capital constraints being important in some cases, but such constraints would rarely be an issue for the larger venture capitalists who do most venture-capital investing.

One other data-related point to consider is that a project that provides above-normal returns for a longer period is better than a project that provides the same annual rate of return for a shorter period. Arguably one might use the total above-normal return rather than the annualized rate of return as the dependent variable. However, using plausible values for the normal rate of return, the estimated results are very similar to those for annual rates of return.

8. Concluding Remarks

In this paper we provide formal representations of two hypotheses concerning the motivation for venture-capital syndication. One hypothesis, which we refer to as the *selection* hypothesis, is that venture capitalists syndicate in order to obtain a second opinion about the quality of a particular investment under consideration. We show that this hypothesis implies that rates of return should, other things being equal, be lower for syndicated investments than for standalone investments. The reason is that a second opinion is only needed on marginal investments. Projects that are obviously good can proceed without a second opinion. Therefore, standalone projects should exhibit the highest returns *ex post*.

The alternative hypothesis, which we refer to as the *value-added* hypothesis, is that syndication adds value to a given project. This implies that syndicated projects should have higher rates of return than standalone projects. The comparison between the selection hypo-

thesis and the value-added hypothesis goes to the heart of the fundamental question as to what venture capitalists actually do. Do venture capitalists add value to projects, or do they merely select the more promising projects?

Our analysis clearly favors the value-added hypothesis, as syndicated projects have, on average, higher rates of return than standalone projects. The paper reports *t*-tests of the difference between two means and regression analysis, and the main result is clear despite the modest size of our dataset. The positive effect of syndication is significant in both the economic and the statistical sense.[11] We also report our attempt to control for several variables that might be expected to affect the regression. We also tried, but do not report, other specifications.

Our empirical analysis does not imply that the value of a second opinion in making selections is absent. It merely means that the value-added effect is empirically stronger than the selection effect. Thus our analysis suggests that venture capitalists do much more than just select promising projects; they also add value through management or other activities. Our analysis does rely on specific assumptions. In particular, we assume that the lead venture capitalist makes the syndication decision. Thus the syndication decision is endogenous to the lead venture capitalist but exogenous to the venture. The models could have different implications if the venture (i.e., the entrepreneur) made this decision.

We also consider the role of risk aversion and risk sharing, as this might be an alternative explanation for the high returns to syndicated investments. We conclude that risk sharing might be important in some cases, but we do not have enough evidence to draw clear conclusions. Even if risk sharing is an important factor, however, we can still safely conclude that the selection effect is dominated by other considerations.

APPENDIX. PROOFS OF PROPOSITIONS

Proof of Proposition 3. (i), sufficiency: First we prove the "if" part: that the conditions $R > r$ and $\varphi = 0$ are jointly sufficient for standalone investment. If $R > r$, then standalone investment is preferred to rejection, as δ_{21} is positive. If, in addition, $\varphi = 0$, then $\delta_{32} < 0$, which implies that standalone investment is preferred to syndication. Thus standalone investment is the dominant strategy.

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11. The value-added hypothesis would be further supported if we could demonstrate empirically that syndicating venture capitalists have skills complementary to those of lead venture capitalists, but we do not have appropriate variables in the data to test this idea.

(i), necessity: We now prove the "only if" part (i.e., that each condition is strictly necessary for standalone investment). If $R \leq r$, then rejection is preferred to standalone investment. [Recall that rejection is assumed to be chosen in the event of ties (i.e., if $\theta = r$).] Thus $R > r$ is necessary for standalone investment. Furthermore, if $\varphi = v$, then condition (5) implies that δ_{32} as given by (8) is positive, in which case syndication will be preferred to standalone investment. Thus $\varphi = 0$ is also necessary for standalone investment.

(ii), sufficiency: The two conditions are jointly sufficient for syndication. Syndication will be chosen if δ_{31} and δ_{32} as given by (7) and (8) are positive. δ_{31} is clearly positive if $\varphi = v$ and $R > r - v$. This means that the value of syndication exceeds the value of rejection. In addition, if $\varphi = v$, then condition (6) implies that $\delta_{32} > 0$, so syndication is also preferred to standalone investment.

(ii), necessity: If $\varphi \neq v$, then it must equal 0. If $\varphi = 0$, it follows from (7) and (8) that either δ_{31} must be nonpositive or φ_{32} must be negative. (If $R > r$, then δ_{32} would be negative, while if $R \leq r$, then δ_{31} would be nonpositive.) Thus syndication could not be chosen. $\varphi = v$ is therefore necessary for syndication. If $R \leq r - v$, then δ_{31} as given by (7) cannot be positive (regardless of the value of φ) and syndication cannot be chosen. Thus $R > r - v$ is also necessary.

(iii): This follows immediately from parts (i) and (ii) and completes the proof.

Proof of Proposition 4. We refer to standalone investment as event T. Similarly, we refer to the event that syndication is chosen as event Y. We now calculate the expected value of expected payoff R for standalone investment, which is denoted $E(R|T)$. This expectation is given by

$$E(R|T) = \int Rf(R|T) \, dR. \tag{A1}$$

The unconditional distribution of f is, by assumption, uniform on the interval $[0, R^*]$. From Proposition 3, part (i), syndication occurs if and only if $R > r$ and $v = 0$. It follows that $f(R|T)$ is uniform on the interval $(r, R^*]$. Therefore

$$E(R|T) = (r + R^*)/2. \tag{A2}$$

We now need to calculate the expected rate of return on syndicated investments. This requires finding $E(R + \varphi|Y)$, which can be written

$$E(R + \varphi|Y) = E(R|Y) + E(\varphi|Y), \tag{A3}$$

where $E(\varphi|Y) = v$, because syndication can occur only if it adds value. To find $E(R|Y)$ we note from Proposition 3 that, given $\varphi = v$, Y (syndication) occurs if and only if $R > r - v$. As $f(R)$ is uniform, it follows that the expected value of R over the relevant range $(r - v, R^*]$ is $(R^* + r - v)/2$. Substituting these values for $E(\varphi|Y)$ and $E(R|Y)$ into (A3) yields

$$E(R + \varphi|Y) = \frac{R^* + r - v}{2} + v. \tag{A4}$$

The expected cash flow (to the syndicate) from syndication is given by (A4), and the expected cash flow from standalone investment is given by (A2). This difference, denoted ΔR, is

$$\Delta R = \frac{R^* + r - v}{2} + v - \frac{R^* + r}{2} = \frac{v}{2} > 0. \tag{A5}$$

References

Admati, A. and P. Pfleiderer, 1994, "Robust Financial Contracting and the Role of Venture Capitalists," *Journal of Finance*, 49, 371–402.

Amit, R., J.A. Brander, and C. Zott, 1998, "Why Do Venture Capital Firms Exit? Theory and Canadian Evidence," *Journal of Business Venturing*, 16, 441–466.

Gompers, P.A., 1995, "Optimal Investment, Monitoring, and the Staging of Venture Capital," *Journal of Finance*, 50, 1461–1489.

Hellmann, T.A., 1998, "The Allocation of Control Rights in Venture Capital Contracts," *Rand Journal of Economics*, 29, 57–76.

—— and M. Puri, 2000, "The Interaction between Product Market and Financing Strategy: The Role of Venture Capital," *Review of Financial Studies*, 13, 959–984.

—— and ——, 2002, "Venture Capital and the Professionalization of Start-up Firms: Empirical Evidence," *Journal of Finance*, 57, 169–197.

Gorman, M. and W.A. Sahlman, 1989, "What Do Venture Capitalists Do?," *Journal of Business Venturing*, 4, 231–248.

Kaplan, S. and P. Strömberg, 1999, "Financial Contracting Meets the Real World: An Empirical Study of Venture Capital Contracts," Working Paper, University of Chicago.

Kunze, R.J., 1990, *Nothing Ventured: The Perils and Payoffs of the Great American Venture Capital Game*, New York: HarperCollins.

Lerner, J., 1994, "The Syndication of Venture Capital Investments," *Financial Management*, 23, 16–27.

Perez, R.C., 1986, *Inside Venture Capital: Past, Present, and Future*, New York: Praeger.

Sah, R.K. and J.E. Stiglitz, 1986, "The Architecture of Economic Systems: Hierarchies and Polyarchies," *American Economic Review*, 76, 716–727.

Schilit, W.K., 1991, *Dream Makers and Deal Breakers: Inside the Venture Capital Industry*, Englewood Cliffs, NJ: Prentice-Hall.